Nevada Division of Environmental Protection

Bureau of Water Pollution Control

(775) 687-9418

WASTEWATER SAMPLING PLAN

WTS-50

January 2015 (Version No. 2)

I. Introduction:

This guidance document provides an overview of the wastewater sampling plan used by the Bureau of Water Pollution Control (BWPC) when conducting a Compliance Sampling Inspection (CSI) at a regulated wastewater treatment facility. The specific wastewater panels/tests, preservation methods, sample containers and hold times are applicable for those analyses performed at the Nevada State Public Health Laboratory. The telephone numbers for this laboratory are (775) 688-1335 (Phone), (775) 688-1460 (Fax). For a list of other State certified laboratories, the reader is referred to the NDEP Laboratory Certification Program (LCP) website: http://ndep.nv.gov/bsdw/labservice.htm. The website includes a downloadable Microsoft Excel spreadsheet entitled *Nevada Certified Lab List*.

II. Safety:

BWPC personnel sampling wastewater discharge facilities must exercise appropriate caution in the sampling workplace to protect themselves from potential hazards including exposure to: disease-causing bacteriological/viral agents, mechanical equipment (e.g. rotary auger screens) and limited footing traction (e.g. wastewater holding basins). Personal Protective Equipment (PPE) that is available includes disposable nitrile (latex-free) gloves, hardhats (construction zones) and safety shoes (e.g. waterproof/water resistant, steel-toed). In addition, protective eyewear is recommended when using chemicals (e.g. acids). Sampling supplies in the NDEP Carson City office are stocked in the BWPC Copy Room (3rd Floor Bryan Building) and the Bureau of Water Quality Planning (BWQP) Laboratory (1st Floor Bryan Building). The NDEP Las Vegas office also has a supply room where the BWPC sampling supplies and refrigerator (samples and ice packs) are maintained.

Fig. 1 – BWPC Supplies

Fig. 2 – BWQP Laboratory

Fig. 3 – NDEP Las Vegas

III. Influent Sampling:

An influent (e.g. untreated) wastewater sample is collected to assess the incoming wastewater strength (e.g. biochemical oxygen demand) and/or determine the overall removal efficiency of pollutants including 5-Day Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS). Since influent samples are not disinfected, the bacteriological/viral hazard is greatest to the sampling personnel, and therefore, appropriate PPE such as disposable gloves must be worn. Also, particulate respirators are available for sampling in confined spaces (wet wells). To avoid cross-contamination, separate dippers and transfer funnels should be used or otherwise cleaned and disinfected (e.g. soap and bleach) prior to switching between influent and effluent samples. BWPC maintains sample dippers in pint (16 oz.) and liter (33 oz.) volume sizes.

Fig. 4 – Influent Sampling

IV. Effluent Sampling:

An effluent (treated) wastewater sample is collected to assess the compliance of the facility with the effluent limitations specified in its groundwater (NS) or NPDES (NV) discharge permit. Effluent sampling is conducted annually by BWPC at Major NPDES POTWs rated for capacity of ≥ 1.0 MGD. Although effluent samples are treated to meet standards considered "safe" for discharge to the aquatic and groundwater environment, appropriate PPE and workplace practices must still be exercised.

Fig. 5 – Effluent Sampling

V. Discrete Samples:

Discrete or "grab" samples are collected in a timeframe not to exceed fifteen (15) minutes. Discrete sampling is used for both influent and effluent samples. In its sampling inspections, BWPC personnel attempt to collect samples at the appropriate sampling outfall; sample spigot or other sample collection point to match the Permittee's sampling procedure for collecting a representative compliance sample.

Fig. 6 – Discrete Sampling

VI. Composite Samples:

A composite sample is collected over a defined time period (e.g. 24-hr.) with an automatic sampler or by manually blending two or more samples into one sample container.

A time composite sample is obtained by collecting equal volumes of sample (e.g. aliquot) at a specified time interval into a single sample container. For example, NDEP's automatic samplers are programmable to collect a 450-ml (15 oz.) aliquot each hour for 24-hr. Time composite samples are used to assess the performance of treatment facilities, which are flow-equalized to avoid the diurnal flow variance in municipal wastewater collection systems. Upon breakdown of its automatic sampler,

BWPC will offer the POTW's lab a split of the remaining sample in the composite bottle once the BWPC sample bottles have been filled and preserved.

Flow proportional samples also use a single collection bottle but vary the volume of the discrete sample (e.g. aliquot) proportional to the measured flow rate. For these samples, BWPC uses an automatic sampler in communication with an open-channel flow sensor (ultrasonic). Flow proportional samples adjust for the diurnal flow variance over the 24-hour sample collection period.

Fig. 7 – Time Composite Sample

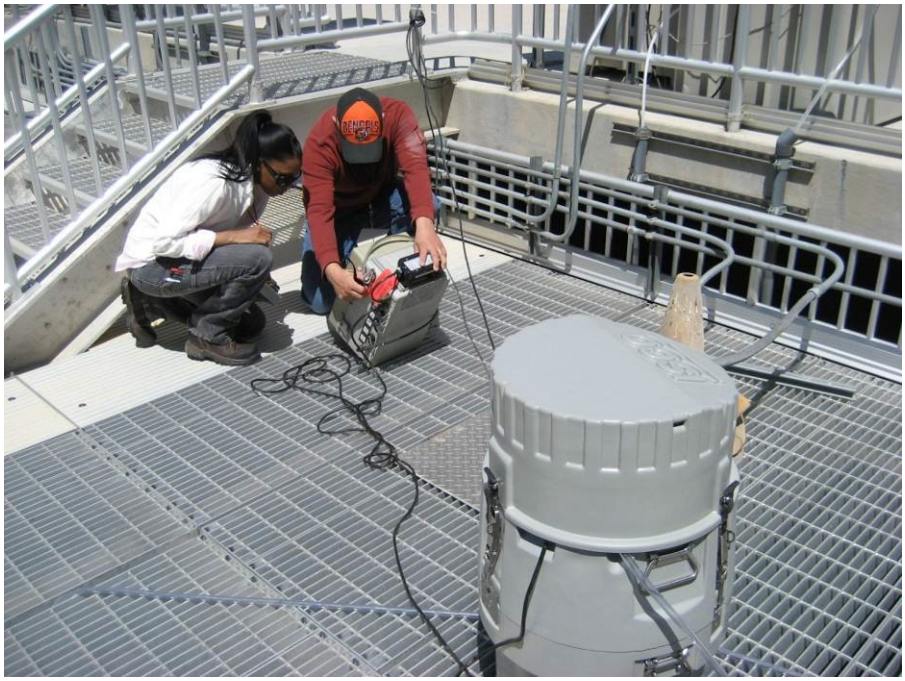


Fig. 8 – Flow Proportional Sample

VII. Annual Sampling:

A Compliance Sampling Inspection (CSI) is conducted at the following Major NPDES Permittee's.

- Truckee Meadows Water Reclamation Facility (NV0020150)
- City of Fallon Wastewater Treatment Plant (NV0020061)
- Clark County Water Reclamation District (NV0021261)
- Laughlin Water Reclamation Facility (NV0021563)
- City of North Las Vegas Wastewater Treatment Facility (NV0023647)
- City of Las Vegas Water Pollution Control Facility (NV0020133)
- City of Henderson Water Reclamation Facility (NV0022098)

The typical effluent panels analyzed include:

- BOD_5
- CBOD (e.g. if per the permit & also for lagoon systems)
- Routine Pollution
- Total Metals
- Dissolved Metals (e.g. for a silver or Ag analysis)
- Bacteriological

Table 1 - Parameters Commonly Analyzed for Inspections[1]

Analytical Parameter	Analytical Method Number	Laboratory Reporting Limits
BIOCHEMICAL OXYGEN DEMAND:		
BOD_5	SM 5210 B	2 mg/l
CBOD (nitrification-inhibited)	SM 5210 B	2 mg/l
BACTERIA:		
Total Coliform	MPN Standard 9221 B	1 MPN/100 mL
E. Coli	MPN Standard 9221 F	1 MPN/100 mL
Fecal Coliform	MPN Standard 9221 E	1 CFU/100 mL
ROUTINE PARAMETERS:		
Alkalinity as $CaCO_3$	SM 2320 B	20 mg/L
Ammonia-N	SM 4500 NH_3 D	0.1 mg/L
Bicarbonate	SM 2320 B	25 mg/L
Carbonate	SM 2320 B	12 mg/L
Chloride	EPA 300.0	5 mg/L
Color	SM 2120 B	5 CU
Electrical Conductivity	SM 2320 B	10 µmhos/cm
Fluoride	EPA 300.0	0.1 mg/l
Hydroxide	SM 2320 B	7 mg/L
Ortho-Phosphate	SM 4500 P E	0.01 mg/L
pH	SM 4500 H+B	0.0 to 14.0 S.U.
pH Temperature	SM 4500 H+B	N/A
Sulfate	EPA 300.0	5 mg/L

Total Dissolved Solids	SM 2540 C	25 mg/L
Total Kjeldahl Nitrogen (TKN)	SM 4500 NH_3 D	0.2 mg/L
Nitrite	SM 4500 NO_2 B	0.01 mg/L
Nitrate + Nitrite	EPA 300.0	0.5 mg/L
Total Phosphorus	SM 4500 P E	0.01 mg/L
Total Suspended Solids	EPA 160.2	10 mg/L
Turbidity	SM 2130 B	0.4 NTU

1. Reporting limits per the Nevada State Public Health Laboratory.

Table 1 (continued) - Parameters Commonly Analyzed for Inspections[1]

Analytical Parameter	Analytical Method Number	Laboratory Reporting Limits
METALS:		
Antimony, Sb	EPA 200.8	1 µg/L
Arsenic, As	EPA 200.8	3 µg/L
Barium, Ba	EPA 200.7	20 µg/L
Beryllium, Be	EPA 200.8	1 µg/L
Boron, B	EPA 200.7	100 µg/L
Cadmium, Cd	EPA 200.8	1 µg/L
Calcium, Ca	EPA 200.7	5 mg/L
Chromium (total), Cr	EPA 200.8	1 µg/L
Copper, Cu	EPA 200.8	1 µg/L
Fluoride, F^-	EPA 300.0	100 µg/L
Iron, Fe	EPA 200.7	50 µg/L

Lead, Pb	EPA 200.8	1 µg/L
Magnesium, Mg	EPA 200.7	5 mg/L
Manganese, Mn	EPA 200.7	20 µg/L
Mercury, Hg	EPA 245.2	0.2 µg/L
Molybdenum, Mo	EPA 200.8	10 µg/L
Nickel, Ni	EPA 200.8	1 µg/L
Selenium, Se	EPA 200.8	1 µg/L
Silver, Ag	EPA 200.8	2 µg/L
Sodium, Na	EPA 200.7	5 mg/L
Thallium, Tl	EPA 200.8	0.5 µg/L
Zinc, Zn	EPA 200.8	10 µg/L

1. Reporting limits per the Nevada State Public Health Laboratory.

VIII. BOD_5 or CBOD Panel:

Table 2 – BOD_5 or CBOD Panel

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
BOD_5	SM 5210 B	(1) 0.5 gallon HDPE bottle per each BOD_5 or CBOD analysis with blue cap.	Secure with blue cap. Bottle is chilled to 4° C.	48 hours
CBOD (nitrification-inhibited)	SM 5210 B			48 hours

- In a labeled 0.5 gallon sample bottle, collect the BOD_5 or CBOD sample. Do not overfill the bottle.
- Cap tightly with one blue screw cap. Wipe bottle clean.
- Store bottle in a chilled cooler or refrigerator to 4°C (39°F).
- Complete applicable Chain of Custody Form.
- Transport sample to the lab within the specified hold time (i.e. the elapsed time from the time of the sample collection until start of the lab analysis).
- Use separate bottles if conducting both the BOD_5 and CBOD analyses.

Fig. 9 – BOD_5 or CBOD Sample Bottle & Blue Cap

IX. Routine Pollution Panel:

Table 3 – Preserved Routine Pollution Parameters

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Ammonia-N	SM 4500 NH_3 D	(1) 0.5 gallon HDPE bottle per each acidified Routine Pollution analysis with red cap.	Bottle is preserved with 5-ml sulfuric acid (96%) immediately after collection. Secure with red cap. Chill bottle to 4°C.	28 days
Nitrite + Nitrate	EPA 300.0			28 days
Total Kjeldahl Nitrogen	SM 4500 N B			28 days
Total Phosphorus	SM 4500 P E			28 days

- For the above parameters, in a labeled 0.5 gallon sample bottle, collect the preserved portion of the Routine Pollution sample. Do not overfill the bottle. Leave sufficient room in the bottle for addition of the acid preservative.
- Using disposable gloves and eye protection (recommended), carefully add the contents of one vial (5-ml sulfuric acid) into the sample. Properly dispose of the empty acid vial.
- Cap tightly with one red screw cap. Invert (mix) the bottle several times to distribute the preservative. Wipe the bottle clean. Use baking soda to neutralize any acid spill.
- Store bottle in a chilled cooler or refrigerator to 4°C (39°F).
- Complete applicable Chain of Custody Form.
- Transport sample to the lab within the specified sample hold time.

Table 4 – Non-Preserved Routine Pollution Parameters

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Alkalinity	SM 2320B	(1) 0.5 gallon HDPE bottle per each non-acidified Routine Pollution analysis with blue cap.	Secure with blue cap. Chill bottle to 4°C.	14 days
Cl^-, F^-, NO_3^-, and SO_4^{2-}	EPA 300.0			28 days
Color	SM 2120 B			48 hours
Electrical Conductivity	SM 2510			28 days
Nitrite	SM 4500 NO_2 B			48 hours
Orthophosphate	SM 4500 P E			48 hours
pH	SM 4500 H+B			24 hours
pH Temperature	SM 4500 H+B			N/A
Sulfate	EPA 300.0			28 days
Total Dissolved Solids	SM 2540 C			7 days
Total Suspended Solids	EPA 160.2			7 days
Turbidity	EPA 180.1			48 hours

- For the above parameters, in a labeled 0.5 gallon sample bottle, collect the non-preserved portion of the Routine Pollution sample. Do not overfill the bottle.
- Cap tightly with one blue screw cap. Wipe the bottle clean.
- Store bottle in a chilled cooler or refrigerator to 4°C (39°F).
- Complete applicable Chain of Custody Form. Transport sample to the lab within the specified sample hold time.

Fig. 10 – Routine Pollution Sample Supplies

Fig. 11 – H_2SO_4 Acid Vials (24/container)

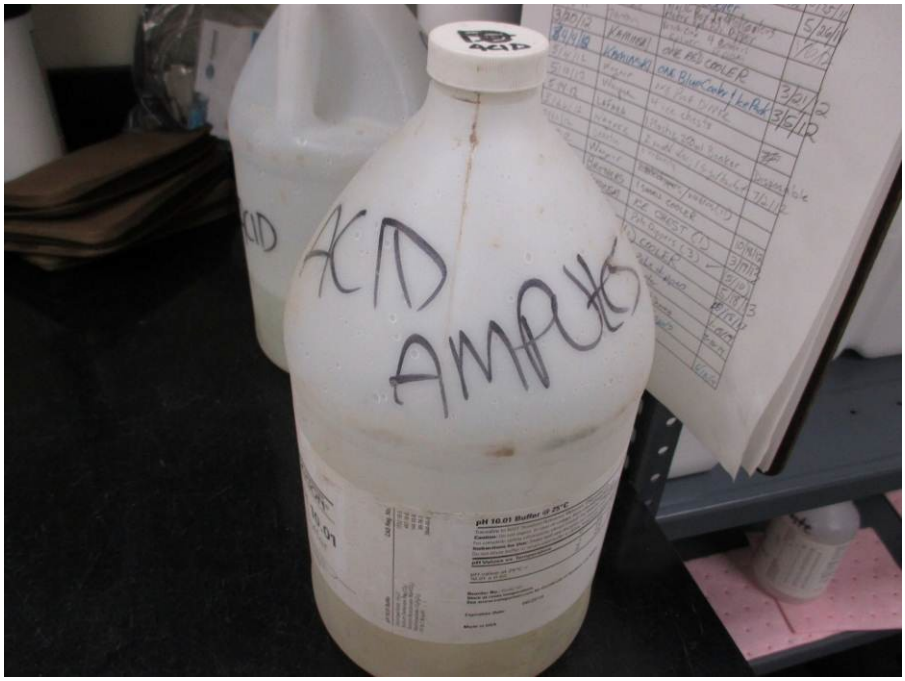


Fig. 12 – Discarded Vials (Ampules) @ BWQP Lab

X. Metals Samples:

Table 5 – Total Recoverable Metals

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Ba, B, Fe, Mn and K	EPA 200.7	(1) 500-ml HDPE bottle per each Total Metals analysis.	Bottle contains 5-ml of nitric acid (15%) before sample addition and 0.15% nitric acid after addition. Secure with white cap. Chill bottle to 4°C within 15 minutes of sample addition.	6 months
Sb, As, Be, Cd, Cr, Cu, Mo, Ni, Pb, Se, Tl and Zn	EPA 200.8			6 months
Fluoride	EPA 300.0			28 days
Mercury	EPA 245.2			28 days

Table 6 – Dissolved Metals

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Ca, K, Mg, and Na	EPA 200.7	(1) 500-ml HDPE bottle per each Dissolved Metals analysis.	Bottle contains 5-ml of nitric acid (15%) before sample addition and 0.15% nitric acid after addition. Secure with white cap. Chill bottle to 4°C within 15 minutes of sample addition.	6 months
Ag, As, Cd, Cr, Cu, Pb, Ni, Se, and Zn	EPA 200.8			6 months
Mercury	EPA 245.2			28 days

- For the above parameters, use one sample bottle per each Total or Dissolved Metals sample. Using a labeled 500-ml HDPE sample container supplied by the lab with 5-ml of the nitric acid (15%) preservative, carefully transfer the wastewater sample into the sample bottle without overfilling the bottle. Due to the narrow neck opening on this bottle, a clean transfer funnel is suggested during filling of the bottle to prevent spillage and loss of preservative. Use disposable gloves and eye protection (recommended) when filling this bottle.
- Cap tightly with the supplied white screw cap and gently invert (mix) the bottle several times to distribute the preservative into the sample. Wipe the bottle clean. Use baking soda to neutralize any acid spill.
- Store bottle in a chilled cooler or refrigerator to 4°C (39°F).
- Complete applicable Chain of Custody Form. Transport sample to the lab within the specified sample hold time.

Fig. 13 – Metals Bottle (w/HNO_3 acid preservative)

Fig. 14 – Filling a Metals Bottle with a Funnel

XI. Bacteriology Sample:

The procedure in Table 7 below is for a Clean Water Act (CWA) Bacteriology analysis conducted at the Nevada State Public Health Laboratory. To meet the sample hold time of six (6) hours, it is recommended that coliform samples be collected by mid-morning and delivered same-day to the lab by lunchtime to allow the chemist to start the analysis within two hours from receipt of the sample. To avoid cross-contamination, coliform samples should be collected directly into a sterile sample bottle (120-ml) via attachment to the swing-sampler (O-ring or rubber band) or from an open sample spigot running for 10 minutes prior to sample collection. Avoid collection of a coliform sample from an automatic sampler due to potential bio-film buildup within the plastic pump tubing between sample pulses. The coliform sample bottle includes a visual fill line to ensure collection of at least 100-ml of the sample.

Table 7 – Bacteriology Panel Parameters (State Health Lab)

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Total Coliform	MPN Standard 9221 B	(1) 120-ml sterile polyethylene coliform bottle. Break sterile seal just before sample collection. Wear clean gloves when handling bottle. Collect 100-ml of sample.	Chill bottle to 4° C after collection. Record free Cl_2 level (mg/l) in effluent flow upon sample collection.	6 hours (collection to lab receipt); 2 hours (receipt to analysis).
E. Coli	MPN Standard 9221 F			
Fecal Coliform	MPN Standard 9221 E			

- Collect coliform sample in a labeled, sterile 120-ml coliform bottle attached to a swing sampler or from a free-flowing spigot.
- Collect at least 100-ml of sample using the fill mark line as a visual aid. Wear clean gloves when collecting a coliform sample. Do not over fill the bottle. Wipe clean any surface spillage.
- Cap tightly with the attached white screw cap. When tightly capped, invert (mix) the sample bottle several times to distribute the white dechlorination powder (e.g. sodium thiosulfate) into the sample.
- Store bottle in a chilled sample cooler or refrigerator to 4°C.
- Complete applicable sample Chain of Custody Form (see Appendices). Return coliform sample and Chain of Custody Form to the Nevada State Public Health Laboratory in Reno within the designated six (6) hour sample hold time from the time of the sample collection until receipt by the lab.
- Schedule sample delivery accordingly to allow the lab two (2) hours to begin the coliform analysis from the time of the sample receipt.
- At the time of the sample collection, record the effluent's free chlorine residual (mg/l) on the chain of custody form.

Fig. 15 – Swing Sampler (O-ring Attachment)

Fig. 16 – Sampling an Open Tap

Fig. 17 –120-ml Coliform Bottle w/Dechlorination Powder

Fig. 18 – Example of a Chlorine Colorimeter

Fig. 19 – Example of an Online Chlorine Analyzer

The procedure in Table 8 below is for a Clean Water Act (CWA) Bacteriology analysis conducted at the Silver State Analytical Laboratories in Las Vegas, which BWPC uses for the coliform analyses conducted in Clark County. Due to the six hour sample hold time, BWPC uses a local lab in Las Vegas for coliform samples. Silver State Laboratories has its own chain of custody form and 120-ml sterile sample bottles, which are picked up by BWPC prior to inspections in Clark County. A separate sample bottle is used for each Total or Fecal Coliform analysis.

Table 8 – Bacteriology Panel Parameters (Silver State Laboratories)

Analytical Parameter	Analytical Method Number	Container	Preservation Requirements	Maximum Holding Times
Fecal Coliform	Colilert-18	(1) 120-ml sterile polyethylene coliform bottle. Break sterile seal just before sample collection. Wear clean gloves when handling bottle.	Chill sample to 4° C after collection. Bottle contains sodium thiosulfate powder (dechlorination).	6 hours (sample collection to lab receipt); 2 hours (lab receipt to analysis).
Total Coliform	Colilert-18			

- Collect sample in a labeled, sterile 120-ml coliform bottle attached to a swing sampler or from a free-flowing spigot. Use a separate bottle for each Fecal or Total Coliform analysis.
- Collect at least 100-ml of sample using the fill mark line as a visual aid. Wear clean gloves when collecting a coliform sample. Do not over fill the bottle. Wipe clean any surface spillage.
- Cap tightly with the attached white screw cap. When tightly capped, invert (mix) the sample bottle several times to distribute the white dechlorination powder (e.g. sodium thiosulfate) into the sample.
- Store in a chilled sample cooler or lab refrigerator to 4°C.
- Complete applicable sample Chain of Custody Form (see Appendices). Return coliform sample and Chain of Custody Form to the Silver State Lab in Las Vegas within the designated six (6) hour sample hold time from the time of the sample collection until lab receipt of sample.

- Deliver sample to lab in a timely manner to allow for the start of the sample's analysis within two (2) hours from the time of receipt of the sample.

Fig. 20 – Coliform Sampling in Henderson (using POTW's dipper)

XII. Other Samples:

On a case-by-case basis, BWPC periodically samples other wastewater parameters, which the Nevada State Public Health Laboratory is either not certified for and/or subcontracts out to another certified lab, e.g. VOCs, BTEX and TPH parameters (e.g. to determine petroleum hydrocarbon presence). For such wastewater samples, contact the Nevada State Public Health Laboratory at (775) 688-1335 for information on where to obtain the sample containers (e.g. 40-ml glass VOA vials), preservatives, and chain of custody forms.

