ACT Waterwatch Volunteer Resource Manual

WATERWATCH
Australian Capital Territory
Communities Caring for Catchments

ACT Waterwatch Resource Manual

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INSTRUCTIONS

APPENDIX

Material Safety Data Sheets (MSDS)

Safety Guidelines