Fig. 21 – Waste Oil Sample

Fig. 22 – 40-ml Volatile Organic Analysis (VOA) Vial

XIII. Field Measurements:

Table 8 – Field Measurements

Analytical Parameter	Analytical Method Number	Sample Hold Time	Alternate (Field)
pH	SM 4500 H+B	24 hours	pH Meter
Dissolved Oxygen	SM 4500 O-C	15 minutes	D.O. Meter
Chlorine Residual	SM 4500 CL-D	15 minutes	Colorimeter

pH: Due to the time constraints for sample transport to and analysis at the Nevada State Public Health Laboratory, the pH parameter is analyzed (reported) out of the specified hold time if more than 24 hours has elapsed since the sample was collected in the field. To measure the wastewater's pH level in the field, calibrated pH probes are commercially available. The BWQP Laboratory stocks reference (calibration) solutions of 4, 7 and 10 S.U. The manufacturers recommend an annual replacement of the instrument's sensor (electrode) to maintain measurement accuracy to ± 0.1 S.U. (pH).

Fig. 23 – Portable pH/Temperature Probe

D.O.: Dissolved Oxygen (D.O.) measurements by the standard reference method (e.g. SM 4500 O-C) are impractical without an on-site lab due to the restriction of the 15 minute sample hold time. The BWQP Laboratory currently maintains an YSI Inc. 550A© handheld D.O. probe for field measurement of oxygen levels in state surface waters. This instrument is available for loan to BWPC, but at this time, BWPC requests that the meter's use be limited to surface water measurements. The meter's user manual includes guidelines for conducting a daily one-point calibration check with air-saturated water (well-shaken water).

Fig. 24 – YSI Inc. 550A© D.O. Meter

Chlorine: Chlorine (residual or free Cl_2) analyses are used to complete the Nevada State Public Health Laboratory's chain of custody form when submitting coliform samples. In addition, field measurement of the chlorine residual is used to determine compliance with the State's free Cl_2 limit (maximum) of 0.1 mg/l for POTWs discharging dechlorinated effluent to surface waters (e.g. aquatic species standard). As an alternate to the 15 minute sample hold time restriction for the standard reference method (e.g. SM 4500 CL-D), BWPC currently stocks a portable chlorine colorimeter at each of its two offices (HACH© Pocket Colorimeter II). The approved method for the colorimetric analysis is U.S. EPA DPD (N,N-Diethyl-p-phenylenediamine sulfate reagent). Instrument resolution (increment) is 0.01 mg/l (low-range). Sample calibration (blank) is performed in the field using a 10-ml aliquot of the dechlorinated effluent. Chlorine readings (free and/or total) are to be completed within 15 minutes of collection of a discrete effluent sample.

Fig. 25 - HACH© Pocket Colorimeter II (tap water demo)

XIV. Fieldwork:

In the field, sample outfalls may not always be located in well-lit areas equipped with handrails, stairways and safety grating. Therefore, BWPC personnel should exercise appropriate caution and work in partnership with a two (or more) person sampling crew. Normally, on the CSI inspection, the BWPC sampling is conducted when the operations staff is on-site and able to lend support.

Fig. 26 – Operator (green shirt) Observing BWPC Sampling Crew

Fig. 27 – Operator (red shirt) Observing BWPC Sampler

Fig. 28 – Two-Person BWPC Sampling Crew (surface water sampling)

XV. Sample Transport:

The Nevada State Public Health Laboratory operates on the same 8 AM – 5 PM weekday schedule as NDEP. To allow for timely sample processing, BWPC samples should be delivered no later than Thursday by 1 PM, except for the CWA Bacteriology Analysis (Wednesday by 1 PM). Contact the lab at (775) 688-1335 for other periods including holidays. Generally, samples collected in Tonopah and northward in Nevada are delivered by BWPC or other NDEP courier arrangement directly to the Nevada State Public Health Laboratory in Reno. For overnight sample storage, an iced sample cooler or non-food storage refrigerator should be arranged.

For samples collected in South Nye, Lincoln or Clark Counties, BWPC uses the Southwest Airlines (SWA) Air Cargo location at the McCarran Airport. Although FAA (Federal Aviation Administration) rules are subject to change, the following general guidelines apply to BWPC sample coolers flown on SWA:

- Coolers must be hard-sided (no Styrofoam containers).
- All bagged ice must be maintained in a leak-resistant container (e.g. BWPC stocks heavy-gauge, 1-gallon Ziploc bags for such purpose).
- SWA currently requests that any untreated (influent) wastewater samples not be shipped by air (e.g. potential biological hazard).

- Effluent sample containers shall be leak proof, labeled and not contain any flammable or reactive liquids.
- Dry ice is limited to 5 lbs. per cooler (the cooler must allow the CO_2 gas to escape without container over-pressurization).
- Upon acceptance by SWA personnel, the coolers are to be tightly secured with clear wrapping tape.
- Due to internal condensation, chain of custody forms should be secured to the underside of the cooler lid in a waterproof, plastic bag.
- On the receiving end (Reno SWA Cargo Area), arrangement shall be made in advance to have a BWPC staff member from the Carson City office pick up the overnight cooler shipment by 9 AM and deliver it to the UNR Campus (State Lab).

Fig. 29 – BWQP Lab (O.K. for CWA Samples)

Fig. 30 – BSDW Storage (O.K. for SDWA Samples)

Fig. 31 – Labeled/Preserved Samples Prior to Packing

Fig. 32 – Packing up the Sample Cooler (local delivery)

Fig. 33 – Handling Dry Ice (always wear insulating gloves)

XVI. Cleanup:

BWPC has key-card access to the BWQP Lab in Carson City where used acid vials, dirty gloves and other sampling trash can be safely discarded, and filled sample bottles can be stored overnight in the refrigerator. The BWQP Lab stocks Labtone™ powdered soap and liquid bleach for cleaning up dirty sampling equipment and used sample coolers (Carson City's supply), and also for cleaning those coolers received via air cargo shipment from the NDEP Las Vegas Office. The NDEP Las Vegas Office on Flamingo Rd. is presently occupying a commercial office building, which is without a laboratory sink for NDEP use. Therefore, arrangement (permission) should be made at the POTWs being inspected to use their cleanup sinks for washing any sampling equipment prior to storage in the NDEP Las Vegas Office supply room. Food-grade and/or sanitary hand sinks should not be used for cleaning up sampling equipment. The NDEP Las Vegas Office maintains a compact refrigerator for sample storage and freezing blue (gel) ice packs. Since dry ice evaporates (sublimates) rapidly upon purchase, the Penguin™ dry ice (e.g. grocery stores) should only be purchased in five (5) pounds quantity on the date that the samples are being shipped. Insulated gloves must be worn when handling dry ice to avoid contact (skin) burn.

BWPC personnel should wash their hands thoroughly with warm water and soap when finished collecting the wastewater samples and prior to touching their face, eating or drinking. When sampling remote facilities without access to potable water, it is advisable to stock the agency vehicles with hand towelettes and/or sanitizing liquid (alcohol gel), liquid bleach and an ample supply of potable water for cleanup. The recommended bleach to water mixing ratio for sanitizing hard (plastic) surfaces is 1:30 or approximately ½ cup household bleach per gallon of water.

Fig. 34 – BWQP Lab (bleach & acid storage – separate compartments)

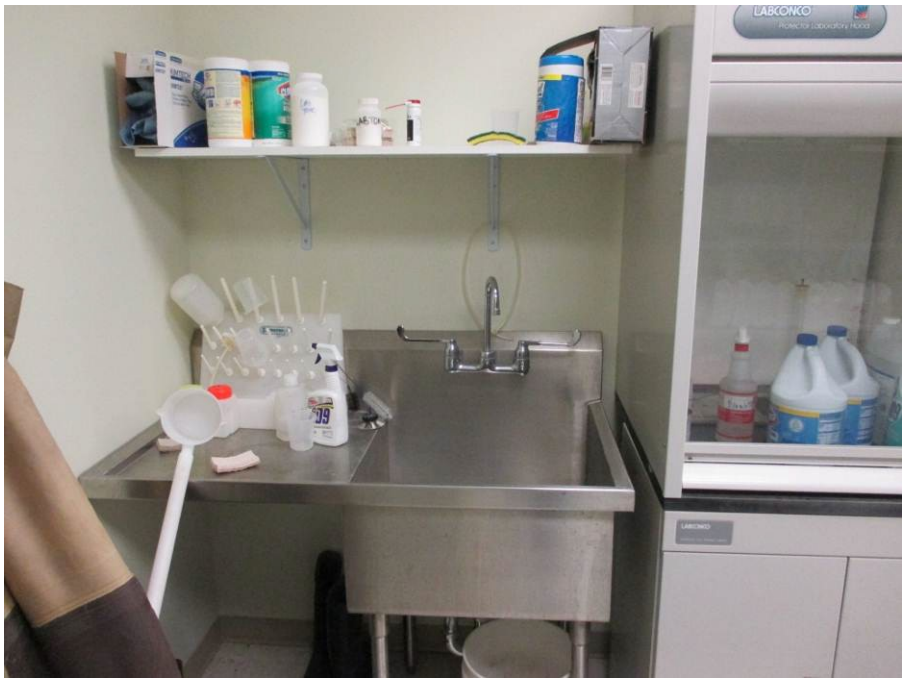


Fig. 35 – BWQP Lab Sink

Fig. 36 – BWQP Mop Sink (for cleaning coolers)

XVII. Sampling Supplies:

Clean sample bottles, lids (caps) and acid preservatives for the BOD_5/CBOD, Routine Pollution, Metals and CWA Bacteriology Analyses are stocked in Carson City in the BWQP Lab. Annually, a season's worth of sampling supplies are packaged and shipped by ground transport to the NDEP Las Vegas Office. Other sampling bottles are obtained upon request from the Nevada State Public Health Laboratory such as the 40-ml VOA glass vials. It advisable that a spare, clean set of sampling bottles is included on each sampling inspection to replace any leaking or otherwise damaged sample containers.

The employee's work duties generally determine what standard PPE are provided to that employee upon hire such as steel-toed boots, reflective clothing, hard hats, and safety glasses. If additional PPE or sampling equipment is needed, that is not stocked by the BWPC Bureau, please contact your supervisor for a purchase request. The approved BWPC vendor list is subject to change, but the following list of vendors has been used in the past for ordering PPE and other miscellaneous sampling supplies (contact BWPC Purchasing for current list and/or vendor contact information):

- USA Blue Book
- Grainger Industrial Supply
- Office Max (Office Depot)
- HACH Co.

XVIII. Acid Storage:

An MSDS sheet for the sulfuric and nitric acid sample preservatives is attached to this document in the appendices. The BWQP Lab maintains these chemicals away from the workspace (cubicles). For the NDEP Las Vegas Office supply room, the NDEP Health and Safety Officer shall provide guidance to BWPC whether a separate acid (corrosive) storage cabinet is required for storing the acid vials and metals bottles. Compact, polyethylene cabinets furnished with locking doors and adjustable trays are available for such chemical storage purpose (see below).

Fig. 37 – Poly-Cabinet for Acid Storage

XIX. Acronyms:

BOD_5	5-Day Biochemical Oxygen Demand
BSDW	Bureau of Safe Drinking Water
BTEX	Benzene, Toluene, Ethyl-Benzene & Xylene
BWPC	Bureau of Water Pollution Control
BWQP	Bureau of Water Quality Planning
CBOD	Carbonaceous Biochemical Oxygen Demand
Cl_2	Chlorine Residual
CSI	Compliance Sampling Inspection
CWA	Clean Water Act
CO_2	Carbon Dioxide (i.e. from Dry Ice)
Division	Nevada Division of Environmental Protection
FAA	Federal Aviation Administration
FOG	Fats, Oils & Grease
MG	Million Gallons
MGD	Million Gallons per Day
mg/l	Milligrams per liter
N	Nitrogen
NDEP	Nevada Division of Environmental Protection
NH_3	Ammonia
NH_4	Ammonium
NO_2	Nitrite
NO_3	Nitrate
NPDES	National Pollutant Discharge Elimination System
pH	Potential of Hydrogen
P	Phosphorus
POTW	Publicly Owned Treatment Works
SDWA	Safe Drinking Water Act
SM	Standard Methods
S.U.	Standard Units (pH)
SWA	Southwest Airlines
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
UNR	University of Nevada-Reno
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WTS	Water Technical Sheet

XX. References:

i. *Nevada Quality Assurance Program Plan for Surface Water Sampling* (Dec. 2013), Nevada Division of Environmental Protection, Bureau of Water Quality Planning.
ii. *Guidelines Establishing Test Procedures for the Analysis of Pollutants* (Aug. 2014 e-CFR version), Title 40 Code of Federal Regulations Part 136.
iii. *National Environmental Methods Index* (https://www.nemi.gov/home/).
iv. *Standard Methods for the Examination of Water and Wastewater* (22nd ed. – Jan. 2012), American Public Health Association et al.
v. *Handbook for Sampling and Sample Preservation of Water and Wastewater* (Sep. 1982), EPA-600/4-82-029, U.S. EPA.
vi. *HACH® Corporation Website*, (http://www.hach.com/).

XXI. Appendices:

Chain of Custody forms are lab specific, but attached, please find the current forms used by BWPC for sampling the standard suite of analyses discussed in this guidance document. Blank chain of custody forms should be carried in the field to correct for multiple error cross-outs, or to account for the spillage of wastewater sample onto paperwork, which occasionally occurs during field work events. Representative analyses from several of the POTWs in Nevada are attached as an illustration for the reader to see how the data is presented. Upon delivery of a sample to the lab, the front-counter receptionist should request a signature and be able to provide the courier with a proof-of-delivery copy. Turnaround times do vary by lab, so be sure to communicate your request ahead of time.

- Item #1: State Health Laboratory (Chain of Custody Form)
- Item #2: State Health Laboratory (List of Panels/Tests)
- Item #3: State Health Laboratory (Bacteriology Analysis Form)
- Item #4: State Health Laboratory (POTW Analysis)
- Item #5: Silver State Laboratories (Chain of Custody Form)
- Item #6: Silver State Laboratories (Coliform Analysis)
- Item #7: MSDS Sheets
- Item #8: BWPC's Field pH/temperature Tester (Jan. 2015 addition)
- Item #9: BWPC's Field Turbidity Meter (Jan. 2015 addition)
- Item #10: BWPC's Field D.O. Meter (Jan. 2015 addition)

[ ] FOR COMPLIANCE

[X] NOT FOR COMPLIANCE

NEVADA STATE HEALTH LABORATORY
CHAIN OF CUSTODY FORM FOR WATER CHEMISTRY ANALYSIS
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335 Fax: (775) 688-1460

OWNER INFORMATION		REPORT TO INFORMATION		DELIVERED ON ICE	BILL TO INFORMATION	
Owner:	Bureau of Water Quality Planning	Owner:	BWQP	[X] Yes [ ] No	Owner:	BWQP
Address:	901 S. Stewart St., Ste. 4001	ATTN:	John Heggeness	Initals (Lab)	Address:	901 S. Stewart St.
City, St, Zip:	Carson City NV 89701	Address:	901 S. Stewart St., Ste. 4001	Shipped Samples:	City, St, Zip:	Carson City, NV 89701
Phone:	687-9444 FAX: 687-5856	City, St, Zip:	Carson City, NV 89701	Temp Blank [ ] °C	Phone:	687-9444 Fax: 687-5856
		Phone:	687-9444 Fax: 687-5856			

SOURCE OF WATER	SAMPLE TYPE	REASON FOR ANALYSIS	USE OF WATER
[ ] Spring [ ] Filter	[ ] SDWA	[ ] Public Water Supply	[ ] Domestic Drinking Water
[ ] Surface [ ] Depth (ft.)	[x] CWA	[ ] Private Residence	[ ] Geothermal [ ] Irrigation
[ ] Well [x] WWTP	[ ] Other	[x] Other *Compliance Inspection*	[ ] Industrial or Mining
			[x] Other:

HYDROGRAPHIC BASIN: (SPECIFY)

Line Item	Date Collected	Time	Station ID	Control Point	State	County	Remarks	Routine Pollution	NDEP Trace Metals	NDEP Total Recoverable Metals	NDEP Dissolved Metals	COD	BOD_5	CBOD (Inhibited BOD_5)
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

Collected By: _____ Sampler Signature: _____

FOR LAB USE ONLY:
How sample was delivered ____ Courier ____ Drop Off ____ Fed Ex ____ UPS ____ U.S. Postal ____ Campus Mail

Delivered By _____ Date _____ Received By _____ Date _____

Sample is tested as received. Analytical results associated with this requisition and generated by NSHL are representative only of the sample submitted to this laboratory.

NOTE: This document will be destroyed at NSHL after 12 years, unless Client requests otherwise

Page 1 of 1

Item #1 – State Health Laboratory (Chain of Custody Form)

PANEL/TESTS

- ☐ **Routine Pollution**
  - ☐ Electrical conductivity
  - ☐ Color
  - ☐ pH Lab
  - ☐ Alkalinity
  - ☐ Total Kjeldahl Nitrogen
  - ☐ Nitrate+Nitrite as N
  - ☐ Nitrite as N
  - ☐ Ammonia-N
  - ☐ Ortho-Phosphate
  - ☐ Total Phosphate
  - ☐ Chloride
  - ☐ Sulfate
  - ☐ TDS
  - ☐ Turbidity
  - ☐ TSS
- ☐ **NDEP Trace Metals**
  - ☐ Cadmium
  - ☐ Chromium
  - ☐ Copper
  - ☐ Iron
  - ☐ Lead
  - ☐ Mercury
  - ☐ Selenium
  - ☐ Zinc
  - ☐ Arsenic
  - ☐ Boron
  - ☐ Hardness
  - ☐ Calcium
  - ☐ Magnesium
  - ☐ Sodium
- ☐ **NDEP Total Recoverable Metals**
  - ☐ Antimony
  - ☐ Arsenic
  - ☐ Barium
  - ☐ Beryllium
  - ☐ Boron
  - ☐ Cadmium
  - ☐ Chromium
  - ☐ Copper
  - ☐ Fluoride
  - ☐ Iron
  - ☐ Lead
  - ☐ Manganese
  - ☐ Nickel
  - ☐ Selenium
  - ☐ Thallium
  - ☐ Zinc
- ☐ **NDEP Dissolved Metals**
  - ☐ Arsenic
  - ☐ Cadmium
  - ☐ Calcium
  - ☐ Chromium
  - ☐ Copper
  - ☐ Lead
  - ☐ Magnesium
  - ☐ Mercury
  - ☐ Nickel
  - ☐ Selenium
  - ☐ Silver
  - ☐ Sodium
  - ☐ Zinc

Item #2: State Health Laboratory (List of Panels/Tests)

UNIVERSITY OF NEVADA
SCHOOL OF MEDICINE

NEVADA STATE HEALTH LABORATORY
University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335

WATER BACTERIOLOGY ANALYSIS **ACCESSION NUMBER:** **252049**

NOTE: FORM MUST BE FILLED OUT IN INK (NO PENCIL ENTRIES)

OWNER INFORMATION

Owner: NDEP / BWQP
Address: 901 SOUTH STEWART STREET, SUITE 4001
City, St, Zip: CARSON CITY NV 89701
Phone: (775) 687-9444 Fax: (775) 687-5856

☐ For Compliance
☐ Not For Compliance
If no box is checked, compliance testing applies and results are sent to BHPS

BILL TO INFORMATION Same As Owner ☐

Bill To: NDEP / BWQP
Address: 901 SOUTH STEWART STREET, SUITE 4001
City, St, Zip: CARSON CITY NV 89701

SAMPLE INFORMATION

Date Collected:
Time Collected:
Source Address:
SampleTaken From:
City:
State: County:

Sample is tested as received. Analytical results associated with this requisition and generated by NSHL are representative only of the sample submitted to this laboratory.

I attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time is considered fraud and may be grounds for legal action.

Sampler Name (Print):
Sampler Signature: Date:

REPORT TO INFORMATION Same As Owner ☐

Report To:
Attn:
Address:
City, St, Zip:
Phone: Fax:

SOURCE OF WATER

Public Water System ID Number:
Public Water System ID Name:
Chlorine Residual:

SAMPLE TYPE

☐ SDWA (Drinking Water)
☐ CWA (Pollution)
☐ Other

REASON FOR ANALYSIS

☐ Public Water Supply
☐ Private Residence
☐ Other

PAYMENT INFORMATION

Fee:
Paid By:
Payment:
Payment Method:
Check or Money Order Number:
Payment Date:
Receipt Number:
Payment Received By:

Tests: **SDWA - Drinking Water Analysis**

Sources: public or private water systems, wells, swimming pools, or chill water

☐ **Total Coliform SDWA** – *Qualitative*	Total Coliform/E. Coli	Presence Absence 9223 B
☐ **Total Coliform SDWA** – *Quantitative*	Total Coliform/E. Coli	Quanti-Tray 9223 B

CWA - Raw or Waste Water Analysis

Sources: surface water (ponds, streams, rivers, lakes, etc.)

☐ **Fecal Coliform CWA** – *Quantitative*	Membrane Filter 9222 D	Recommended Dilution ____
☐ **Fecal Streptococci CWA**– *Quantitative*	Membrane Filter 9230 C	Recommended Dilution ____
☐ **Total Coliform CWA**– *Quantitative*		Recommended Dilution ____
Total Coliform/E. Coli	Quanti-Tray 9223 B	

Sources: chlorinated effluent

☐ **10 Tube MPN CWA** – *Quantitative*		Recommended Dilution ____
Total Coliform	MPN Standard 9221 B	
E. Coli	MPN Standard 9221 F	
Fecal Coliform	MPN Standard 9221 E	

Sources: public or private water systems, wells, swimming pools, chill water or DI systems

☐ **Heterotrophic Plate Count** – *Quantitative*	Heterotrophic Plate Count	Pour Plate

Each sample bottle should be returned accompanied by a sample analysis requisition form, indicating the type of test(s) needed. If bottles are not returned, a supply charge may be assessed. Submission incurs obligation for payment of fees. NOTE: This document will be destroyed at NSHL after 5 years, unless Client requests otherwise.

Delivered By: _____ **Received By:** _____

Item #3: State Health Laboratory (Bacteriology Analysis Form)

NEVADA STATE HEALTH LABORATORY
University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335

WATER CHEMISTRY REPORT

STATUS: FINAL

Report To:

ATTN: JOHN HEGGENESS
NDEP / BWQP
901 SOUTH STEWART STREET, SUITE 4001
CARSON CITY, NV 89701

Accession Number:	251760
Sampled By:	MARK KAMINSKI
Date/Time Collected:	02/12/14 11:30
Date/Time Received:	02/12/14 15:25
Report Date and Time:	04/23/14 0:00

Analysis Type:	CWA
General Location:	CITY OF FALLON WWTP (INFLUENT)
Source Address:	NV0020061
City:	FALLON
State:	NV
County:	CHURCHILL

PWS ID:
Public Water System:

Township: Range: Section:

☑ For Compliance
☐ Not For Compliance
☐ Not Indicated

Test:	Method:	Results:	RL	Analysis Date:	Analyst:
ROUTINE POLLUTION Panel					
Alkalinity as CaCO3	SM 2320 B	369 mg/L	20	02/12/14	SRice
Ammonia-N	SM 4500 NH3 D	29 mg/L	0.1	02/14/14	GBrewster
Bicarbonate	SM 2320 B	450 mg/L	25	02/12/14	SRice
Carbonate	SM 2320 B	<12 mg/L	12	02/12/14	SRice
Chloride	EPA 300.0	150 mg/L	5	02/25/14	Vmiller
Color	SM 2120 B	95 CU	5	02/13/14	Dbaker
Electrical Conductivity	SM 2510	1600 umhos/cm	10	02/12/14	SRice
Hydroxide	SM 2320 B	<7 mg/L	7	02/12/14	SRice
Nitrate+Nitrite as N	EPA 300.0	<0.1 mg/L	0.1	02/25/14	Vmiller
Sample analyzed out of hold time					
Nitrite-N	SM 4500 NO2 B	0.04 mg/L	0.01	02/13/14	Dbaker
Ortho-Phosphate	SM 4500 P E	3.6 mg/L	0.1	02/13/14	GBrewster
pH	SM 4500 H B	7.76 SU		02/12/14	SRice
pH Temperature	SM 4500 H B	20.8 DegC		02/12/14	SRice

P = Pending Result
RL = Reporting Limit
MCL = Maximum Contaminant Level
ND = Not Detected

NOTE: This document will be destroyed at NSHL after 12 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis)

Accession Number: 251760

Sulfate	EPA 300.0	210 mg/L	5	02/25/14	Vmiller
Total Dissolved Solids	SM 2540 C	939 mg/L	25	02/13/14	abobadilla
Total Suspended Solids	EPA 160.2	159 mg/L	10	02/13/14	Dbaker
Total-Phosphorous	SM 4500 P E	5.4 mg/L	0.25	02/25/14	GBrewster
Turbidity	SM 2130 B	90 NTU	4	02/18/14	SRice
Sample analyzed out of hold time					
NDEP TOTAL RECOVERABLE Panel					
Antimony	EPA 200.8	<5 ug/L	5	03/05/14	GBrewster
Arsenic	EPA 200.8	43 ug/L	3	03/05/14	GBrewster
Barium	EPA 200.7	40 ug/L	20	02/19/14	SRice
Beryllium	EPA 200.8	<2 ug/L	2	03/05/14	GBrewster
Boron	EPA 200.7	1.3 mg/L	0.1	02/19/14	SRice
Cadmium	EPA 200.8	<1 ug/L	1	03/05/14	GBrewster
Chromium	EPA 200.8	3 ug/L	2	03/05/14	GBrewster
Copper	EPA 200.8	52 ug/L	2	03/05/14	GBrewster
Fluoride	EPA 300.0	0.9 mg/L	0.1	02/25/14	Vmiller
Iron	EPA 200.7	1.5 mg/L	0.05	02/19/14	SRice
Lead	EPA 200.8	2 ug/L	1	03/05/14	GBrewster
Manganese	EPA 200.7	60 ug/L	20	02/19/14	SRice
Mercury	EPA 245.2	<0.2 ug/L	0.2	03/05/14	abobadilla
Molybdenum	EPA 200.8	29 ug/L	10	03/05/14	GBrewster
Nickel	EPA 200.8	<5 ug/L	5	03/05/14	GBrewster
Potassium	EPA 200.7	17 mg/L	5	02/19/14	SRice
Selenium	EPA 200.8	2 ug/L	2	03/05/14	GBrewster
LFM out of acceptable limits for this sample					
Thallium	EPA 200.8	<1 ug/L	1	03/05/14	GBrewster
Zinc	EPA 200.8	120 ug/L	10	03/05/14	GBrewster
Biochemical Oxygen Demand - 5 (BOD-5)	SM 5210 B	215 mg/L	2	02/13/14	abobadilla
Total Kjeldahl Nitrogen (TKN) Send Out	SM 4500 N(org)	0 Send Out		04/21/14	Dbaker
Sample analyzed by WET Lab, reference #1404066-002.					

FOR LAB USE ONLY:

EPM: -13.6037 **LSI:** -1.34 **Calc TDS:** 591 **SAR:** 0.0000 **TDS/EC:** 0.59

Approved By

4-23-14
Date

P = Pending Result
RL = Reporting Limit
MCL = Maximum Contaminant Level
ND = Not Detected

Page 2 of 2

NOTE: This document will be destroyed at NSHL after 12 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis - continued)

NEVADA STATE HEALTH LABORATORY
University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335

WATER CHEMISTRY REPORT
STATUS: FINAL

Report To:

ATTN: JOHN HEGGENESS
NDEP / BWQP
901 SOUTH STEWART STREET, SUITE 4001
CARSON CITY, NV 89701

Accession Number:	251761
Sampled By:	MARK KAMINSKI
Date/Time Collected:	02/12/14 11:30
Date/Time Received:	02/12/14 15:31
Report Date and Time:	03/14/14 0:00

Analysis Type:	CWA
General Location:	CITY OF FALLON WWTP (EFFLUENT)
Source Address:	NV0020061
City:	FALLON
State:	NV
County:	CHURCHILL

PWS ID:
Public Water System:

Township: Range: Section:

☑ For Compliance
☐ Not For Compliance
☐ Not Indicated

Test:	Method:	Results:	RL	Analysis Date:	Analyst:
ROUTINE POLLUTION Panel					
Alkalinity as CaCO3	SM 2320 B	256 mg/L	20	02/12/14	SRice
Ammonia-N	SM 4500 NH3 D	<0.1 mg/L	0.1	02/14/14	GBrewster
Bicarbonate	SM 2320 B	312 mg/L	25	02/12/14	SRice
Carbonate	SM 2320 B	<12 mg/L	12	02/12/14	SRice
Chloride	EPA 300.0	160 mg/L	5	02/25/14	Vmiller
Color	SM 2120 B	45 CU	5	02/13/14	Dbaker
Electrical Conductivity	SM 2510	1400 umhos/cm	10	02/12/14	SRice
Hydroxide	SM 2320 B	<7 mg/L	7	02/12/14	SRice
Nitrate+Nitrite as N	EPA 300.0	1.3 mg/L	0.1	02/25/14	Vmiller
Sample analyzed out of hold time					
Nitrite-N	SM 4500 NO2 B	0.02 mg/L	0.01	02/13/14	Dbaker
Ortho-Phosphate	SM 4500 P E	0.01 mg/L	0.01	02/13/14	GBrewster
pH	SM 4500 H B	8.07 SU		02/12/14	SRice
pH Temperature	SM 4500 H B	20.6 DegC		02/12/14	SRice

P = Pending Result
RL = Reporting Limit
MCL = Maximum Contaminant Level
ND = Not Detected

Page 1 of 2

NOTE: This document will be destroyed at NSHL after 12 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis - continued)

Accession Number: 251761

Sulfate	EPA 300.0	220 mg/L	5	02/25/14	Vmiller
Total Dissolved Solids	SM 2540 C	898 mg/L	25	02/13/14	abobadilla
Total Kjeldahl Nitrogen (TKN)	SM 4500 N B, 4500 NH3 D	0.4 mg/L	0.2	02/27/14	Dbaker
Total Suspended Solids	EPA 160.2	<10 mg/L	10	02/13/14	Dbaker
Total-Phosphorous	SM 4500 P E	0.14 mg/L	0.01	02/13/14	GBrewster
Turbidity	SM 2130 B	4.2 NTU	0.4	02/18/14	SRice
Sample analyzed out of hold time					
NDEP TOTAL RECOVERABLE Panel					
Antimony	EPA 200.8	<5 ug/L	5	03/05/14	GBrewster
Arsenic	EPA 200.8	24 ug/L	3	03/05/14	GBrewster
Barium	EPA 200.7	<20 ug/L	20	02/19/14	SRice
Beryllium	EPA 200.8	<2 ug/L	2	03/05/14	GBrewster
Boron	EPA 200.7	1.4 mg/L	0.1	02/19/14	SRice
Cadmium	EPA 200.8	<1 ug/L	1	03/05/14	GBrewster
Chromium	EPA 200.8	<2 ug/L	2	03/05/14	GBrewster
Copper	EPA 200.8	10 ug/L	2	03/05/14	GBrewster
Fluoride	EPA 300.0	0.7 mg/L	0.1	02/25/14	Vmiller
Iron	EPA 200.7	0.08 mg/L	0.05	02/19/14	SRice
Lead	EPA 200.8	2 ug/L	1	03/05/14	GBrewster
Manganese	EPA 200.7	<20 ug/L	20	02/19/14	SRice
Mercury	EPA 245.2	<0.2 ug/L	0.2	02/25/14	abobadilla
Molybdenum	EPA 200.8	23 ug/L	10	03/05/14	GBrewster
Nickel	EPA 200.8	<5 ug/L	5	03/05/14	GBrewster
Potassium	EPA 200.7	16 mg/L	5	02/19/14	SRice
Selenium	EPA 200.8	<2 ug/L	2	03/05/14	GBrewster
LFM out of acceptable limits for this batch					
Thallium	EPA 200.8	<1 ug/L	1	03/05/14	GBrewster
Zinc	EPA 200.8	53 ug/L	10	03/05/14	GBrewster
Biochemical Oxygen Demand - 5 (BOD-5)	SM 5210 B	<2 mg/L	2	02/13/14	abobadilla

FOR LAB USE ONLY:

EPM: -13.9278 **LSI:** -1.19 **Calc TDS:** 536 **SAR:** 0.0000 **TDS/EC:** 0.64

3-14-14

Approved By **Date**

P = Pending Result
RL = Reporting Limit
MCL = Maximum Contaminant Level
ND = Not Detected

Page 2 of 2

NOTE: This document will be destroyed at NSHL after 12 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis - continued)

NEVADA STATE HEALTH LABORATORY
University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335

RECEIVED
ENVIRONMENTAL PROTECTION
FEB 20 2014

WATER BACTERIOLOGY REPORT
STATUS: FINAL

Report To:

ATTN: JOHN HEGGENESS
NDEP / BWQP
901 SOUTH STEWART STREET, SUITE 4001
CARSON CITY, NV 89701

Accession Number:	247013
Sampled By:	MARK KAMINSKI
Date/Time Collected:	02/12/14 12:00
Date/Time Received:	02/12/14 15:16
Report Date and Time:	02/18/14 12:33

Sample Temperature Deg C

Analysis Type:	Raw or Wastewater
General Location:	OUTFALL #1 (1:1)
Source Address:	CITY OF FALLON POTW
City:	FALLON
State:	NV
County:	CHURCHILL

PWS ID:
Public Water System:

Chlorine Residual:
- ☑ For Compliance
- ☐ Not For Compliance
- ☐ Not Indicated

Test:	Method:	Results:	Dilution:
Total Coliform - 10 Tube MPN	MPN Standard 9221 B	23	1:1
E. Coli - 10 Tube MPN	MPN Standard 9221 F	<1.1	1:1
Fecal Coliform - 10 Tube MPN	MPN Standard 9221 E	1.1	1:1

Lorie Muir — Approved By
2-18-2014 — Date

Starlims EN 2014 0716

The absence of coliforms meets Nevada State Health Division bacteriological standards for safe drinking water.

NOTE: Results displayed in BOLD, ITALIC TYPE have failed Nevada State health standards

NOTE: This document will be destroyed at NSHL after 5 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis - continued)

NEVADA STATE HEALTH LABORATORY
University of Nevada School of Medicine
1660 North Virginia Street, Reno, NV 89503-1738
Phone: (775) 688-1335

WATER BACTERIOLOGY REPORT
STATUS: FINAL

Report To:

ATTN: JOHN HEGGENESS
NDEP / BWQP
901 SOUTH STEWART STREET, SUITE 4001
CARSON CITY, NV 89701

Accession Number:	247014
Sampled By:	MARK KAMINSKI
Date/Time Collected:	02/12/14 12:00
Date/Time Received:	02/12/14 15:20
Report Date and Time:	02/18/14 12:33

Sample Temperature Deg C

Analysis Type:	Raw or Wastewater
General Location:	OUTFALL #2 (1:10)
Source Address:	CITY OF FALLON POTW
City:	FALLON
State:	NV
County:	CHURCHILL

PWS ID:
Public Water System:

Chlorine Residual:
- ☑ For Compliance
- ☐ Not For Compliance
- ☐ Not Indicated

Test:	Method:	Results:	Dilution:
Total Coliform - 10 Tube MPN	MPN Standard 9221 B	6.9	1:1
E. Coli - 10 Tube MPN	MPN Standard 9221 F	1.1	1:1
Fecal Coliform - 10 Tube MPN	MPN Standard 9221 E	<1.1	1:1

Approved By — Date: 2-18-2014

Starlims SN2014 0717

The absence of coliforms meets Nevada State Health Division bacteriological standards for safe drinking water.

NOTE: Results displayed in BOLD, ITALIC TYPE have failed Nevada State health standards

NOTE: This document will be destroyed at NSHL after 5 years, unless Client requests otherwise.

Item #4: State Health Laboratory (POTW Analysis - continued)

SilverState Analytical Laboratories
www.ssalabs.com

☐ 3638 E. Sunset Rd., Ste. 100, **Las Vegas**, NV 89120
Phone: (702) 873-4478 Fax: (702) 873-7967 (EPA #: NV0930)

☐ 4587 Longley Lane, No 2, **Reno**, NV 89502
Phone: (775) 825-1127 Fax: (775) 825-1167 (EPA #: NV0931)

CHAIN-OF-CUSTODY-RECORD
(Project Work Order)
Page _____ of _____

Project or Client Job #:	PO # or Payment Method:	SSAL Quote #:

SEND INVOICE TO:	
Name:	
Company:	
Mailing Address:	
City, State, Zip:	

REPORT RESULTS TO:	
Name:	Phone:
Company:	
Mailing Address:	
City, State, Zip:	
Results to email or Fax:	

Sampled By:

Report Attention:

On-Site pH/Temperature:

Turnaround Time (Specify Below with an X):

Standard 10 Business Days (Some Tests Vary): ☐

Rush: 1 Day | 2 Day | 3 Day | Other

NOTE: A surcharge is applied for rush samples

Other Pertinent Info:

ANALYSES REQUESTED

Circle Applicable Program:
SDWA CWA RCRA Mining Non-Reg
Other: _____

QC Report Level:
I II III IV
NOTE: Surcharges apply to Level I, III and IV reports

Date Sampled	Time Sampled	Sample Location/ Sample ID	Silver State Lab No.	Comp/ Grab	Matrix*	Preservative	Number/Type of Containers**										
																	*Metals:

I attest to the validity and authenticity of the sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time is considered fraud and may be grounds for legal action.

Relinquished by: Signature/Print	Time/Date	Received by: Signature/Print	Time/Date:
Relinquished by: Signature/Print	Time/Date	Received by: Signature/Print	Time/Date:
Relinquished by: Signature/Print	Time/Date	Received by: Signature/Print	Time/Date:

Authorized by:

Signature/Print: _____ Date: _____

Authorization is required to process samples. This obligates your organization for service fees. SSAL Standard T & C's or other written agreement applies. If collections or legal services are required to recover said fees, your organization will be responsible for all fees and costs in addition to service fees.

Method of Delivery:

Receiving Laboratory:

Special Instructions:

Note: Samples are discarded 30 days after results are reported. Samples deemed hazardous are returned to the client upon completion of analysis.

* Key: AQ – Aqueous S – Solid SS – Soil OT – Other

** Key: P – Plastic G – Glass V – VOA Vial OT - Other

Appendices Item #5 – Silver State Labs Chain of Custody Form

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: March 28, 2013

REPORT NUMBER: 13-1339

CLIENT: NDEP
2030 E. Flamingo Road, Suite 230
Las Vegas, NV 89119

PAGE: 1 of 1

PROJECT:

CLIENT PO #:

Sampled By: D. Haile
Date Sampled: 03/27/13
Time Sampled: 1420

Submitted by: D. Haile
Date Received: 03/27/13
Time Received: 1447

Report Attention:

Sample ID	Location	Parameter	Result	Unit	Reporting Limit	Method	Date Analyzed	Analyst
13-1339-1	CLVWPCF-Outfall 001	Total Coliform	10.9	100 mL^{-1}	1.0	Colilert-18	03/27/13	DC
	CLVWPCF-Outfall 001	Fecal Coliform	<1.0	100 mL^{-1}	1.0	Colilert-18	03/27/13	DC

ND: non-detect
EPA Flags: None

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 • Las Vegas, NV 89120 • Tel: 702-873-4478 Fax: 702-873-7967
4587 Longley Lane, No. 2 • Reno, NV 89502 • Tel: 775-825-1127 Fax: 775-825-1167
www.ssalabs.com • www.envirotechonline.com

Appendices Item #6 – Silver State Lab's Coliform Analysis

MSDS SHEETS

For Acid Preservatives

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION of the SUBSTANCE or PREPARATION

Trade/Material Name: **SULFURIC ACID > 51%**
Chemical Names, Common Names: Concentrated Sulfuric Acid
Synonyms: Hydrogen Sulfate; Oil of Vitriol; Vitriol Brown Oil; Mattling Acid; Battery Acid; Sulphuric Acid; Electrolyte Acid; Dihydrogen Sulfate; Spirit of Sulfur; Chamber Acid
Product Use: Various
Molecular Formula: H_2SO_4
Product Catalog Numbers: ACS-.5; ACS-1; ACS-10; ACS-2; ACS-5; SVCS-.5; SVCS-1; SVCS-10; SVCS-2; SVCS-5

COMPANY/UNDERTAKING IDENTIFICATION:
U.S. Manufacturer's Name: EP Scientific Products, LLC.-ThermoFisher Scientific
Address: 520 N. Main Street
Miami, OK 74354
Business Phone: 1-(800)-331-7425
Emergency Phone: CHEMTREC: 1-800-424-9300 (U.S./Canada/Puerto Rico) [24-hours]
CHEMTREC: +1-703-527-3887 (Outside North America) [24-hours]

EMAIL ADDRESS FOR PRODUCT INFORMATION:

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR. The product is also classified per all applicable EU Directives through EC 1907: 2006, the European Union CLP EC 1272/2008 and the Global Harmonization Standard.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION CLASSIFICATION: This product has been classified in accordance with the Global Harmonization Standard.

Classification: Skin Corrosion, Category 1A
Hazard Statement Codes: H314

See Section 15 for full text of Precautionary Statements and Hazard Statement Codes

EU LABELING AND CLASSIFICATION 67/548/EEC: This product meets the definition of hazardous, as defined by the European Community Council Directive 67/548/EEC or subsequent Directives.

EU CLASSIFICATION: C [Corrosive] EU RISK PHRASES: R: 35
EU SAFETY PHRASES: S: (1/2-); S: 26; S: 30; S: 45

See Section 15 for full text of Ingredient Risk and Safety Phrases

EMERGENCY OVERVIEW: Product Description: This product is an oily, clear, colorless to yellow liquid with strong, acrid odor. **Health Hazards: DANGER!** This product is corrosive and can cause severe irritation or burns by all routes of exposure. May be fatal by inhalation or ingestion. Symptoms by inhalation may be delayed. Repeated inhalation of low level concentrations may cause reduced lung capacity. Chronic skin exposure to low concentration may result in dermatitis. Strong inorganic acid mists containing sulfuric acid may cause cancer. **Flammability Hazards:** This product is not flammable or combustible. If involved in a fire it may generate irritating fumes and toxic gases (e.g., sodium oxides). **Reactivity Hazards:** Concentrated Sulfuric Acid reacts violently with water and many other substances under certain conditions. Reaction with water can generate significant heat. Hygroscopic (absorbs moisture from the air). Sulfuric Acid is corrosive to many metals and contact may produce flammable hydrogen gas. **Environmental Hazards:** This product may cause harm to organisms if accidentally released. **Emergency Considerations:** Emergency responders should wear appropriate protection for situation to which they respond.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS#	WT%	EU Hazard Symbol (67/548/EEC)	GHS/EU Hazard Symbol (1272/2008 EC)	EU Classification (67/548/EEC) GHS & EU Classification (1272/2008 EC) Risk Phrases/Hazard Statements
Sulfuric Acid	7664-93-3	231-639-5	96%			EU 67/548 Hazard Classification: C (Corrosive) EU 67/548 Risk Phrases: R: 35 GHS & EU 1272/2008 Classification: Skin Corrosion, Category 1A GHS & EU 1272/2008 Hazard Statement Code: H314

See Section 15 for full text of Ingredient Risk Phrases and Precautionary Statements

4. FIRST-AID MEASURES

DESCRIPTION OF FIRST AID MEASURES: Take a copy of label and MSDS to physician or health professional with the contaminated individual.
IMMEDIATE MEDICAL ATTENTION NEEDED: Yes.
SKIN EXPOSURE: If this solution contaminates the skin, flush with running water for 20 minutes. Seek medical attention if adverse effect occurs after flushing.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: If this product contaminates the eyes, rinse eyes under gently running water. Use sufficient force to open eyelids and then "roll" eyes while flushing. Do not interrupt flushing. Minimum flushing is for 20 minutes. The contaminated individual must seek immediate medical attention.

INHALATION: If mists, vapors or sprays of this product are inhaled, causing irritation, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. If breathing is difficult, give oxygen. Seek medical attention if adverse effect continues after removal to fresh air.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, DO NOT INDUCE VOMITING. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. If victim is convulsing, maintain an open airway and obtain immediate medical attention.

PROTECTION OF FIRST AID RESPONDERS: See Sections 6 (Accidental Release Measures) and 8 (Exposure Controls-Personal Protection).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin or respiratory disorders may be aggravated by overexposures to this product.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure. Monitor arterial blood gases, chest x-ray, and pulmonary function tests if respiratory tract irritation or respiratory depression is evident. Treat dermal irritation or burns with standard topical therapy. Effects may be delayed. Do NOT use sodium bicarbonate in an attempt to neutralize the acid.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

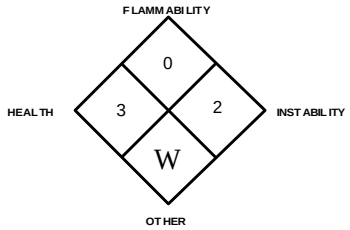
AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %): Not applicable.

FIRE EXTINGUISHING MEDIA: Use extinguishing agents suitable for the surrounding fire. Use water only to keep non-leaking, fire-exposed containers cool. If water is used, care should be taken, since it can generate heat and cause spattering if applied directly to sulfuric acid.

UNSUITABLE FIRE EXTINGUISHING MEDIA: Water.

NFPA RATING



Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe

SPECIAL FIRE AND EXPLOSION HAZARDS: Sulfuric Acid is not flammable or combustible. During a fire, irritating/toxic sulfur oxides may be generated. Sulfuric Acid reacts violently with water and organic materials with the evolution of heat. Fire may result due to the heat generated by contact of concentrated Sulfuric Acid with combustible materials. Sulfuric Acid reacts with most metals, especially when diluted with water. This reaction produces highly flammable hydrogen gas, which may explode if ignited, particularly in confined spaces. Sulfuric Acid is a strong dehydrating agent, which may cause ignition of finely divided materials on contact. Containers may explode in the heat of a fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive. Explosion Sensitivity to Static Discharge: Not sensitive.

ADVICE TO FIRE-FIGHTERS: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus (SCBA) and full protective equipment. Evacuate area and fight fire from a safe distance or protected location. Approach fire from upwind to avoid hazardous decomposition products. Closed containers may rupture violently when exposed to the heat of fire and suddenly release large amounts of product. If possible, isolate materials not yet involved in the fire and move containers from fire area if this can be done without risk. Protect personnel. Otherwise, cool fire-exposed containers, tanks or equipment by applying hose streams. Cooling should begin as soon as possible (within several minutes) and should concentrate on any un-wetted portions of the container. Apply water from the side and a safe distance. Cooling should continue until well after the fire is out. If this is not possible, use unmanned monitor nozzles and immediately evacuate the area. Use water spray in large quantities to knock down fumes. The resulting sulfuric acid solutions are very corrosive. Dike fire control water for appropriate disposal. DO NOT direct water at open or leaking containers and take precautions not to get water into containers. If protective equipment is contaminated by this product, it should be thoroughly washed with soapy water prior to removal of SCBA respiratory protection. Firefighters whose protective equipment becomes contaminated should thoroughly shower with warm, soapy water and should receive medical evaluation if they experience any adverse effects.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES: Trained personnel using pre-planned procedures should respond to uncontrolled releases. In case of a spill, clear the affected area and protect people. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Avoid allowing water runoff to contact spilled material. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666). The atmosphere must have levels of components lower than those listed in Section 8, (Exposure Controls and Personal Protective Equipment), if applicable, and have at least 19.5 percent oxygen before personnel can be allowed into the area without Self-Contained Breathing Apparatus.

6. ACCIDENTAL RELEASE MEASURES (Continued)

PROTECTIVE EQUIPMENT: Proper protective equipment should be used.

Small Spills: Wear double-gloves (rubber over latex gloves), rubber apron, and splash goggles or safety glasses.

Large Spills: Trained personnel following pre-planned procedures should handle non-incidental releases. Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit**.** Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.**

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Spills: Neutralize spill area with sodium bicarbonate or other material appropriate for acidic materials. Absorb spilled liquid with polypads, or other suitable absorbent materials. Absorb spilled liquid with polypads, or other suitable absorbent materials. Do not use sawdust or other organic material. Wash contaminated area with soap and water, absorb with polypads or other appropriate material, and rinse with water.

Large Spills: Neutralize spill area with sodium bicarbonate or other material appropriate for acidic materials. Absorb spilled liquid with polypads, or other suitable absorbent materials. Ensure adequate ventilation. Prevent material from entering sewer or confined spaces, waterways, soil or public waters. Monitor area and confirm levels are bellow exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, before non-response personnel are allowed into the spill area.

All Spills: Place all spill residue in a double plastic bag or other containment and seal, place in appropriate container and dispose of properly. Decontaminate the area thoroughly. After all spill residue has been removed from the area, rinse the area with flooding quantities of water. Do not mix with wastes from other materials. If necessary, discard all stained response equipment or rinse with soapy water before returning such equipment to service.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewer or confined spaces, waterways, soil or public waters. Do not flush to sewer.

REFERENCE TO OTHER SECTIONS: See Section 13, Disposal Considerations for more information.

State, and local procedures (see Section 13, Disposal Considerations).

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: All employees who handle this product should be trained to handle it safely. As with all chemicals, avoid getting this product ON YOU or IN YOU. Do not eat, drink, smoke, or apply cosmetics while handling this product. Wash hands thoroughly after handling this product or equipment and containers of this compound. Follow SPECIFIC USE INSTRUCTIONS supplied with product. Avoid breathing vapors or mists generated by this product. Use in a well-ventilated location. Open containers slowly on a stable surface. Containers of this product must be properly labeled. Empty containers may contain residual liquid or vapors; therefore, empty containers should be handled with care. Do not allow water to get into containers. Corrosion of equipment and surfaces should be considered in areas where hot or misted acid is present. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Soda ash or lime should be kept nearby for emergency use. Never add water to Sulfuric Acid; always add Sulfuric Acid to water; severe spattering and generation of significant heat can occur. When mixing with water, stir small amounts in slowly. Use cold water to prevent excessive heat generation.

CONDITIONS FOR SAFE STORAGE: Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers or in a diked area, as appropriate. Keep container tightly closed when not in use. Storage areas should be made of fire and corrosion resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Do not allow water to get into the container because of violent reaction. Ideally, Sulfuric Acid should be stored in isolation from all other chemicals in an approved acid or corrosives safety cabinet. Containers may develop pressure after prolonged storage. Drums may need to be vented. Venting should only be performed by trained personnel. Follow supplier/manufacturer recommendations. If drums are swollen, contact the manufacturer/supplier immediately for assistance. Handling swollen drums requires special procedures and equipment.

SPECIFIC END USE(S): This product has various uses in different industries. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: When cleaning non-disposable equipment, wear latex or butyl rubber (double gloving is recommended), goggles, and lab coat. Wash equipment with soap and water. Wipe equipment down with damp sponge or polypad. Collect all rinsates and dispose of according to applicable Federal, State, and local procedures standards.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: This product should be used areas with adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits provided in this section, if applicable. Use a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside, taking necessary precautions for environmental protection. An eyewash and safety shower should be readily accessible.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Sulfuric Acid	7664-93-9	0.2 T	NE	1	NE	1	NE	15	DFG MAKs: TWA = 0.1 (inhalable fraction) PEAK = 1•MAK 15 min. average value, 1-hr interval, 4 per shift, 0.2 (ceiling) DFG MAK Pregnancy Risk Classification: C Carcinogen: IARC-1, MAK-4, NTP-K, TLV-A2

NE = Not Established. T = Measured as Thoracic Fraction of the Aerosol

INTERNATIONAL EXPOSURE LIMITS: Currently, the following international exposure limits are in place for Sulfuric Acid. This may not be a complete list and exposure limits change and should be checked for currency.

ARAB Republic of Egypt: TWA = 1 mg/m, JAN 1993
Australia: TWA = 1 mg/m^3, STEL = 3 mg/m^3, JUL 2008
Belgium: TWA = 1 mg/m^3, STEL = 3 mg/m^3, MAR 2002
Denmark: TWA = 1 mg/m^3, OCT 2002
Finland: TWA = 1 mg/m^3, STEL 3 mg/m^3, SEP 2009
France: VME = 1 mg/m^3, VLE = 3 mg/m^3, FEB 2006
Germany: MAK = 1 0.1 mg/m^3 (inhalable), 2005
Hungary: TWA = 1 mg/m^3, STEL = 1 mg/m^3, SEP 2000
Japan: OEL-C = 1 mg/m^3, APR 2007
Korea: TWA = 1 mg/m^3, 2006
Mexico: TWA = 1 mg/m^3, 2004
The Netherlands: MAC-TGG = 1 mg/m^3, 2003
New Zealand: TWA = 1 mg/m^3, JAN 2002
Norway: TWA = 1 mg/m^3, JAN 1999
Poland: MAC(TWA) = 1 mg/m^3, MAC(STEL) = 3 mg/m^3, JAN 1999
Russia: STEL = 1 mg/m^3, Skin, JUN 2003
Sweden: TWA = 1 mg/m^3; STEL = 3 mg/m^3, JUN 2005
Switzerland: MAK-W = 0.1 mg/m^3, KZG-W = 0.1 mg/m^3, DEC 2006
Thailand: TWA = 1 mg/m^3, JAN 1993
Turkey: TWA = 1 mg/m^3, JAN 1993
In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-07) and CR 13464:1999 for face/eye protection. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: If airborne mists or sprays from this product are created during use, use appropriate respiratory protection. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) and equivalent U.S. State standards, Canadian CSA Standard Z94.4-93 and the European Standard EN 529:2005 and Respiratory Protection Standards of EU member states. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under U.S. Federal OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH respiratory protection equipment guidelines for Sulfuric Acid and are provided for additional information on the selection of respiratory protection equipment.

SULFURIC ACID

CONCENTRATION	RESPIRATORY PROTECTION
Up to 15 mg/m_3:	Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with acid gas cartridge(s) in combination with a high-efficiency particulate filter, or any Chemical Cartridge Respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter, or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter, or any Self-Contained Breathing Apparatus (SAR) with a full facepiece, or any SAR with a full facepiece.
Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter, or any appropriate escape-type, SCBA.

EYE PROTECTION: Splash goggles or safety glasses should be worn during operations in which airborne mists or sprays may be generated. A faceshield may be necessary under certain circumstances and if large quantity is being handled. If necessary, refer to U.S. OSHA 29 CFR 1910.133, the Canadian CSA Standard Z94.3-M1982, *Industrial Eye and Face Protectors,* or the European Standard CR 13464:1999 for further information.

HAND PROTECTION: Wear butyl rubber gloves for routine industrial use. Use triple gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138, appropriate Standards of Canada, or the European Standard CEN/TR 15419:2006.

BODY/SKIN PROTECTION: Use body protection appropriate for task (e.g., lab coat, coveralls, Tyvek suit). When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. Full-body chemical protective clothing is recommended for emergency response procedures. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or refer to appropriate Standards of Canada, or the European Standard CEN/TR 15419:2006, for further information. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-M1984, *Protective Footwear*.

9. PHYSICAL and CHEMICAL PROPERTIES

BOILING POINT: 290- 338℃ (554-640.4℉)
FREEZING/MELTING POINT: 10℃ (50℉)
EVAPORATION RATE (water = 1): Slower than ether.
SOLUBILITY IN WATER: Soluble with much heat.
VAPOR PRESSURE (air = 1) @ 20℃: < 0.001 mmHg
VAPOR DENSITY (air= 1): 3.38
SPECIFIC GRAVITY/DENSITY: 1.84
VISCOSITY @ 25℃: 21 mPas
MOLECULAR WEIGHT: 98.08
MOLECULAR FORMULA: H_2SO_4
DECOMPOSITION TEMPERATURE: 340℃ (644℉)
pH: 0.3 (1N solution)
OXIDIZING PROPERTIES: Not an oxidizer.
ODOR THRESHOLD: Sulfuric Acid is odorless. Irritation has been experienced between 1 and 3 mg/m3.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable (ionizable compounds)
APPEARANCE AND COLOR: This product is an oily, clear, colorless to yellow liquid with strong, acrid odor.
HOW TO DETECT THIS SUBSTANCE (identification properties): Litmus paper will turn red in contact with this product and may assist in identification in event of accidental release.

10. STABILITY and REACTIVITY

REACTIVITY: Sulfuric Acid is a very reactive substance. Sulfuric Acid reacts with most metals, especially when diluted with water.
CHEMICAL STABILITY: This product is stable when properly stored (see Section 7, Handling and Storage) at normal temperature. Contact with metals can produce highly flammable hydrogen gas.
DECOMPOSITION PRODUCTS: *Combustion:* If exposed to extremely high temperatures, thermal decomposition may generate irritating fumes and toxic gases (e.g. sulfur oxides). *Hydrolysis*: None.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Sulfuric Acid is a very reactive substance. Sulfuric Acid is water-reactive. The concentrated acid oxidizes, dehydrates, or sulfonates most organic compounds. Sulfuric acid reacts vigorously, violently or explosively with many organic and inorganic chemicals including acrylonitrile, alkali solutions, carbides, chlorates, fulminates, nitrates, perchlorates, permanganates, picrates, powdered metals, metal acetylides or carbides, epichlorohydrin, aniline, ethylenediamine, alcohols with strong hydrogen peroxide, chlorosulfonic acid, cyclopentadiene, hydrofluoric acid, nitromethane, 4-nitrotoluene, phosphorus (III) oxide, potassium, sodium, ethylene glycol, isoprene, styrene. Hazardous gases, such as hydrogen, hydrogen cyanide, hydrogen sulfide and acetylene, are evolved on contact with chemicals such as metals, cyanides, sulfides and mercaptans and carbides respectively. Sulfuric acid attacks many plastics, such as nylon, polyvinylidene chloride, acrylonitrile-butadiene-styrene, styrene acrylonitrile, polyurethane (rigid), polyetherether ketone, polyethylene terephthalate, high-density polyethylene, thermoset polyester bisphenol A fumarate, thermoset polyester isophathalic acid, polystyrene, ethylene vinyl acetate; elastomers, such as butyl rubber (isobutylene isoprene), nitrile buna N (nitrile rubber), chloroprene (neoprene), isoprene, natural rubber, hard rubber, soft rubber, chlorosulfonated polyethylene, styrene-butadiene, polyacrylate, polyurethane, chlorinated polyethylene, nylon 11 and 12, silicone rubbers, flexible polyvinyl chloride, low density polyethylene, ethylene vinyl acetate. Sulfuric Acid also attacks many types of polymer coatings.
POSSIBILITY OF HAZARDOUS REACTIONS OR POLYMERIZATION: Acetaldehyde and allyl chloride may polymerize violently in the presence of Sulfuric Acid.
CONDITIONS TO AVOID: Avoid extreme temperatures and contact with water and incompatible chemicals.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The health hazard information provided below is pertinent to employees using this product in an occupational setting. The following paragraphs describe the symptoms of exposure by route of exposure.
INHALATION: If vapors, mists or sprays of this solution are inhaled, symptoms of exposure may include breathing difficulty, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat. Damage to the tissues of the respiratory system may also occur, especially after prolonged exposures or exposures to high concentrations of this solution. Severe inhalation over-exposures can lead to chemical pneumonitis, pulmonary edema, and death. Chronic inhalation exposures may result in dental erosion and perforation of the nasal septum. Exposure may impair lung function and cause mucostasis (reduced mucous clearance).
CONTACT WITH SKIN or EYES: Contact with the eyes will cause severe irritation, pain, reddening, watering, and possibly, blindness. Depending on the duration of skin contact, skin overexposures may cause reddening, discomfort, severe irritation, and chemical burns. Chemical burns result in blistering of the skin and possible scarring. Repeated skin-overexposures to low concentrations can result in dermatitis (inflammation and reddening of the skin).
SKIN ABSORPTION: Skin absorption is not a significant route of overexposure for this product.
INGESTION: Ingestion is not anticipated to be a likely route of occupational exposure to this product. If ingestion does occur, severe irritation and burns of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Symptoms of such over-exposure can include nausea, vomiting, diarrhea. Ingestion of large volumes of this product may be fatal.
INJECTION: Though not anticipated to be a significant route of overexposure for this product, injection (via punctures or lacerations by contaminated objects) may cause redness at the site of injection.

11. TOXICOLOGICAL INFORMATION (Continued)

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Overexposure to this product may cause the following health effects:

ACUTE: This product is corrosive and may cause severe irritation or burns by all routes of exposure. Eye contact may cause tissue damage or blindness. Ingestion may be harmful or fatal.

CHRONIC: Chronic inhalation of vapors, mists or spray from this product may cause reduction in lung capacity, bronchitis and erosion of the teeth. Repeated, low concentration skin contact of this product may cause dermatitis. Occupational exposure to strong inorganic acid mists containing Sulfuric Acid is carcinogenic to humans.

TARGET ORGANS: ACUTE: Eyes, respiratory system, skin. CHRONIC: Respiratory system, skin.

TOXICITY DATA: Currently, the following toxicity data are available for Sulfuric Acid.

Standard Draize Test (Eye-Rabbit) 250 µg: Severe
Rinsed with Water (Eye-Rabbit) 5 mg/30 seconds: Severe
TCLo (Inhalation-Human) 3 mg/m^3/24 weeks: Musculoskeletal: changes in teeth and supporting structures
TCLo (Inhalation-Human) 1 mg/m^3/3 hours: Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Human) 0.6 mg/m^3: Lungs, Thorax, or Respiration: cough
TCLo (Inhalation-Human) 0.73 mg/m^3: Sense Organs and Special Senses (Eye): effect, not otherwise specified
TCLo (Inhalation-Human) 0.63 mg/m^3: Brain and Coverings: changes in surface EEG
TCLo (Inhalation-Human) 3 mg/m^3/5 minutes: Lungs, Thorax, or Respiration: dyspnea
LDLo (Unreported-Man) 135 mg/kg
LD_{50} (Oral-Rat) 350 mg/kg
LC_{50} (Inhalation-Rat) 510 mg/m^3/2 hours
LC_{50} (Inhalation-Rat) 510 mg/m^3
LC_{50} (Inhalation-Mouse) 320 mg/m^3/2 hours
LC_{50} (Inhalation-Mouse) 320 mg/m^3
LC_{50} (Inhalation-Guinea Pig) 18 mg/m^3: Lungs, Thorax, or Respiration: other changes
LC_{50} (Inhalation-Guinea Pig) 18 mg/m^3/8 hours
LCLo (Inhalation-Rat) 65 mg/m^3/30 minutes: Lungs, Thorax, or Respiration: bronchiolar constriction
LCLo (Inhalation-Rat) 461 mg/m^3/7 hours
LCLo (Inhalation-Mouse) 461 mg/m^3/7 hours
LCLo (Inhalation-Rabbit) 461 mg/m^3/7 hours
LCLo (Inhalation-Cat) 461 mg/m^3/7 hours
TCLo (Inhalation-Rat) 0.2 mg/m^3/6 hours/4 weeks-intermittent: Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Rat) 784 µg/m^3/24 hours/84 days-continuous: Behavioral: muscle contraction or spasticity; Kidney/Ureter/Bladder: other changes in urine composition; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase
TCLo (Inhalation-Rat) 1.8 mg/m^3/24 hours/65 days-continuous: Peripheral Nerve and Sensation: recording from peripheral motor nerve; Kidney/Ureter/Bladder: changes in both tubules and glomeruli
TCLo (Inhalation-Rat) 0.3 mg/m^3/6 hours/5 days-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Guinea Pig) 8 mg/m^3/5 days: Behavioral: food intake (animal), changes in motor activity (specific assay); Lungs, Thorax, or Respiration: acute pulmonary edema
TCLo (Inhalation-Guinea Pig) 30 mg/m^3/7 days-continuous: Lungs, Thorax, or Respiration: acute pulmonary edema; Related to Chronic Data: death
TCLo (Inhalation-Guinea Pig) 4 mg/m^3/24 hours/18 days-continuous: Lungs, Thorax, or Respiration: fibrosis (interstitial), acute pulmonary edema
TCLo (Inhalation-Monkey) 2 mg/m^3/23 hours/78 weeks-intermittent: Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Monkey) 2.4 mg/m^3/24 hours/78 weeks-continuous: Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Monkey) 2.4 mg/m3/24 hours/78 weeks-continuous: Lungs, Thorax, or Respiration: respiratory depression
TCLo (Inhalation-Dog) 900 µg/m^3/21 hours/89 weeks-intermittent: Cardiac: changes in heart weight; Lungs, Thorax, or Respiration: other changes Lungs, Thorax, or Respiration: changes in lung weight
TCLo (Inhalation-Dog) 0.9 mg/m^3/21 hours/620 days-intermittent: Lungs, Thorax, or Respiration: respiratory depression
TCLo (Inhalation-Rabbit) 20 mg/m^3/7 hours: female 6-18 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system
TCLo (Inhalation-Mammal-Horse, Donkey) 0.1 mg/m^3/5 days/26 weeks-intermittent: Lungs, Thorax, or Respiration: other changes
Cytogenetic Analysis (Hamster-Ovary) 4 mmol/L

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	2

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
SEE SECTION 8			

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

IRRITANCY OF PRODUCT: This product may cause severe irritation or burns by all routes of exposure.

SENSITIZATION OF PRODUCT: Sulfuric Acid is not known to cause human skin or respiratory sensitization.

CARCINOGENIC POTENTIAL: Sulfuric Acid is listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

SULFURIC ACID (*strong inorganic acid mists containing sulfuric acid): *ACGIH TLV-A2 (Suspected Human Carcinogen); *IARC-1 (Carcinogenic to Humans); *NTP-K (Known to Be a Human Carcinogen); MAK-4 (Substances with Carcinogenic and Genotoxic Effects, the Potency of Which is Considered to Be So Low, That, Provided the MAK and BAT Values are Observed, No Significant Contribution to Human Cancer Risk is to Be Expected)

SYNERGISTIC MATERIALS: There are conflicting results from studies in animals on the interactive effects between ozone and Sulfuric Acid when they are inhaled concurrently. While some have shown a synergistic effect others have shown no effect or an antagonistic effect.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Sulfuric Acid on human and animal reproductive systems.

Mutagenicity: The components of this product are not reported to cause human mutagenic effects. There are no mutagenicity studies specifically of sulfuric acid. However, there are established effects of reduced pH in mutagenicity testing, as would be caused by sulfuric acid. These effects are an artifact of low pH and are not necessarily due to biological effects of sulfuric acid itself.

Embryotoxicity: The components of this product are not reported to cause human embryotoxic effects.

Teratogenicity: The components of this product are not reported to cause human teratogenic effects. Sulfuric Acid was not teratogenic in mice and rabbits, but was slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m3 for 7 hr/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.

Reproductive Toxicity: The components of this product are not reported to cause human reproductive effects.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION (continued):

A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryo toxin is a chemical that causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices (BEIs) have not been determined for the components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY IN SOIL: Since Sulfuric Acid is miscible with water, the presence of water in the soil or falling as precipitation at the time of the spill will influence the rate of chemical movement in the soil. Dilution through mixture with water will decrease the viscosity more than the mass density. This will have the net effect of increasing the velocity of downward movement in the soil. Upon reaching the groundwater table, the acid will continue to move in the direction of groundwater flow and downward since its mass density exceeds that of water. A contaminated plume will be produced, with diffusion and dispersion serving to reduce the acid concentration somewhat.

PERSISTENCE AND BIODEGRADABILITY: Sulfuric Acid has led to increased weathering of calcium from soils and rocks so that the calcium ion rises in concentration in waters above pH 6, and also in those below pH 5.

BIO-ACCUMULATION POTENTIAL: Sulfuric Acid does not bioconcentrate.

ECOTOXICITY: This product has not been tested for aquatic or animal toxicity. All release to terrestrial, atmospheric, and aquatic environments should be avoided. The following aquatic toxicity data are available for Sulfuric Acid:

TLm (*Gambusia affinis* mosquito fish) 48 hours = 42 mg/L turbid water/Conditions of bioassay not specified

TLm (*Lepomis macrochirus* bluegill) 48 hours = 49 mg/L tap water 20℃/Conditions of bioassay not specified

TLm (*Lepomis macrochirus* bluegill) 24 hours = 24.5 ppm/fresh water/Conditions of bioassay not specified

LC_{50} (Flounder) 48 hours = 100 to 330 mg/L; aerated water/Conditions of bioassay not specified

LC_{50} (Shrimp) 48 hours = 80 to 90 mg/L; aerated water /Conditions of bioassay not specified

LC_{50} (Prawn) 48 hours = 42.5 ppm/salt water /Conditions of bioassay not specified

OTHER ADVERSE EFFECTS: This material is not listed or expected to have having ozone depletion potential.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

13. DISPOSAL CONSIDERATIONS

WASTE TREATMENT/DISPOSAL METHODS: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Shipment of wastes must be done with appropriately permitted and registered transporters.

DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55-gallon poly or metal waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials. Dispose of in accordance with applicable Federal, State, and local procedures and standards.

EPA WASTE NUMBER: Wastes from this product should be tested to see if they meet D002 (Waste Characteristic-Corrosivity).

EUROPEAN WASTE CODES: 16 05 08: Discarded Organic Chemicals Consisting of or Containing Dangerous Substances.

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

PROPER SHIPPING NAME:	Sulfuric acid with more than 51 per cent acid
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive)
UN IDENTIFICATION NUMBER:	UN 1830
PACKING GROUP:	PG II
DOT LABEL(S) REQUIRED:	Class 8 (Corrosive)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2008): 137

MARINE POLLUTANT: No component of this product meets the criteria of the DOT as Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

NOTE: Shipments of this product may be shipped under small quantity and limited quantity exceptions as indicated under 49 CFR §173.4 and 49 CFR §173.154, if all requirements are met.

Small Quantity Exception (49 CFR 173.4): Small quantities of Class 8 material are not subjected to other requirements of the Hazardous Materials Regulations (Subchapter C) when the maximum quantity per inner receptacle is limited to 30 mL (liquids). Refer to 49 CFR 173.4 for specific information in packaging small quantity materials.

Limited Quantity Exceptions [49 CFR 173.154(b)(2)]: Limited quantities for Class 8, Packing Group II materials have inner packagings not over 1.0 L (liquids) net capacity each, packed in strong outer packaging.

14. TRANSPORTATION INFORMATION (Continued)

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME:	Sulfuric acid with more than 51 per cent acid, *or* Sulphuric acid with more than 51 per cent acid
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive)
UN IDENTIFICATION NUMBER:	UN 1830
PACKING GROUP:	PG II
HAZARD SHIPPING LABEL(S) REQUIRED:	Class 8 (Corrosive)
SPECIAL PROVISIONS:	None
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:	1
ERAP INDEX:	3000
PASSENGER CARRYING SHIP INDEX:	None
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX:	1

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is classified as dangerous goods, per the International Air Transport Association.

UN IDENTIFICATION NUMBER:	UN 1830
PROPER SHIPPING NAME/DESCRIPTION:	Sulfuric acid with more than 51 per cent acid
HAZARD CLASS or DIVISION:	8 (Corrosive)
HAZARD LABEL(S) REQUIRED:	Class 8 (Corrosive)
PACKING GROUP:	II
PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION:	809
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG:	1 L
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION:	Y809
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG:	0.5 L
CARGO AIRCRAFT ONLY PACKING INSTRUCTION:	813
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG:	30 L
SPECIAL PROVISIONS:	None
ERG CODE:	8L

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is classified as dangerous goods, per the International Maritime Organization.

UN No.:	1830
PROPER SHIPPING NAME:	Sulfuric acid with more than 51 per cent acid
HAZARD CLASS NUMBER:	8
SUBSIDIARY RISK:	None
PACKING GROUP:	II
SPECIAL PROVISIONS:	None
LIMITED QUANTITIES:	LQ: 1 mL, EQ: E2
PACKING INSTRUCTIONS:	P001
EmS:	F-A, S-B
STOWAGE CATEGORY:	Category C. For steel drums, Category B.

MARINE POLLUTANT: This material does not meet the criteria of a Marine Pollutant under UN criteria.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is classified by the Economic Commission for Europe to be dangerous goods.

UN NO.:	1830
NAME and DESCRIPTION:	Sulfuric acid with more than 51 per cent acid
CLASS:	8
CLASSIFICATION CODE:	C1
PACKING GROUP:	II
LABELS:	8
SPECIAL PROVISIONS:	None
LIMITED QUANTITIES:	LQ22
PACKING INSTRUCTIONS:	P001, IBC02
MIXED PACKING PROVISIONS:	MP15
HAZARD IDENTIFICATION No.:	80

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Sulfuric Acid is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows.

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Sulfuric Acid	No	No	Yes (aerosol forms only)

U.S. SARA SECTION 302 THRESHOLD PLANNING QUANTITY (TPQ): 1000 lb (454 kg)

15. REGULATORY INFORMATION (Continued)

ADDITIONAL UNITED STATES REGULATIONS (continued):

U.S. SARA SECTION 304 REPORTABLE QUANTITY (TPQ): 1000 lb (454 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): 1000 lb (454 kg)

U.S. TSCA INVENTORY STATUS: Sulfuric Acid is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Sulfuric Acid has requirements under additional U.S. regulations, as follows:

SULFURIC ACID:

CLEAN WATER ACT: Sulfuric Acid is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance.

CERCLA REPORTABLE QUANTITIES: Releases of CERCLA hazardous substances are subject to the release reporting requirement of CERCLA section 103, codified at 40 CFR part 302, in addition to the requirements of 40 CFR part 355. Sulfuric acid is an extremely hazardous substance (EHS) subject to reporting requirements when stored in amounts in excess of its threshold planning quantity (TPQ) of 1,000 lbs.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Strong inorganic acid mists containing sulfuric acid are on the California Proposition 65 Lists. WARNING! Strong inorganic mists containing Sulfuric Acid are known to the State of California to cause cancer.

U.S. ANSI STANDARD LABELING (Precautionary Statements): DANGER! CORROSIVE. WATER REACTIVE. CAUSES BURNS BY ALL ROUTES OF EXPOSURE. MAY BE HARMFUL OR FATAL IF SWALLOWED. CHRONIC, LOW-LEVEL INHALATION MAY CAUSE REDUCED LUNG FUCTION. CHRONIC, LOW-LEVEL SKIN EXPOSURE MAY CAUSE DERMATITIS. CONTACT WITH WATER CAN CAUSE VIOLENT REACTION. Can react dangerously with many organic and inorganic materials. Strong inorganic acid mists containing sulfuric acid may cause cancer. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing vapors or mist. Keep container closed. Avoid accidental contact with water. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 20 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO_2, or “alcohol” foam. **IN CASE OF SPILL:** Absorb spill with inert material or neutralizing agent for acids. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL STATUS: This material is listed on the DSL inventory.

CANADIAN ENVIRONMENTAL PROTECTION AGENCY (CEPA) PRIORITIES SUBSTANCES LIST: Substance With Greatest Potential For Human Exposure Substance on Environment Canada/Health Canada Pilot Project List (CEPA 1999, Section 73). Meets categorization criteria: *may present, to individuals in Canada, the greatest potential for exposure; or *are persistent or bio-accumulative in accordance with the regulations, and inherently toxic to human beings or to non-human organisms, as determined by laboratory or other studies.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Class E: Corrosive Material, **Class D1A:** Class D, Division 2 Poisonous and Infectious Material: Other toxic effects

GLOBAL HARMONIZATION CLASSIFICATION: This product has been classified in accordance with the Global Harmonization Standard.

Classification: Skin Corrosion, Category 1A

Hazard Statements: H314: Causes severe skin burns and eye damage

Precautionary Statements:

Prevention: P260: Do not breathe gas/mist/vapours/spray. P264: Wash thoroughly after handling. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. P310: Remove contact lenses, if present and easy to do. Continue rinsing. P363: Wash contaminated clothing before reuse.

Storage: P405: Store locked up.

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Signal Words: Danger

Hazard Symbols: GHS05

15. REGULATORY INFORMATION (Continued)

EU LABELING AND CLASSIFICATION: This product meets the definition of hazardous as defined by the European Community Council Directives.

EU Classification: C [Corrosive]

EU Risk Phrases: R: 35: Corrosive.

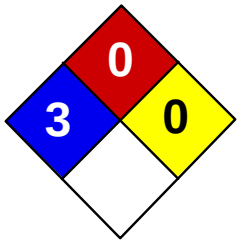
EU Safety Phrases: S:(1/2-)*: Keep locked up and out of the reach of children.* S: 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S: 30: Never add water to this product. S: 45: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.

European Community Annex II Hazard Symbols: C [Corrosive]

16. OTHER INFORMATION

PREPARED BY:	CHEMICAL SAFETY ASSOCIATES, Inc. PO Box 1961, Hilo, HI 96721 • (808) 969-4846 • (800) 441-3365
DATE OF PRINTING:	August 27, 2014



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric Acid, 15% (v/v) MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric Acid, 15% (v/v)

Catalog Codes: SLN2284

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	88-94.5
Nitric acid, fuming	7697-37-2	7-10.5

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

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 immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek 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.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. Nickel tetraphosphide ignites with fuming nitric acid. (Nitric Acid)

Special Remarks on Explosion Hazards:
Reacts exlposively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid + 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:
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 sodium carbonate.

Large Spill:
Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

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 threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

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.

Exposure Limits:
Nitric acid, fuming TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 2 STEL: 4 (ppm) [Australia] TWA: 2 STEL: 4 from NIOSH TWA: 5 STEL: 10 (mg/m3) from NIOSH TWA: 2 STEL: 4 (ppm) from OSHA (PEL) [United States] TWA: 5 STEL: 10 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 83°C (181.4°F) (Nitric acid, fuming). Weighted average: 98.51°C (209.3°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.03 (Water = 1)

Vapor Pressure: The highest known value is 6.4 kPa (@ 20°C) (Nitric acid, fuming). Weighted average: 2.66 kPa (@ 20°C)

Vapor Density: The highest known value is 2.3 (Air = 1) (Nitric acid, fuming). Weighted average: 0.77 (Air = 1)

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:
Reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Extremely corrosive in presence of copper, brass. Corrosive in presence of aluminum. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316).

Special Remarks on Reactivity:
A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Incompatible with combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:
In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel (Nitric acid, fuming)

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric Acid UNNA: 2031 PG: II

Special Provisions for Transport: Marine Pollutant (Nitric acid, fuming)

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 8.75% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. S24/25- Avoid contact with skin and eyes. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 10:59 AM

Last Updated: 05/21/2013 12:00 PM

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Appendices Item # 8: Field pH/Temperature Tester:

The Routine Pollution Panel test provides a certified laboratory analysis of the pH parameter (SM 4500 H+B) with the restriction of a 24-hr. sample hold time from the time of the sample collection to the commencement of the lab analysis. If this hold time cannot be met, an in-field tester for pH/Temperature is available for BWPC staff using a HACH® Pocket Pro™ tester. This tester includes a non-replaceable sensor (electrode), and the unit must be replaced when the electrode has deteriorated and can no longer hold a calibration reference point. This portable tester provides field measurements of both the pH (Std. Units) and Temperature (°C) parameters.

For further details, refer to the attached User Manual documentation, which is available for download on the HACH® website. The instructions below correspond to using a pre-calibrated instrument. The BWQP Laboratory stocks deionized (DI) water and reference pH calibration solutions of 7 and 10 Standard Units.

Basic Instructions:

- Push and hold the 3rd (bottom) button on the panel's keypad to turn the unit on. The unit is powered by four (4) "AAA" alkaline battery cells.
- Sample measurements can be made in a clean beaker or in the attached plastic sensor cup. Ensure that the sensor's glass membrane is completely immersed and the reading has stabilized before recording.
- When done, rinse the glass sensor with a "clean" water source such as DI water, blot dry with clean tissue paper and store the unit with the sensor cup snapped in place to protect the glass membrane during transport.
- Push and hold the 3rd (bottom) button on the panel to turn off the unit and preserve the battery life.
- Follow the User's Manual instructions for periodic calibration using the reference solutions available in the BWQP laboratory.
- Replace the unit as needed when the sensor has deteriorated (e.g. recommended annual replacement basis for frequent field use).

1 – DI H_2O & pH Std. Solutions (Lab Supplies)

2 – DI Rinse Bottle (Electrode Maintenance)

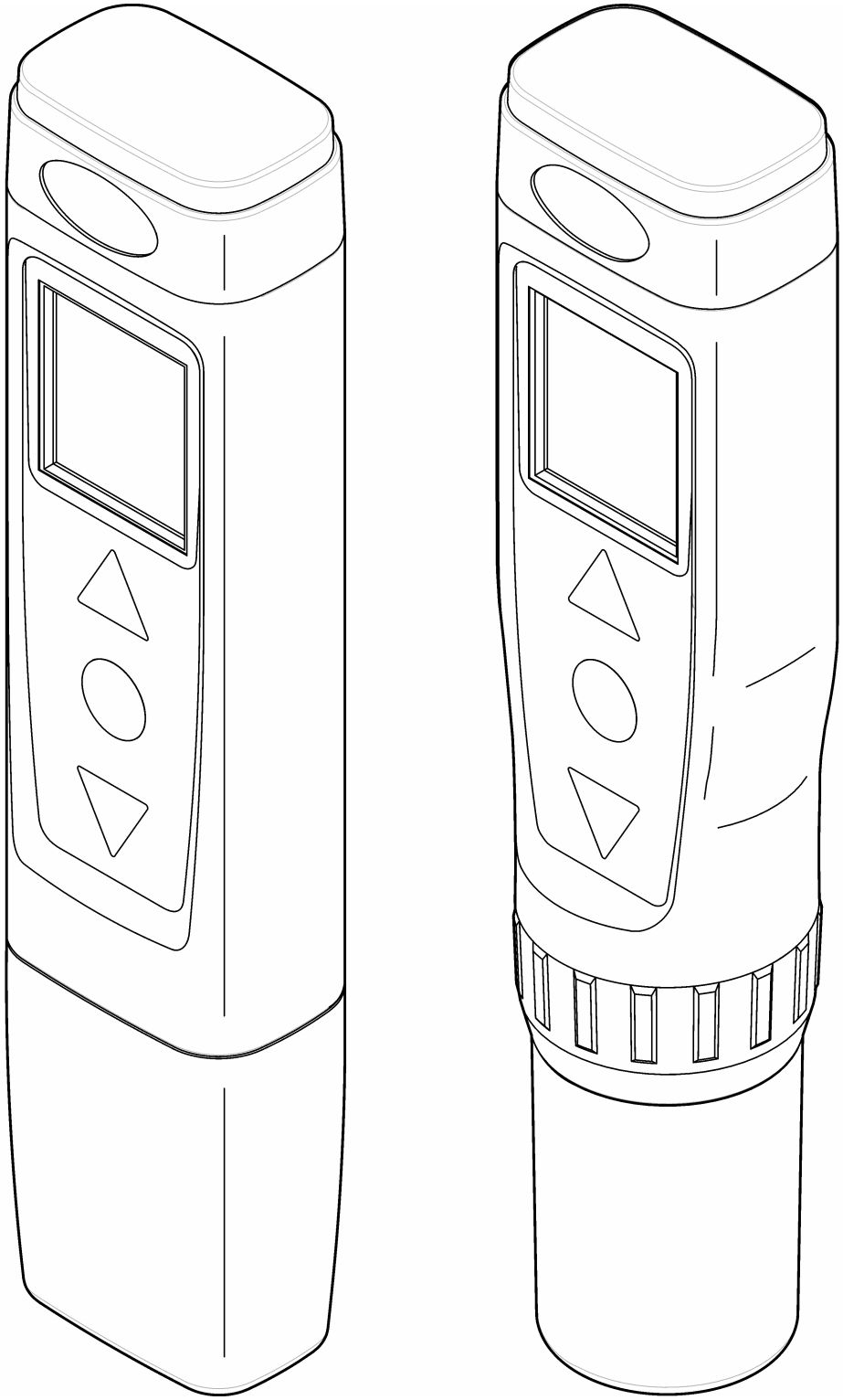
3 – Sensor (Electrode) Detail

4 – Sample Measurement (solution of 7.0 pH)

User Manual

DOC022.53.80394

Pocket Pro™, Pro™+ pH



Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	37 x 30 x 170 mm (1.45 x 1.18 x 6.69 in.)
Enclosure rating	IP67
Weight	135 g (0.297 lb) with batteries
Power requirements (internal)	AAA alkaline batteries (4x)
Battery life	Pocket Pro: 450 hours Pocket Pro+: 450 hours (200 hours with backlight on)
Operating temperature	0 to 50 °C (32 to 122 °F)
Storage temperature	–20 to 60 °C (–4 to 140 °F)
Operating humidity	80% (non-condensing)
Altitude	2000 m (6562 ft)
Instrument range	0.0 to 14.0 pH
Resolution	Pocket Pro: 0.1 pH; Pocket Pro+: 0.01 pH
Accuracy[1]	Pocket Pro: ±0.1 pH; Pocket Pro+: ±0.01 pH
Calibration points	Pocket Pro: 3 points (auto); Pocket Pro+: 3 points (auto) or 2 points (custom) ***Note:*** *Temperature calibration is not available.*
Auto-recognition calibration standards	USA: 4.01, 7.00, 10.01 pH; NIST: 4.01, 6.86, 9.18 pH
Certifications	CE mark
Warranty	6 months for Pocket Pro tester, 1 year for Pocket Pro+ tester and 6 months for replacement sensor for manufacturing faults only. Damage from use is not covered.

[1] Based on a 3-point calibration and the calibration standards at the same temperature as the samples measured. Also valid for 5.5 to 8.5 pH based on a 1-point calibration, 0.0 to 8.5 pH based on a 2-point calibration with pH 7 and pH 4 standards, or 5.5 to 14 pH based on a 2-point calibration with pH 7 and pH 10 standards.

General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

Use of hazard information

⚠ DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

⚠	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
🗑	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user. ***Note:*** *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.*

Certification

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual,

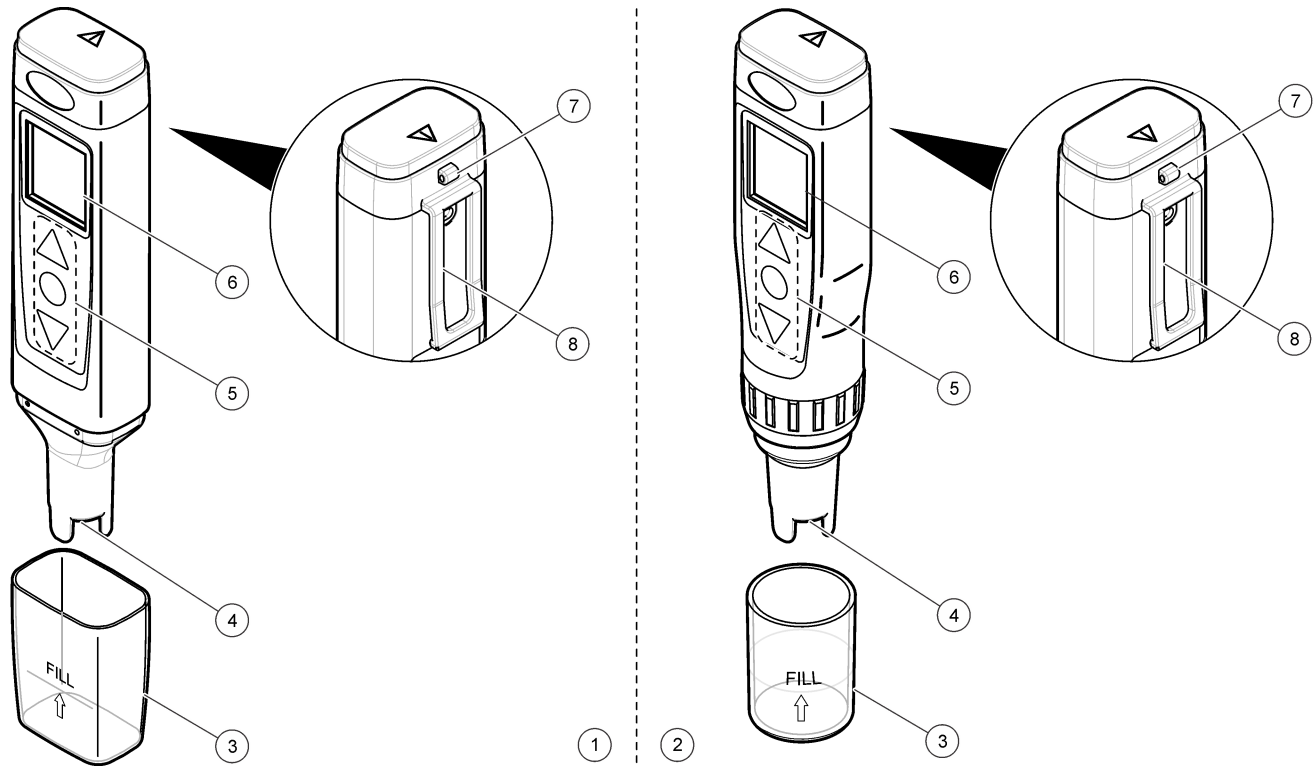
may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Move the equipment away from the device receiving the interference.
2. Reposition the receiving antenna for the device receiving the interference.
3. Try combinations of the above.

Product overview

The Pocket Pro™ pH tester and Pocket Pro™+ pH tester measure the pH of general water samples. Refer to Figure 1. These testers are waterproof and float.

Figure 1 Product features

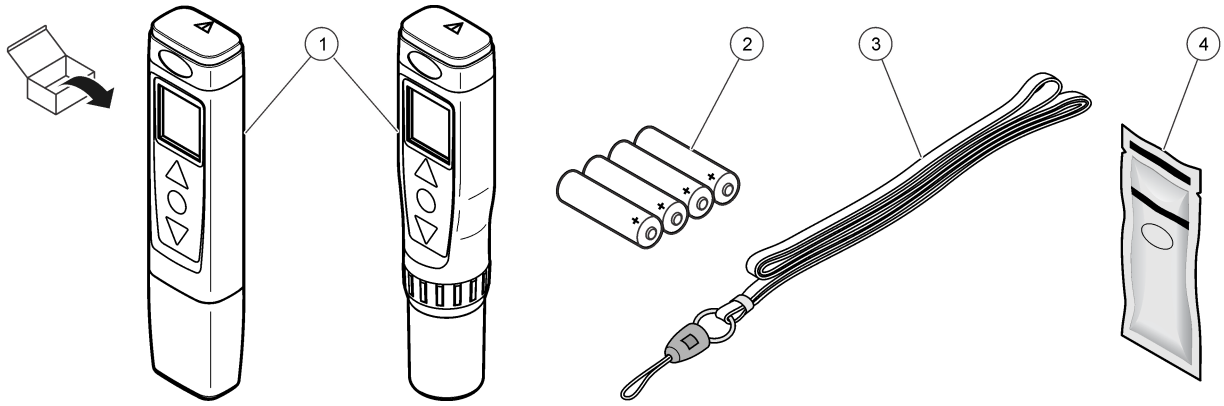


1 Pocket Pro tester	**4** Sensor	**7** Lanyard attachment
2 Pocket Pro+ tester	**5** Keypad	**8** Pocket clip
3 Sensor cap	**6** Display	

Product components

Make sure that all components have been received. Refer to Figure 2. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 2 Product components



1 Pocket Pro tester or Pocket Pro+ tester	**3** Lanyard
2 AAA alkaline batteries (4x)	**4** SINGLET™ (7.00 pH)

Install the batteries

⚠ CAUTION

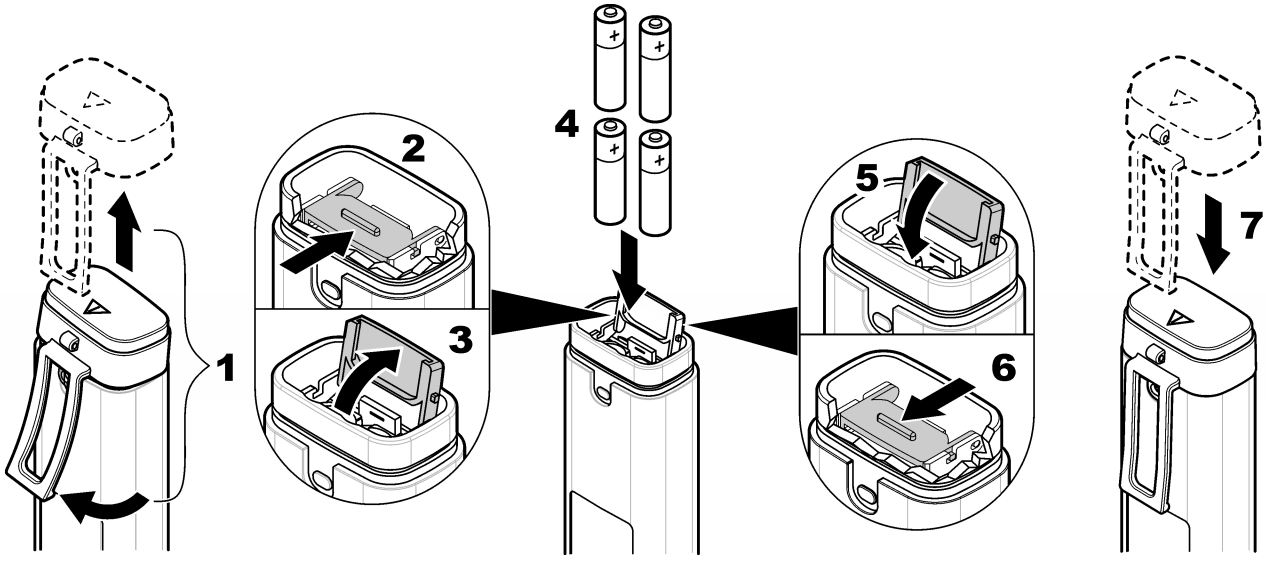
Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

⚠ WARNING

Fire hazard. Battery substitution is not permitted. Use only alkaline batteries.

Install the four AAA alkaline batteries in the tester. Refer to the illustrated steps in Figure 3.

Figure 3 Install the batteries

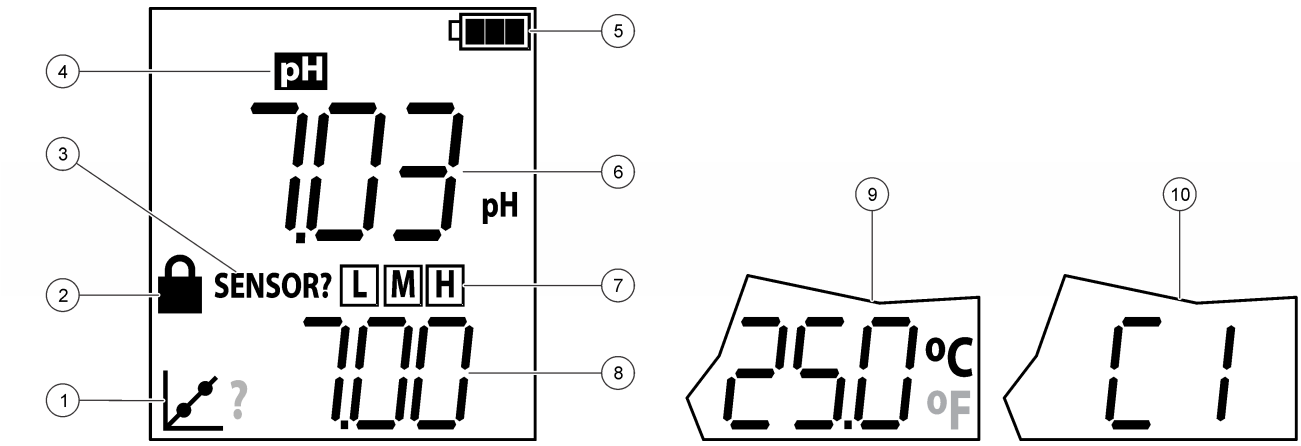


User interface and navigation

Display description

Figure 4 shows the measurements, calibration standard information and indicator icons shown on the display. Table 1 gives descriptions of the icons.

Figure 4 Display overview



1 Calibration icon	**5** Battery icon	**9** Temperature
2 Lock icon	**6** Parameter value	**10** Custom standard (C1, C2)[3]
3 Sensor? icon	**7** Calibration standard(s) measured for last calibration (low, medium, high)[1]	
4 Parameter	**8** Calibration standard(s) expected[2]	

[1] Shows after auto calibration
[2] Shows during auto calibration
[3] Shows during custom calibration.

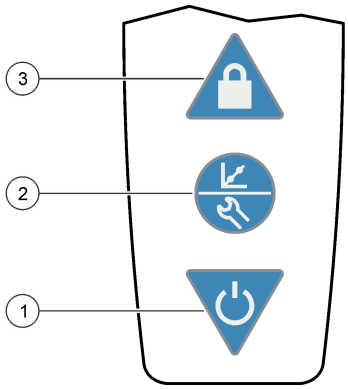
Table 1 Display icons

Icon	Description
	Shows the battery power level. Flashes when the battery power is less than 10%.
	Shows when the lock feature is on. When the lock feature is on, the parameter value on the display does not change. Push to set the lock feature to on or off.
Sensor?	Refer to Troubleshooting on page 10.
	Shows when the tester is in calibration mode or when a calibration is due. If "?" shows next to the calibration icon, the last calibration was not successful. When the ACAL setting is set to Yes (default), "?" shows next to the calibration icon when a calibration is due.

Keypad description

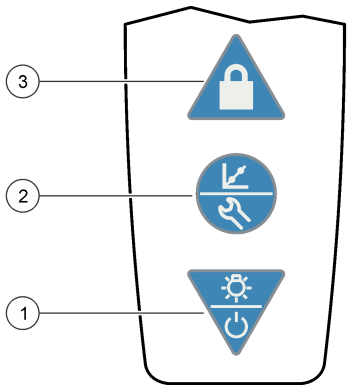
Figure 5 and Figure 6 show the Pocket Pro and Pocket Pro+ keypads. Table 2 gives the key descriptions.

Figure 5 Keypad overview - Pocket Pro



1 Power key	**2** Calibration/Settings key	**3** Lock key

Figure 6 Keypad overview - Pocket Pro+



1 Power/Backlight key	**2** Calibration/Settings key	**3** Lock key

Table 2 Key functions

Key	Description
⏻	Push and hold to set the power to on or off.
☼/⏻	Push and hold to set the power to on or off. Push to set the backlight to on or off. After 1 minute of no activity, the backlight switches off.
✓/🔧	Push to start a calibration. To exit a calibration, push and hold. Push and hold until "SEt" shows on the display to go to the settings menu. To exit the settings menu, push and hold until "End" shows on the display. When in the settings menu, push to scroll through the settings. ***Note:*** *Power cannot be set to off while in settings or calibration mode.*
🔒	Push to set the lock feature to on or off. When the lock feature is on, the lock icon shows and the parameter value on the display does not change.

Calibration

⚠ CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

Calibrate the tester before initial use and when:

- Results drift
- Results are not accurate
- "?" shows next to the calibration icon

Calibrate the tester with the:

- Auto calibration procedure
- Custom calibration procedure*

Before the initial calibration and after a dry storage, soak the sensor for several minutes in the sample or tap water.

Auto calibration

Items to collect: One, two or three auto-recognition calibration standards

1. Set the power to on.
2. Remove the cap from the sensor.
3. Push ✓ to go to calibration mode.
   The auto-recognition standard(s) to measure shows on the bottom line.
   Note: *If "C1" shows on the bottom line, do not continue. Set the tester to auto calibration mode. Refer to* Configure the settings *on page 9.*
4. Rinse the sensor and cap with deionized water and blot dry.
5. Pour the auto-recognition standard shown into the cap to the fill line.
6. Put the sensor fully into the cap.
7. When the measurement is stable, push ✓ to save the measurement.
   The measured value flashes three times.
8. Optional: To measure another calibration standard (maximum of 3), do steps 4–7 again.
9. Push and hold ✓ to go to continuous measurement mode. "END" shows on the display.
   Note: *"ECAL" shows on the display if the calibration was not successful. Refer to* Troubleshooting *on page 10.*
10. Rinse the sensor and cap with deionized water and blot dry.

Custom calibration (Pocket Pro+ only)

Items to collect: One or two calibration standards or samples of known pH value

1. Set the power to on.
2. Remove the cap from the sensor.
3. Go to the settings menu. Make sure that the bUFr setting is set to Cus (custom standard). Refer to Configure the settings on page 9.
4. Push ✓ to go to calibration mode.
   "C1" shows on the bottom line.
5. Rinse the sensor and cap with deionized water and blot dry.
6. Pour the calibration standard or sample into the cap to the fill line.
7. Put the sensor fully into the cap.
8. When the measurement is stable, push ▲ and ▼ until the pH value of the calibration solution or sample shows on the display.
9. Optional: To measure a second pH calibration standard or sample of known value, push ✓, then do steps 5–8 again.

* Custom calibration can only be done on the Pocket Pro+ tester.

10. When the last measurement is stable, push and hold to save the calibration and go to continuous measurement mode. "END" shows on the display.

    Note: *"ECAL" shows on the display if the calibration was not successful. Refer to* Troubleshooting *on page 10.*

11. Rinse the sensor and cap with deionized water and blot dry.

Measurement

Note: *Air bubbles under the probe tip when submerged can cause slow stabilization or error in measurement. Shake the tester from side to side to remove air bubbles.*

1. Set the power to on.
2. Remove the cap from the sensor.
3. If the lock icon shows on the display, push to go to continuous measurement mode.
4. Rinse the sensor and cap with deionized water and blot dry.
5. Pour the water sample into the cap to the fill line.
6. Put the sensor fully into the cap. The measured value shows on the top line.
7. To keep the measured value on the display when the sensor is removed from the sample, push .

   Note: *The lock icon shows on the display when the measurement is stable.*

8. To measure another sample, do steps 3–7.
9. When done with measurements:

   a. Rinse the sensor and cap with deionized water.
   b. Put the cap on the tester.
   c. Set the power to off.

Advanced operation

Configure the settings

1. Push and hold until "SEt" shows on the display.
2. Push to scroll through the settings. The current value of the setting shows on the bottom line.

Option	Description
Unit	Select the temperature unit that shows on the display—Celsius (default) or Fahrenheit.
bUFr	Select the pH buffers that are used for auto calibration—USA (4.01, 7.01, 10.01, default), NIST (4.01, 6.86, 9.18) or Cus (custom standard). ***Note:*** *"Cus" can only be selected on the Pocket Pro+ tester.*
AOFF	Set the auto-off feature to on (default) or off. When set to on, power is automatically set to off after 8 minutes of no activity.
ACAL	Enable or disable pH calibration reminder—Yes (enable, default) or No (disable). When set to Yes, "?" shows next to the calibration icon on the pH screen when a pH calibration is due.
rSEt	Change the settings to the factory defaults—Yes or No (default). When set to Yes, changes the settings to the factory settings and default values.

3. To change the value of the setting, push ▲ or ▼ .
4. When done with changes, push and hold until "End" shows to go to continuous measurement mode.

Maintenance

⚠ CAUTION	
⚠	Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

Clean the sensor

Clean the sensor when:

- "SENSOR?" shows on the display
- Stabilization is slow
- Results drift or are not accurate
- Calibration failure occurs

1. Soak the sensor in the applicable cleaning agent. Refer to Table 3.
2. Rinse or soak the sensor in deionized water for 1 minute.

Table 3 Cleaning agents

Contaminant	Cleaning agent	Time
Grease, oils and fats	Electrode cleaning solution	2 hours maximum
Mineral buildup	10% hydrochloric acid (HCl) solution	5 minutes maximum

Replace the batteries

When the battery icon flashes or the tester will not come on, replace all four batteries. Refer to Install the batteries on page 5.

Replace the sensor

Note: *Only Pocket Pro+ testers have replaceable sensors.*

To replace the sensor, refer to the instructions supplied with the sensor.

Troubleshooting

Message	Possible cause	Solution
SENSOR?	The calibration slope is ±10–15%.	Gently clean the sensor. Refer to Clean the sensor on page 10.
ECAL	Calibration failure. The pH calibration slope is greater than ±15%.	Gently clean the sensor. Refer to Clean the sensor on page 10. Calibrate again. If calibration failure continues, replace the tester or sensor as applicable.
"- - - -" (top line)	The parameter value is not within the measurement range of the tester. Refer to Specifications on page 2.	Make sure that the value of the sample is within the measurement range of the tester. Gently clean the sensor. Refer to Clean the sensor on page 10. Calibrate as necessary.
"- - - -" (bottom line)	The temperature value is not within the operating temperature range of the tester or a temperature sensor failure occurred. Refer to Specifications on page 2 for the operating temperature range.	Make sure that the sample temperature is within the operating temperature range of the tester. Contact technical support as necessary. ***Note:*** *The tester can still be used if a temperature sensor failure has occurred, but without automatic temperature compensation.*
Battery icon flashes	The batteries have less than 10% power remaining.	Replace all four batteries. Refer to Install the batteries on page 5.

Replacement parts and accessories

⚠ WARNING

Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Table 4 Replacement parts

Description	Quantity	Item no.
AAA alkaline batteries	4/pkg	4674300
Lanyard	1	201305
SINGLET, 7.00 pH	20/pkg	2770120
pH sensor, replacement	1	9532001

Table 5 Accessories

Description	Quantity	Item no.
SINGLET, 4.01 pH	20/pkg	2770020
SINGLET, 10.01 pH	20/pkg	2770220
Electrode cleaning solution	500 mL	2965249
Hydrochloric Acid (HCl)	2.5 L	13406
Hydrochloric Acid (HCl)	500 mL	13449

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09/2013, Edition 1

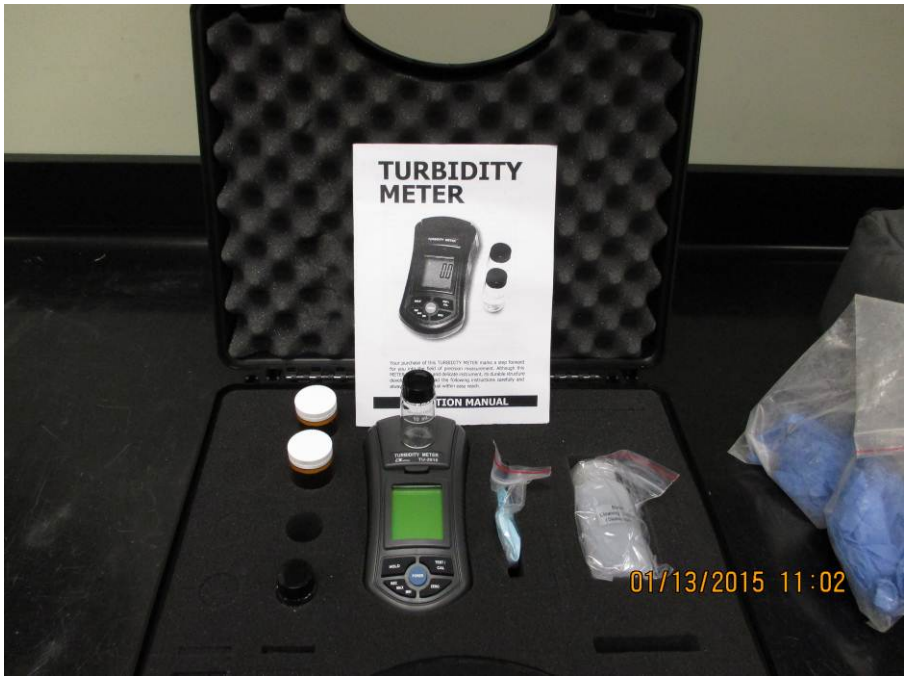
Appendices Item # 9: Field Turbidity Meter:

The Routine Pollution Panel test will provide a certified laboratory analysis of the turbidity parameter (EPA Method No. 180.1). The allowable sample hold time is 48-hr. from the time of sample collection until commencement of the lab analysis. For in-field (direct) measurement of a stormwater or wastewater effluent sample, a turbidity meter (e.g. nephelometer) is available for BWPC staff using a SPER Scientific® TU-2016™ Turbidity Meter. This meter provides turbidity measurements within the range of 0 - 1,000 NTU (Nephelometric Turbidity Units).

For further detail, refer to the attached User Manual documentation, which is available for download on the SPER Scientific® website. The instructions below correspond to using a pre-calibrated nephelometric instrument. The instrument case includes reference calibration standards of 0 and 100 NTU, respectively. The calibration standards should be stored in the protective "dark-filmed" sleeves to prevent photo-degradation of the calibration solutions. Replacement turbidity calibration solutions are available from the manufacturer's website (http://www.sperdirect.com/).

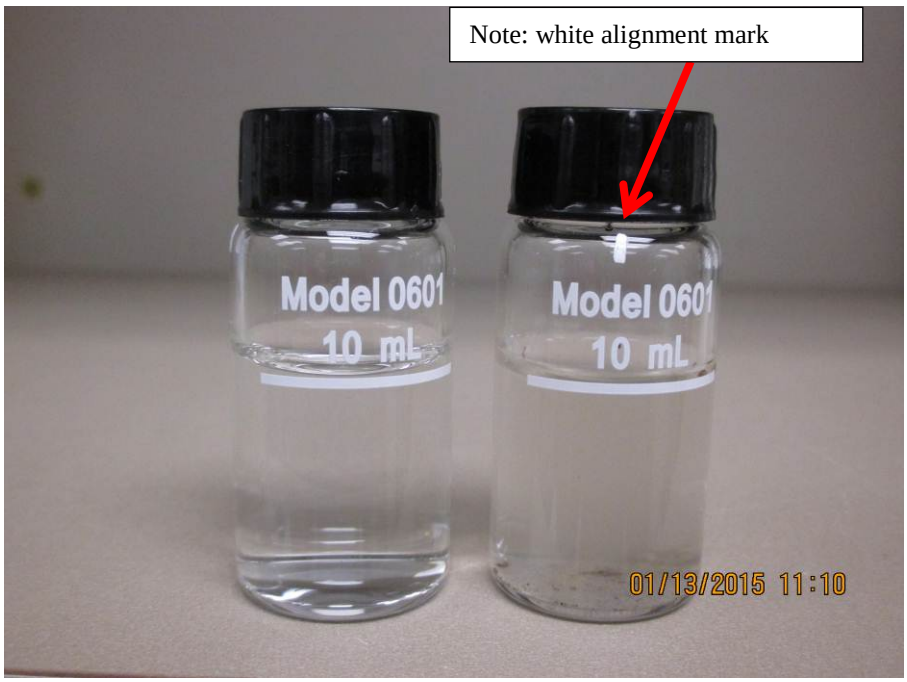
Basic Instructions:

- Fill a clean sample vial with 10 ml of the sample to the meniscus or "fill" line. Lightly shake or tap the side of the vial to dislodge (break) any entrained gas bubbles. Wipe off any fingerprint smudges with the cleaning cloth or lab-grade tissue papers (e.g. Kimwipes™). To prevent smudges, it is recommended that clean nitrile gloves be worn in the field.
- Insert the sample vial into the unit's detection well being careful to align the two white marks. Close the cover lid. "Power" the unit into the on position.
- Press the "Test" button. The display will flash "Test" and provide an NTU measurement in approximately 10 seconds.
- To preserve battery life (6 "AAA" cells) turn the unit off by pressing the "Power" button (the unit automatically powers off after 10 minutes).
- When finished, properly discard the sample, rinse the vial clean with distilled water and wipe the glass dry to prevent water spots. The unit's travel case includes 100 ml (3.4 oz.) of distilled water so check for any TSA travel restrictions if carrying the case onboard an airline. Distilled water and/or deionized water (DI) is available in the BWQP lab or in most grocery stores.
- Refer to the User's Manual for periodic calibration in steps of 0 (1st) and 100 (2nd) NTU, respectively.



1 – Turbidity Meter Supplies

2 – 100 & 0 NTU Calibration Standards



3 – Clear (left) & Turbid (right) Samples

4 – Alignment in Sample Well

5 – Sample Reading of DI H_2O (0 NTU)

6 – Sample Reading of Turbid H_2O (e.g. 235 NTU)

7 – Cleaning Supplies for Glass Vials

8 – Glassware Wipes (Kimwipes™)

0.00 to 50.00 NTU, 50 to 1,000 NTU

TURBIDITY METER

Model : TU-2016

Your purchase of this TURBIDITY METER marks a step forward for you into the field of precision measurement.
Although this CHLORINE METER is a complex and delicate instrument, its durable structure developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

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1. FEATURES

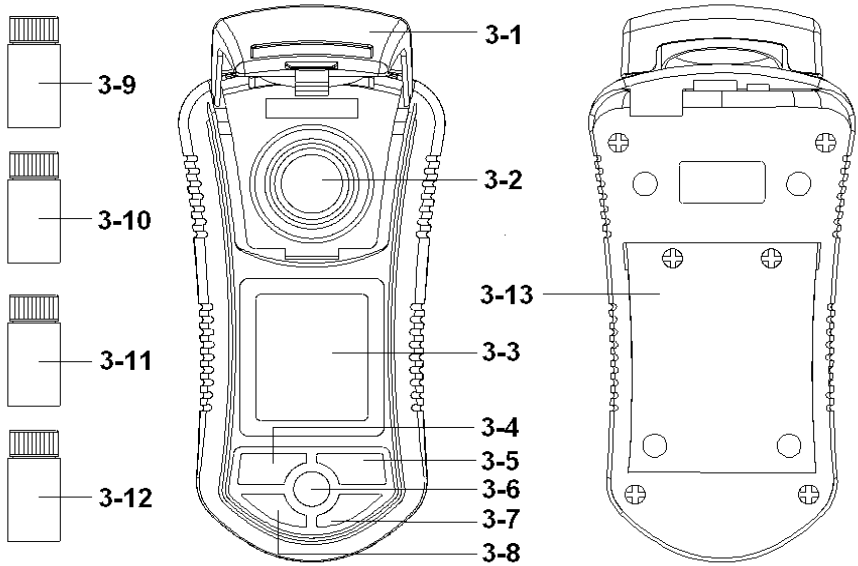
* Designed to meet ISO 7027.
* NTU (Nephelometric TURBIDITY Unit) measuring unit.
* Wide and auto measurement range : 0 to 1,000 NTU.
* High resolution : 0.01 NTU/1 NTU.
* The unique optics structure, enables the instrument to read low value of TURBIDITY to the high level up to 1,000 NTU.
* Four operation buttons and two calibration points, easy operation and giarantee the spec. accuracy.
* Jumbo LCD, easy readout.
* Microprocessor circuit assures maximum possible accuracy, provides special functions and features.
* Battery operated for field and on-site testing convenience.
* Data hold function for freezing the desired value on display.
* Records Maximum and Minimum readings with Recall.
* Heavy duty & compact housing with hard carrying case, designed for easy carry out & operation.
* Auto shut off is available to save battery life.
* Application : Test municipal water, food and beverage water, or other aqueous solution where fluid clarity is important.

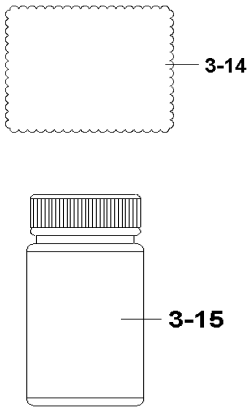
2. SPECIFICATIONS

Circuit	Custom one-chip of microprocessor LSI circuit.
Display	LCD size : 41 mm x 34 mm.
Range	0.00 to 50.00 NTU, 50 to 1,000 NTU ** NTU : Nephelometric Turbidity Unit* ** Auto range*

Accuracy	± 5 % F.S. or ± 0.5 NTU, which ever is greater.	
Light source	LED, 850 nm.	
Detector	Photo diode	
Standard	Meet ISO 7027.	
Response time	Less than 10 seconds.	
Sample volume needed	10 mL.	
Data hold	Freeze the display reading.	
Memory recall	Maximum & Minimum value.	
Display sampling time	Approx. 1 second.	
Power off	Auto shut off saves battery life or manual off by push button.	
Calibration points	0 NTU, 100 NTU.	
Operating temperature and humidity	0 to 50 ℃. Less than 85% R.H.	
Power supply	DC 1.5 V battery (UM4, AAA) x 6 PCs, or equivalent.	
Power current	Stand by	Approx. DC 3.5 mA.
	Testing	Approx. DC 36 mA.
Weight	320 g/0.70 LB. *@ Battery is included.*	
Dimension	155 x 76 x 62 mm (6.1 x 3.0 x 2.4 inch)	
Accessories Included	Instruction manaual 1 PC. Testing bottle with 0 NTU standard, TU-0NTU.....1 PC. Testing bottle with 100 NTU standard, TU-100NTU.....1 PC. Empty testing bottle (Bottle-061)..... 2 PCs Clean cloth..... 1 PC. Clean solution (Distill water)..... 1 bottle Hard carrying case, CA-08..... 1 PC.	
Optional Accessories	Testing bottle with 100 NTU standard solution, TU-100NTU Testing bottle with 0 NTU standard solution, TU-0NTU Empty testing bottle, 0601	

3. FRONT PANEL DESCRIPTION





3-1 Cover of Testing bottle
3-2 Container of Testing bottle
3-3 Display
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3-5 TEST/CAL Button
3-6 Power Button
3-7 ZERO Button
3-8 REC Button (MAX, MIN Button)
3-9 Testing bottle with 0 NTU standard solution
3-10 Testing bottle with 100 NTU standard solution
3-11 Empty testing bottle 1
3-12 Empty testing bottle 2
3-13 Battery Compartment/Cover
3-14 Clean Cloth
3-15 Clean Solution (Distill Water)

4. MEASURING PROCEDURE

4-1 Measurement Consideration

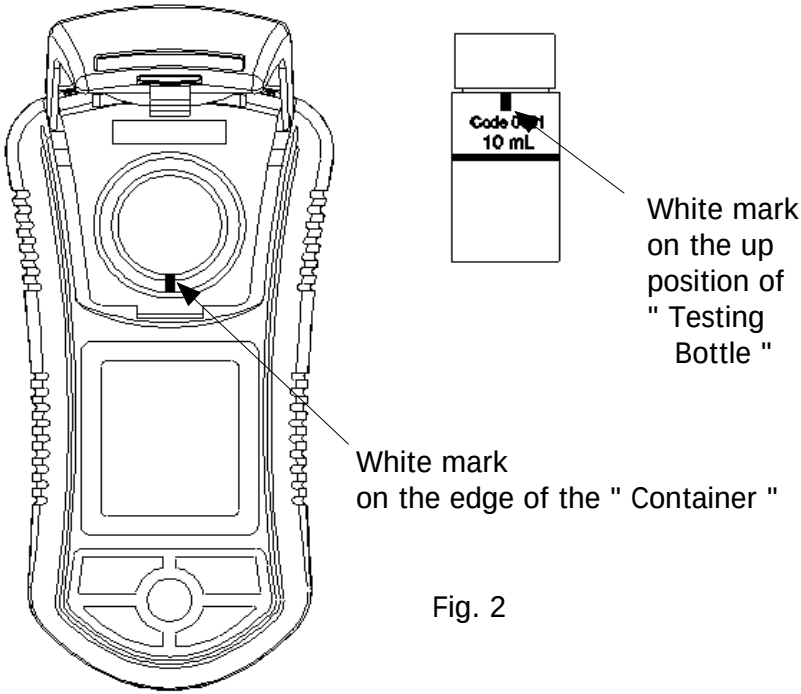


Fig. 2

1) **There is a " White mark " on the edge of the " Container " (3-2, Fig. 1) and also on the up position of " Testing Bottle " (3-9, 3-10, 3-11, 3-12, Fig. 1), refer Fig. 2.**

2) When make the measurement (or calibration), it should keep the " Container white mark " face to face together with the " Testing bottle white mark "

3) Insert the " Testing bottle " to the bottom of " Container " (3-2, Fig. 1) completely.
4) Before the measurement, it should envelop in the " Cover " (3-1, Fig. 1) completely.

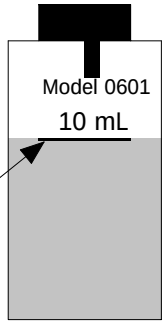
Remark : *Before the measurement, it should keep the outside of Testing Bottle under the dry condition and without existing any dust.*

4-2 Measurement

1) Fill the measurement liquid into the " Testing bottle " (3-11, 3-12, Fig. 1) .

Attention :

It should fill the measurement liquid capacity until its level up to the " level marker " of the " Testing bottle "



2) Insert the " Testing bottle " to the bottom of " Container " (3-2, Fig. 1) completely.
3) Before the measurement, it should envelop in the " Cover " (3-1, Fig. 1) completely.
4) Power ON the meter by pressing the " Power Button " (3-6, Fig. 1) once.
5) Press " TEST Button " (3-5, Fig. 1) once, the display will show the text " tESt " (TEST)", following the " tESt " will flash approx. 10 seconds , then the TURBIDITY value will present on the display along with the " ntu " unit.

Remark :

* *Under power OFF, if press the TEST Button " (3-5, Fig. 1) will power ON and going on to make the test automatically.*
* *After the testing, within ten minutes approx., the meter will auto power OFF automatically.*

Wash (Reinse) the Testing bottle

* *After the testing, it should wash (reinse) the Testing Bottle by the Clean Solution (Distill Water) " (3-17, Fig. 1).*

4-3 Zero

When measure the " 0 NTU " liquid, if the display not show the zero value, it can deduct (offset) those " not zero value " with default, the zero procedures are :

Press the " ZERO Button " (3-7, Fig, 1) continuously until the display show zero value then release the finger from the button

* *Remark :*
  The zero function can be executed within the zero dift value < 2.0 NTU only.

4-4 Data Hold

During the measurement, press the " Hold Button " (3-4, Fig. 1) once will hold the measured value & the LCD will display a " HOLD " symbol.

* Press the " Hold Button " once again will release the data hold function.

4-5 Data Record (Max., Min. reading)

* The data record function records the maximum and minimum readings. Press the " REC Button " (3-8, Fig. 1) once to start the Data Record function and there will be a " REC. " symbol on the display.

* With the " REC. " symbol on the display :
  a) Press the " REC Button " (3-8, Fig. 1) once, the " REC. MAX. " symbol along with the maximum value will appear on the display.
     If intend to delete the maximum value, just press the " Hold Button " (3-4, Fig. 1) once, then the display will show the " REC. " symbol only & execute the memory function continuously.
  b) Press the " REC Button " (3-8, Fig. 1) again, the " REC. MIN. " symbol along with the minimum value will appear on the display.
     If intend to delete the minimum value, just press the " Hold Button " (3-4, Fig. 1) once, then the display will show the " REC. " symbol only & execute the memory function continuously.

5. CALIBRATION PROCEDURE

1) The meter can be calibrated under two kinds standard solution :

   0 NTU standard solution
   100 NTU standard solution

2) The meter ship along with

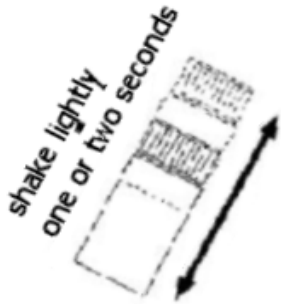
   a. Testing bottle with 0 NTU standard solution x 1 PC
   b. Testing bottle with 100 NTU standard solution x 1 PC

   as the standard accessories.

3) The complete calibration should be executed by following two solution :

   0 NTU standard solution
   100 NTU standard solution

4) **Shaking the calibration bottle lightly**



Before execute the calibration, it should shake lightly (not strongly) the

Standard solution (TU-0NTU, TU-100NTU)

one to two seconds to let the calibration solution under the uniform condition.

Remark :

Do not shake the Standard solution strongly due to it may generate the " Air bubble " and let the solution existing not accurate value.

5) **The buttons that will be used during the Calibration procedures**

Escape button, select button :

Fig. 1, 3-4 Hold Button (Esc Button)

Calibration button, Enter button :

Fig. 1, 3-5 TEST/CAL Button (Enter Button)

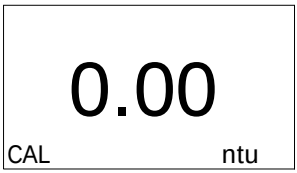
6) **0 NTU calibration**

a. Insert the " 0 NTU standard solution into the " Container " (3-2 , Fig. 1) and envelope in the " Cover " (3-1, Fig. 1) completely, other procedures please refer to above section 4-1, 4-2.

b. Press " CAL Button " (3-5, Fig. 1) continuously (at least 3 seconds) until the Display show the text " CAL " then release the button.

Fig. 5-1

c. After the LCD show above Fig. 5-1, wait a while the display will show

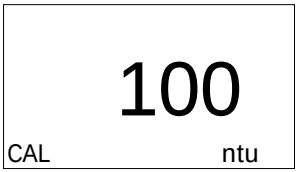


<u>Now the meter is ready for the " 0 NTU " calibration</u>

d. Press " CAL Button " (3-5, Fig. 1) once, the Display will show following text with flashing (approx. 10 seconds).

flashing

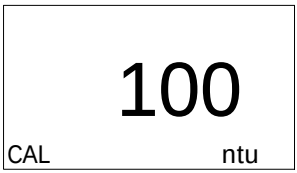
Then the Display will show :



Now the meter is finished the " 0 NTU " calibration procedures and ready for " 100 NTU " calibration procedures.

7) **100 NTU calibration**

When finish the " 0 NTU " calibration procedures and the Display show :



<u>The meter is ready for " 100 NTU " calibration.</u>

* Insert the " 100 NTU standard solution into the " Container " (3-2 , Fig. 1) and envelope in the " Cover " (3-1, Fig. 1) completely.
Press " CAL Button " (3-5, Fig. 1) once, the Display will show following text with flashing (approx. 10 seconds).

flashing

Then the LCD display will return to normal measurement screen, now the meter is finished the calibration procedures (0 NTU, 100 NTU calibration) completely and ready for the measurement.

8) **During the calibration, if exit something wrong (Error, can not be calibrated.....), please check if the " Standard solution " value is wrong, if still can not fix the problem , then execute the execute the " Calibration clear " procedures (Section 6) may can fix the problem.**

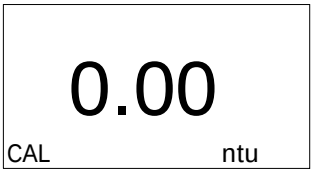
6. CALIBRATION CLEAR

Execute the calibration procedures will clear all the calibration value (Section 5) , the system will return to the Default value.

a. Power On (no matter if the " Testing bottle " insert into the " Container " or not) press the " CAL Button " (3-5, Fig. 1) continuously (at least 3 seconds) until the Display show the text " CAL " then release the button, the display will show :

Fig. 6-1

b. After the LCD show above Fig. 6-1, wait a while the display will show :



Press " Hold Button " (3-4, Fig. 1) once the display will show :

100
CAL ntu

Press " Hold Button " (3-4, Fig. 1) once again the display will show :

CLr
CAL ntu

Now the meter is ready for the " Calibration clear "

Press " CAL Button " (3-5, Fig. 1) once, the Display will show following text with flashing (approx. 10 seconds).

CAL
CLr

flashing

Then the LCD display will return to normal measurement screen, now the meter is finished the calibration clear procedures and clear all the existing calibration data.

7. BATTERY REPLACEMENT

1) When the left corner of LCD display show " ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
2) Loss the " Battery Cover Screws " and slide the " Battery Cover " (3-13, Fig. 1) away from the instrument and remove the battery.
3) Replace with DC 1.5 V battery (UM4, AAA, Alkaline/heavy duty) x 6 PCs, and reinstate the cover.
4) Make sure the battery cover is secured after changing the battery.

Appendices Item # 10: Dissolved Oxygen (D.O.) Meter:

Due to the short (e.g. 2-hr.) holding time restriction for a certified-laboratory dissolved oxygen (D.O.) analysis (e.g. Modified Winkler Method), BWPC staff have available a SPER Scientific® D.O. Meter Kit (No. 850048) for conducting in-field measurements of the D.O. readings in aquatic environments such as a wastewater aeration basin or an effluent storage pond. The D.O. meter is hand-held and features a 10-ft. cable length for placement of the measurement probe in the correct water depth layer. For potentially stratified (i.e. non-mixed) water columns (e.g. outdoor ponds), the uppermost or "photic" layer will generally support the highest oxygen level to provide an odor cap, especially if overlying a high-oxygen demand anaerobic layer (e.g. decaying sludge).

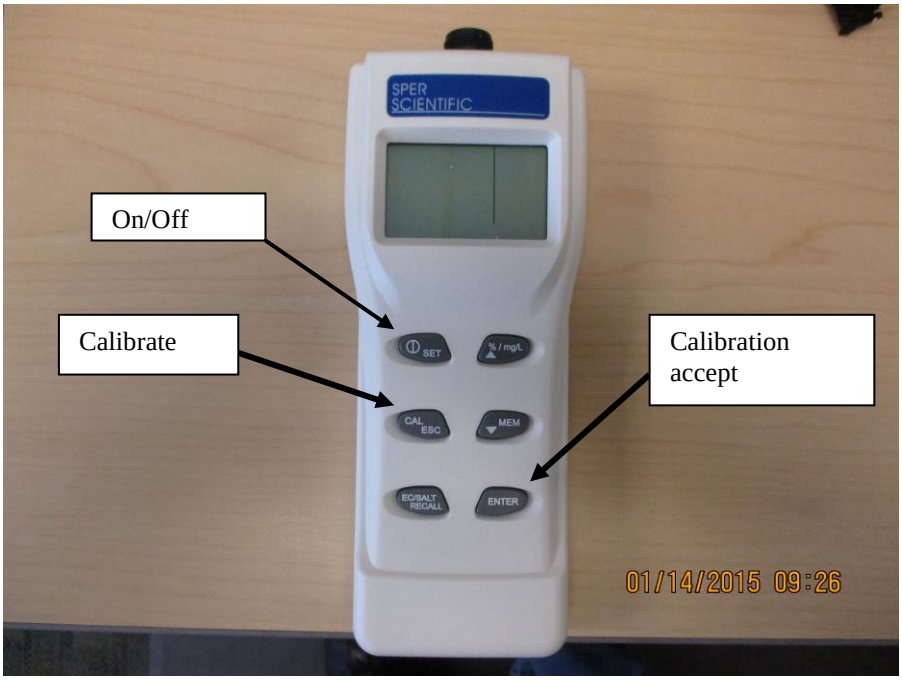
For further details, refer to the attached User's Manual documentation, which is available for download on the SPER Scientific® website. For proper field readings, the D.O. meter must be temperature-acclimated and air-calibrated at each measurement site. A clean source of rinse water (e.g. deionized or DI H_2O) should be on-hand to rinse the electrode tip clean before each calibration and again after each usage to prevent sedimentation buildup and fouling of the membrane surface. Always store the electrode with the protective cap in-place during transport to prevent desiccation. Refer to the manufacturer's instructions for replacing the membrane set and electrolyte solution when the membrane can no longer be cleaned; it becomes damaged or otherwise, a valid calibration cycle cannot be performed. The instrument case includes two spare electrolyte solution bottles and membrane sets for this purpose. The manufacturer's website is: (http://www.sperdirect.com/).

Basic Instructions:

- Air-calibration of the meter is recommended at each measurement site.
- Remove the meter from the case allowing it to acclimate to the ambient temperature.
- Attach the D.O. probe to the meter and remove the protective cap.
- Rinse the membrane tip with DI water and either gently shake or blot dry.
- Turn on the unit. Hold the probe tip steadily in the air allowing the LCD reading to stabilize (may take 1-3 minutes).
- Press the "CAL/ESC" button for two seconds to begin a calibration cycle ("CAL" icon will flash).
- At 100% air saturation, complete the calibration cycle by pressing "Enter".
- The user can toggle between the % saturation and mg/l key to change the unit readout between % saturation and mg/l.

- To read D.O., ensure that the electrode is completely immersed in the sample solution. Readings may be taken in the water body or in a clean measurement beaker. For beaker measurements, it is recommended that the D.O. reading be taken as soon as possible after the sample has been transferred to prevent degassing or reaeration.
- In ponds, the uppermost surface layer (e.g. 16 to 24 in. below the waterline) is generally the most aerobic layer except immediately after a spring or autumn turnover event when higher oxygen-demand sludge or detritus has risen to the surface.
- When your readings are completed, turn off the unit, unscrew the probe from the meter and rinse the membrane tip with clean (e.g. DI) water. Attach the protective cap onto the probe tip to prevent desiccation of the membrane and electrolyte solution.
- Refer to the manufacturer's instructions for replacement of a membrane set and electrolyte solution when a valid calibration cycle is no longer achieved.
- Replacement electrolyte solution, a membrane set or a D.O. probe is available from the manufacturer: (http://www.sperdirect.com/).
- The unit is powered by (4) "AAA" alkaline batteries. Replace batteries upon seeing a low battery level on the digital display.
- For airline transport of the D.O. meter, distilled water in 1-gallon containers can be purchased in most grocery stores for cleaning the membrane.

1 – D.O. Meter Kit



2 – Control Panel

3 – DI H_2O Rinse Bottle

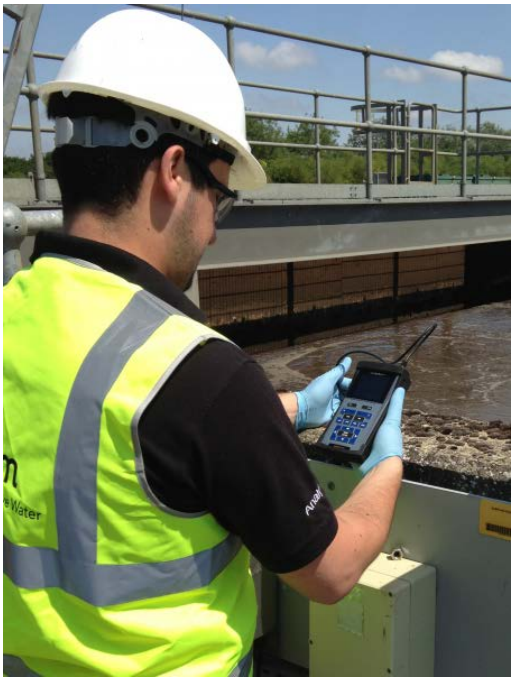
4 – Membrane Maintenance (before & after usage)

5 – Pre-Calibration (waiting for stable value)

6 – Begin Calibration

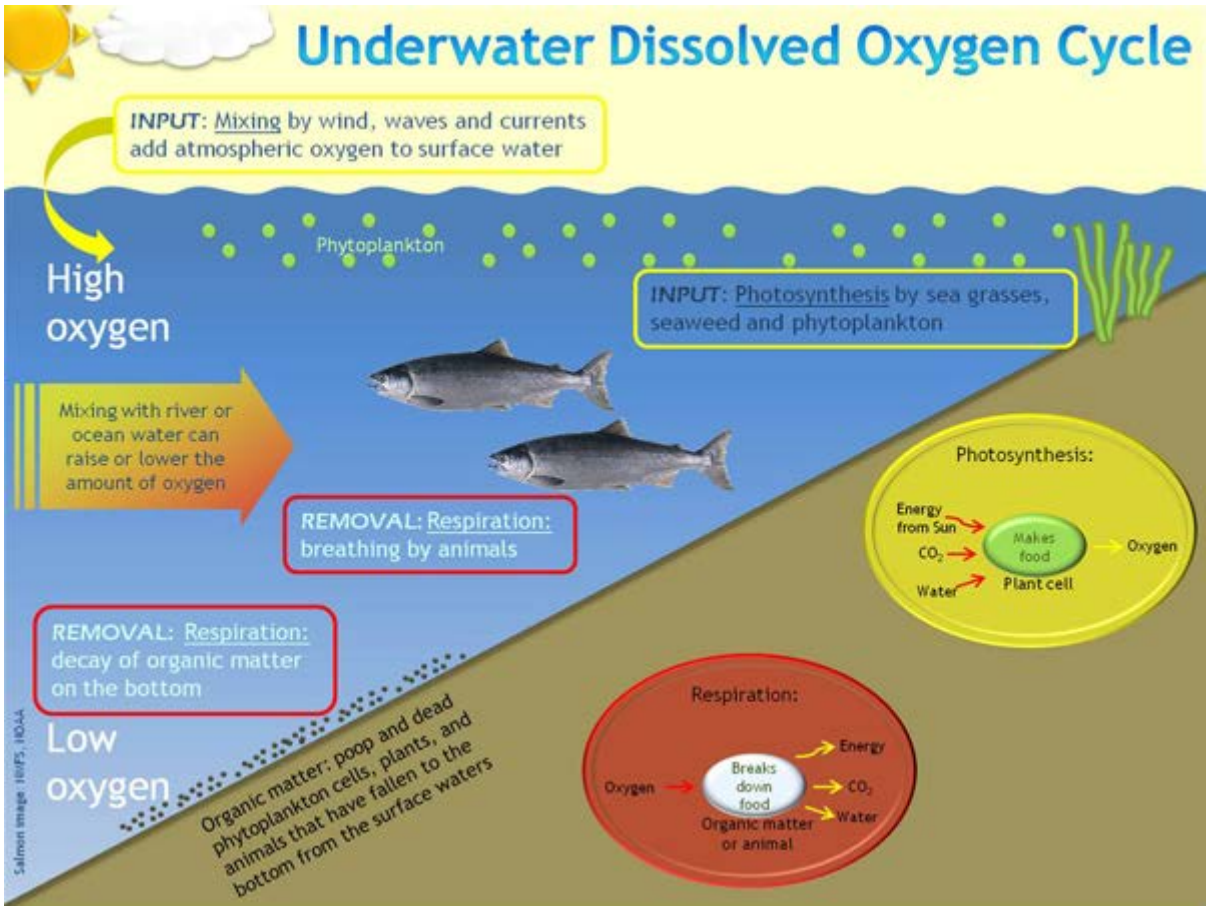
7 – Accept Calibration (100% saturation)

8 – 1st Option – Measure D.O. in a Sample Beaker

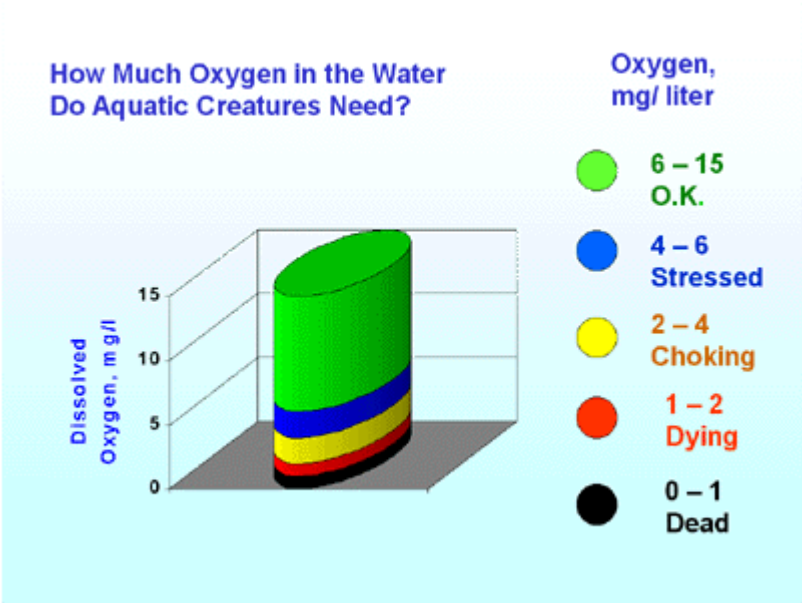


9 – 2nd Option – Measure D.O. in an Aeration Basin
(Note proper PPE – hard hat, vest, gloves & safety glasses)

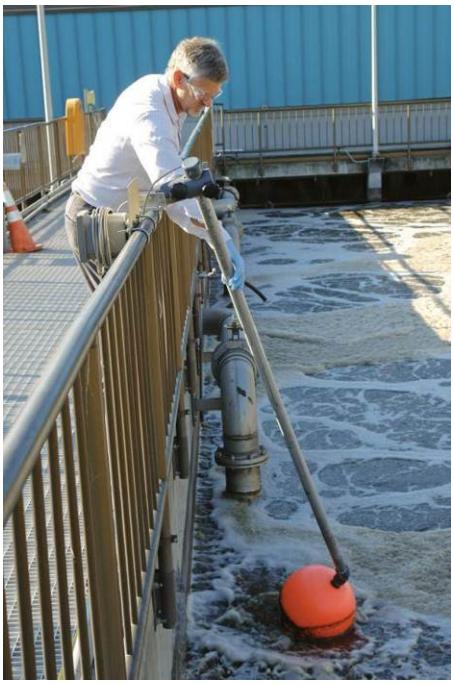
10 – 3rd Option – Measure D.O. in a Pond



11 – Reference Aquatic D.O. Cycle



12 – D.O. Level Recommendations in mg/l
(e.g., 1-2 mg/l in aeration basins vs. ≥ 6 mg/l for fish ponds)



13 – Example of a "Fixed" Reference D.O. Sensor

14 – Lab Reference Winkler Method

DO Meter Kit

850048

Instruction Manual

SPER
SCIENTIFIC

Environmental Measurement Instruments

DO Meter Kit 850048

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FIRST TIME USE

This instrument requires calibration prior to operating. After attaching the probe for the first time, please allow the probe to warm up for 30 minutes before beginning calibration. Please see calibration instructions on page 9.

When using the meter, press the buttons firmly for one full second to ensure proper operation.

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INTRODUCTION

This meter reads dissolved oxygen (DO) for measuring water quality in labs, industrial and municipal waste water, aquariums, fish hatcheries and environmental testing.

Features include automatic temperature compensation (ATC) and manual altitude and salinity compensation. The meter also provides readings in either °C or °F, multiple calibration points (for optional pH and conductivity probes), 99 memory points, a large backlit LCD screen, a low battery icon and one-hour automatic shut off. A Set Up Mode allows you to customize the meter's defaults and parameters.

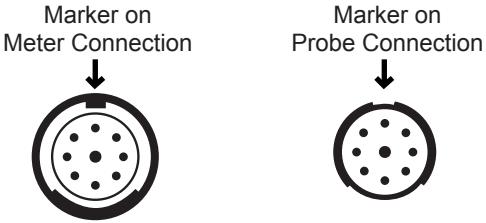
The meter comes complete with DO probe, replacement electrolyte fluid, 2 replacement membrane sets, carrying case, batteries, and instruction manual.

Optional Accessories:

- Replacement DO Probe - 850048DO
  (includes 2 probe heads & electrolyte)
- Conductivity/Salinity Probe - 850048C/S
- pH Probe - 850048PH

ATTACHING AND DETACHING THE PROBE

*Always turn the power **OFF** before attaching and detaching the probe, and use caution. Please use alignment quide markings on probe and meter for proper connection (see image below).*



To attach the probe to the meter:

1. Plug the probe into the connector port on top of the meter.
2. Screw down the attached probe guard until it is moderately tight.

To detach the probe from the meter:

1. Unscrew the probe guard (the piece that is directly on top of the meter that connects the probe to the meter).
2. Holding the plug, pull the probe away from the meter. **DO NOT** hold the cable and pull the probe and meter apart as this may damage the probe connection.

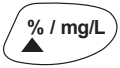
FRONT PANEL DESCRIPTION

POWER/SET - Press to turn the meter on and off. In Normal Mode, press for >2 seconds to enter Function (Set) Mode.

CAL/ESC - Press to switch between Normal and Calibration Modes. Press to return to Normal Mode from Function or Recall Modes.

EC/SALT - If using with the optional conductivity probe, press to switch between CON (µs) or Salt (ppt) units.

RECALL - Press for >2 seconds to read the memory value.



% / mg/L - Press to switch between DO in % and mg/l.

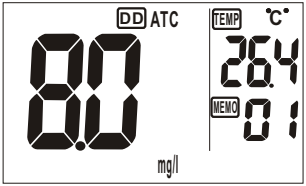
▲- Press to increase the displayed value in Function or Calibration Modes.

MEM - Press to save the current reading.

▼- Press to decrease the displayed value in Function or Calibration Modes.

ENTER - Press to confirm the calibration or parameter setting.

LCD DISPLAY DESCRIPTION



- The DO value is displayed on the left side of the LCD.
- The temperature value is displayed on the upper right side of the LCD.
- The total number of records saved is displayed on the lower right side of the LCD.

DO PROBE *(please inspect upon receiving)*

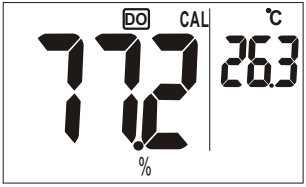
Clean the electrode (see pg. 19) if there is too much white residue attached to it. It is normal to see the cloudy/milky electrolyte and there is no need to replace it for this reason. The best condition of the electrode is a clean surface. However, some white residue attached on electrode is also fine.

DISSOLVED OXYGEN % SATURATION CALIBRATION

After attaching the probe, please allow the probe to warm up for 30 minutes before beginning calibration.

Calibrate the meter before each use.

1. Remove the protective cap from the DO probe.
2. Press the power button to turn the meter **ON**.
   See p.16 to adjust salt & altitiude value if necessary.
3. Hold the probe in a well ventilated area for several minutes (it may take 5-10 minutes) until the LCD reading has stabilized. This is particularly important if you have just refilled the electrolyte solution or replaced either the batteries or the membrane set.
4. Press **CAL/ESC** for 2 seconds to calibrate for 100% saturation. The CAL icon will flash on the LCD.



5. Press **ENTER** to finish the calibration.
6. If “ERR” appears during calibration, there is an error due to low electrolytes or a defective probe.

Note…
To exit Calibration Mode without saving the new value, press **CAL/ESC**. The meter will retain the previously saved calibration data for the current range.

MEASUREMENT PROCEDURES

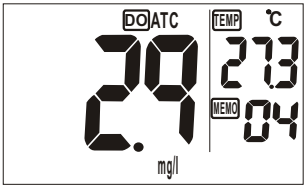
1. Remove the protective cap from the DO probe.
2. Insert the DO probe into the meter.
3. Press the power button to turn the meter **ON**.
4. Hold the probe in the air until the LCD reading has stabilized. This may take several minutes.
5. The DO reading will be displayed on the LCD. You may change the display from % to mg/L as desired by pressing **% / mg/L**.
6. Place the probe into the sample solution, making sure that the electrode is completely immersed in the sample.
7. Stir the probe gently to create a homogenous sample.
8. Wait until the reading has stabilized.

Storing DO Readings in Memory

1. To store the reading in memory, the value must be displayed in mg/l. Press **% / mg/L** if needed to change from % to mg/L.
2. Press the **MEM** button to save the value.
3. The memory number will be displayed on the LCD. If the memory is full, “FUL” will be displayed. See Memory Clear Function on p.12.

Recall Readings

1. Press and hold **RECALL** for 2 seconds to enter Recall Mode.
2. Press ▲ or ▼ to scroll through the data in memory.
3. Press **CAL/ESC** for 2 seconds to return to Normal Mode.



FUNCTION SETTINGS

Entering Function Mode

1. Press and hold **SET** for >2 seconds to enter Function Mode.
2. Press ▲ or ▼ to scroll through the programmable functions. The meter will display functions for the probe currently in use. The left side of the LCD shows the |function name and the right side shows the function number.
3. Press **CAL/ESC** to exit Function Mode.

The table below shows the programmable functions of the DO probe as well as the optional pH and Conductivity probes.

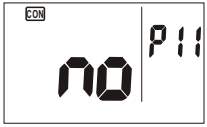
Parameter	**DO**	**COND**	**PH**
P 10 Memory Clear-Clr adjustable	x	x	x
P 20 PH Electrode Slope Review			x
P 30 Cond. Calibration Review		x	
P 40 Cond. Cell Constant Review		x	
P 60 DO Review & Set parameters adj.	x		
P 70 Temperature unit setting adjustable	x	x	x
P 90 Reset to Default Setting adjustable	x	x	x

Memory Clear Function (P10)

Note…
This function will clear all 99 records in the memory. Once cleared, the data cannot be recovered.

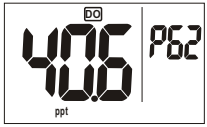
Clearing the memory will delete the records for the current probe type only. For example, if you are using the optional conductivity probe and you clear the memory with that probe inserted, you will not affect any records stored with the DO probe.

1. Enter Function Mode. “Clr P10” will be displayed on the LCD screen.
2. Press **ENTER**. The default “no” icon will flash and “P11” will be displayed.
3. Press ▲or ▼ to change the status from “no” to “yes”.
4. Press **ENTER** to confirm. The memory records will be cleared and “Clr P1” will display. To exit without clearing the memory, press **CAL/ESC**.
5. Press ▲or ▼ to continue to the next function or press **CAL/ESC** to exit Function Mode.



DO Review and Set Parameters Function (P60)

1. Enter Function Mode. Press ▲or ▼ until “COE P60” is displayed.
2. Press **ENTER** to view the previous DO calibration temperature information. “P61” will be displayed.
3. Press **ENTER** again. The salinity compensation value will flash and “P62” will be displayed.



Note…
To exit at any point without making any changes, press **CAL/ESC**.

4. Press or hold down ▲or ▼ to adjust the salinity compensation value. The salinity value can be adjusted from 0.0 to 42.0 ppt.
5. Press **ENTER** to confirm.
6. The compensation value for height above sea level will flash and “P63” will be displayed. Press or hold down ▲or ▼ to adjust the value. The height level can be adjusted from 0 to 3500 m in 100 m increments.

7. Press ENTER to confirm.
8. Press ▲or ▼ to continue to the next function or press CAL/ESC to exit Function Mode.

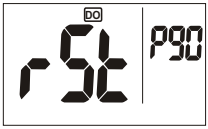
Select Temperature Units Function (P70)

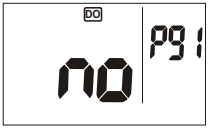
Temperature data can be displayed in either °C or °F.

1. Enter Function Mode. Press ▲or ▼ until “unt P70” is displayed.
2. Press **ENTER**. “C” or “F” will flash and “P71” will be displayed.
3. Press ▲or ▼ to change the temperature units.
4. Press **ENTER** to confirm.
5. Press ▲or ▼ to continue to the next function or press **CAL/ESC** to exit Function Mode.

Restore Default Settings (P90)

1. Enter Function Mode. Press ▲or ▼ until “rSt P90” is displayed.
2. Press **ENTER**. “No” will flash and “P91” will be displayed.





3. Press ▲or ▼ to change the status from “no” to “yes”.
4. Press **ENTER** to confirm. The meter will revert to the factory default settings. To exit without restoring the default settings, press **CAL/ESC**.
5. Press ▲or ▼ to continue to the next function or press **CAL/ESC** to exit Function Mode.

pH Electrode Slope (View Only) Function (P20)

For use with optional pH probe.

To view the pH electrode data (slope value):

1. Enter Function Mode. Press ▲or ▼ until “ELE P20” is displayed.
2. Press **ENTER** to view P22. The slope value will be displayed.

Note...

The meter allows a maximum of 3 pH calibration points, so you can review 2 slope values. If the displayed value is <75% or >115%, we recommend that you change the electrode immediately.

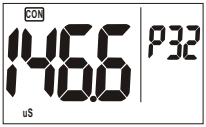
3. Press **CAL/ESC** to return to the “ELE P20” display.
4. Press ▲or ▼to continue to the next function or press **CAL/ESC** to exit Function Mode.

Conductivity Calibration (View Only) Function (P30)
For use with optional conductivity probe.

This function allows you to view previously stored conductivity calibration values.

1. Enter Function Mode. Press ▲or ▼ until “CAL P30” is displayed.

2. Press **ENTER** to view the calibration information for Range 1. “P32” will be displayed.

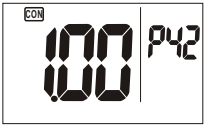


3. Press **ENTER** to continue scrolling through the calibration information for Range 2 (P33), Range 3 (P34) and Range 4 (P35).
4. Press **ENTER** to return to the “CAL P30” display.
5. Press ▲or ▼to continue to the next function or press **CAL/ESC** to exit Function Mode.

Conductivity Cell Constant (View Only) Function (P40)
For use with optional conductivity probe.

1. Function Mode. Press the ▲or ▼ buttons until "CEL P40" is displayed.

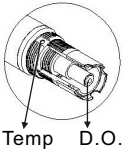
2. Press **ENTER** to view the cell constant information screen. "P42" will be displayed.



3. Press **ENTER** to continue scrolling through the cell constant information for P43, P44 and P45.
4. Press **ENTER** to return to the "CEL P40" display.
5. Press ▲or ▼to continue to the next function or press **CAL/ESC** to exit Function Mode.

Parameters	Default Setting Value
P 10 Memory Clear-CLr adjustable	No
P 20 pH Electrode Slope Review	100%
P 30 Cond. Calibration Review	146.6 μS, 1413 μS, 12.88 mS, 51.5 mS
P 40 Cond. Cell Constant Review	1.00
P 60 DO Review and Set parameters adjustable	25°C, 0 ppm, 0 Meter
P 70 Temperature unit setting adj.	Degree °C
P 90 Reset to Default setting adj.	No

DO Probe Maintenance



- Protect the probe in the storage cap when it is not in use.
- Make sure the electrode is clean. Rinse it carefully in deionized water before using.
- Please store at 0 ~ 50°C after each use.

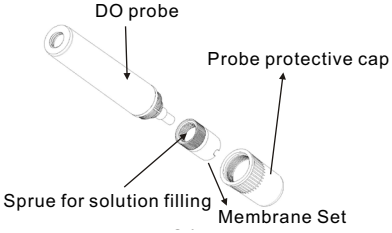
Cleaning the Electrode

Disassemble the electrolyte from probe and use soft/long fiber cloth to clean the electrode surface where the white residue is attached. After cleaning the electrode, assemble the membrane kit properly.

Refilling the Membrane Set & Electrolyte Solution

Replace the membrane set when the membrane is dirty or damaged or when calibration cannot be performed.

1. Remove the protective cap from the DO probe.
2. Unscrew the old membrane set from the probe.
3. Hold the new membrane set vertically on a flat surface and add the fresh fluid.
4. Install the new membrane set by screwing it onto the probe.
5. Replace the protective cap on the probe and tighten it until it is secure.



Refill the electrolyte solution when:

- The solution has evaporated.
- You are changing the membrane set.
- There are bubbles in the probe.
- The meter appears to be less sensitive.
- An error message indicates that measurements are inaccurate.

BATTERY INSTALLATION AND REPLACEMENT

The battery compartment is located on the back of the meter. When you are using the meter for the first time or when the low battery icon appears, install/replace all 4 batteries with new AAA heavy-duty alkaline batteries. Be sure to match the polarity (-/+) when you insert the batteries.

TROUBLESHOOTING

Meter is on, but there is no display

Check and/or replace the batteries. Be sure there is good contact and that the polarity is correct.

Meter is not reading correctly or reading is unstable

1. Clear and re-calibrate the probe.
2. Make sure that the sample solution covers the entire sensor.
3. Replace the probe if it is damaged.

Meter is slow to respond

1. Rinse the electrode in tap water for 10-15 minutes.
2. Replace elctrolyte and probe head.

ERROR CODES

ERROR CODE	CAUSE	ACTION
E02	The value is under the lower limit.	The concentration of the testing solution is out of range or the probe may need replacement.
E03	The value is over the upper limit.	The concentration of the testing solution is out of range or the probe may need replacement.
E04	There is a mistake in the original data.	Check the mV or temperature reading.
E13	There is a mistake in the pH calibration (pH probe only)	Recalibrate or replace the probe.
E16	The cell constant is out of range (COND probe only).	Recalibrate or replace the probe.
E31	Measuring circuit failure.	Contact Sper Scientific, Ltd
E32	Memory IC failure/ reading failure.	Contact Sper Scientific, Ltd.

SPECIFICATIONS

Parameter	Range	Accuracy	Resolution
pH	2.00 ~ 12.00	± 0.1	0.01
Conductivity	0 ~ 199.9 0 ~ 1999 µS/cm 0 ~ 19.99 0 ~ 69.99 mS/cm	± -1% F.S. ± 1 digit	0.1 µS/cm 1 µS/cm 0.01 mS/cm 0.1 mS/cm
Salinity	0 ~ 10 ppt 0 ~ 42 ppt (sea water)	± 1% F.S. ± 1 digit	0.01 ppt 0.1 ppt
DO	0 ~ 199.9% (0 ~ 30 mg/L)	± 3% F.S. ± 1 digit	0.1
Temp	0 ~ 60.0°C	± 0.5°C	0.1

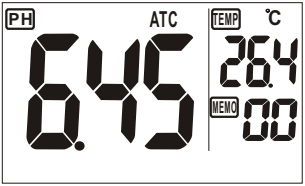
Operating Temp & RH%	0 ~ 50°C Humidity <80%
Storage Temp & RH %	-20 ~ 60°C Humidity <90%
Dimensions (mm)	169 (L) x 78.3 (W) x 43.4 (H)
Weight	200 g
Power	4 AAA Batteries

Appendix A

850048PH

pH Probe

LCD DISPLAY DESCRIPTION



- The pH value is displayed on the left side of the LCD.
- The temperature value is displayed on the upper right side of the LCD.
- The total number of records saved is displayed on the lower right side of the LCD.

pH PROBE CALIBRATION

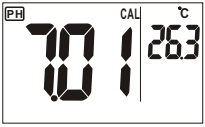
The probe should be calibrated before first use.

Note…

Do NOT wipe the pH probe dry. Wiping the probe may cause static and instability in calibration and measurement.

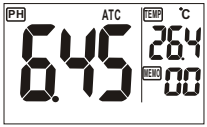
1. Remove the electrode soaker cap from the pH probe.
2. Rinse the electrode in de-ionized or distilled water. If the probe is dehydrated, soak it for 30 minutes in a KCl solution.
3. Insert the pH probe into the meter.
4. Press the power button to turn the meter **ON**.

5. Pour the pH buffer into a clean container and place the electrode into the buffer. We recommend starting with a middle range buffer such as pH 7.01. Make sure the pH electrode is completely immersed in the buffer.
6. Press and hold **CAL/ESC** for 2 seconds to enter Calibration Mode.
7. When the probe automatically recognizes the pH buffer, “CAL” and “7.01” will flash.
8. If the displayed value is different from the standard buffer that you are using, press ▲ or ▼ to adjust the value.
9. Press **ENTER** to save the calibration value. “SA” will be displayed to indicate that the calibration has been saved. If you do not press **ENTER**, the meter will save the value automatically after 30 seconds.
10. Repeat the steps to calibrate the meter using 4.01 & 10.01 buffers.



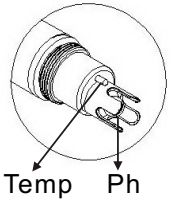
pH MEASUREMENT

1. Remove the electrode soaker cap from the pH probe.
2. Rinse the electrode in de-ionized or distilled water. If the probe is dehydrated, soak it for 30 minutes in a KCl Solution.
3. Insert the pH probe into the meter.
4. Press the power button to turn the meter **ON**.
5. Place the electrode into the sample solution, making sure that the electrode is completely immersed in the sample.
6. Stir the probe gently to create a homogenous sample and shorten the stabilizing time.
7. Wait until the reading has stabilized. The pH value will be displayed on the left side of the LCD.



pH PROBE MAINTENANCE

- Do NOT touch, wipe or rub the glass bulb.
- The pH glass bulb must always be kept moist. Place it in the protective storage cap whenever it is not in use.

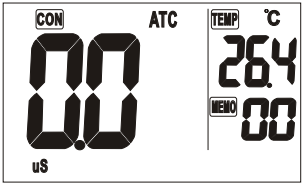


Appendix B

850048CS

Conductivity/Salinity Probe

LCD DISPLAY DESCRIPTION



- The conductivity value is displayed on the left side of the LCD.
- The temperature value is displayed on the upper right side of the LCD.
- The total number of records saved is displayed on the lower right side of the LCD.

CONDUCTIVITY PROBE CALIBRATION

The probe should be calibrated before first use.

- Always use a fresh calibration solution because contaminants in the solution will affect accuracy.
- Calibrate at 2/3 full range under most conditions. For example, if the measuring range is 0~1999 mS, use 1413 μS solution to calibrate.
- You will only need to do single-point calibration.

Calibration Procedure

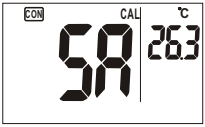
1. Remove the protective cap from the conductivity probe.
2. Rinse the probe by inserting it into de-mineralized or distilled water for 30 minutes.

3. Insert the conductivity probe into the meter.
4. Press the power button to turn the meter **ON**.
5. Select a standard buffer close to your measuring range or refer to the table below.

	Cond. Measuring Range	Suggested Buffer Range
1	0 ~ 199.9 µS	60.0 ~ 170.0 µS
2	0 ~ 1999 µS	600 ~ 1700 µS
3	0 ~ 19.99 mS	6.00 ~ 17.00 mS
4	0 ~ 199.9 mS	60.0 ~ 170.0 mS

6. Pour the solution into a clean container and place the probe in the solution. The sensing area of the probe should be completely immersed in the liquid.
7. Gently tap the probe on the bottom of the container to remove any air bubbles from the sensing area.
8. Press and hold **CAL/ESC** for 2 seconds to enter Calibration Mode. The probe will detect the conductivity solution value and the number will flash on the LCD.
9. If the displayed value is different from the standard buffer that you are using, press ▲ or ▼ to adjust the value on the LCD to match the standard calibration value.

10. Press ENTER when the conductivity solution value is correct. “SA” will be displayed to indicate that the value has been saved. The meter will return to Normal Mode.



11. Repeat the steps if needed to calibrate for other ranges.
12. If the probe has degraded over time or through use, “E16” will display after calibration. Please replace the probe immediately.

Note…
To exit Calibration Mode without saving the new value, press CAL/ESC. The meter will retain the previously saved calibration data for the current range.

Recalibration Guidelines

The meter should be periodically recalibrated to maintain accuracy. Each recalibration will replace the previously saved data for that range.

- Recalibrate the meter at least once a week if the conductivity of the solutions being tested is <100 µS.
- Recalibrate the meter at least once a month if the meter is being used to test solutions in the midranges.
- Recalibrate the meter at least once a week if measurement is taking place at extreme temperatures.

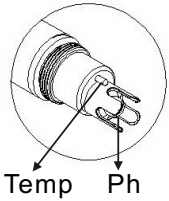
CONDUCTIVITY MEASUREMENT

1. Remove the protective cap from the conductivity probe.
2. Rinse the probe by inserting it into de-mineralized or distilled water for 30 minutes to remove any impurities.
3. Insert the probe into the meter.
4. Press the power button to turn the meter **ON**.
5. Place the probe into the sample solution, making sure that the electrode is completely immersed in the sample.
6. Gently stir the probe to make sure that there are no air bubbles trapped in the slot.
7. Wait until the reading has stabilized.

SALINITY MEASUREMENT

1. Remove the protective cap from the conductivity probe.
2. Rinse the probe in de-ionized or distilled water for 30 minutes to remove any impurities.
3. Insert the probe into the meter.
4. Press the power button to turn the meter **ON**.
5. Press **EC/SALT**.
6. Place the probe into the sample solution, making sure that the electrode is completely immersed in the sample.
7. Gently stir the probe to make sure that there are no air bubbles trapped in the slot.
8. Wait until the reading has stabilized.

CONDUCTIVITY PROBE MAINTENANCE



- Do NOT rub or wipe the surface of the electrode. This might change the original constants and affect the testing range.
- Protect the probe in the storage cap whenever it is not in use. The probe should be dry for storage.
- If the surface of the electrode is contaminated, place the probe in a solution of either detergent or acid for 15 minutes. Rinse the probe with distilled water.

WARRANTY

Sper Scientific warrants this product against defects in materials and workmanship for a period of **five (5) years** from the date of purchase, and agrees to repair or replace any defective unit without charge. If your model has since been discontinued, an equivalent Sper Scientific product will be substituted if available. This warranty does not cover probes, batteries, battery leakage, or damage resulting from accident, tampering, misuse, or abuse of the product. Opening the meter to expose its electronics will break the waterproof seal and void the warranty. To obtain warranty service, ship the unit postage prepaid to:

SPER SCIENTIFIC LTD.
8281 E. Evans Rd., Suite #103
Scottsdale, AZ 85260
(480) 948-4448

The defective unit must be accompanied by a description of the problem and your return address. Register your product online at www.sperscientific.com, or return your warranty card within 10 days of purchase.

11/19/2013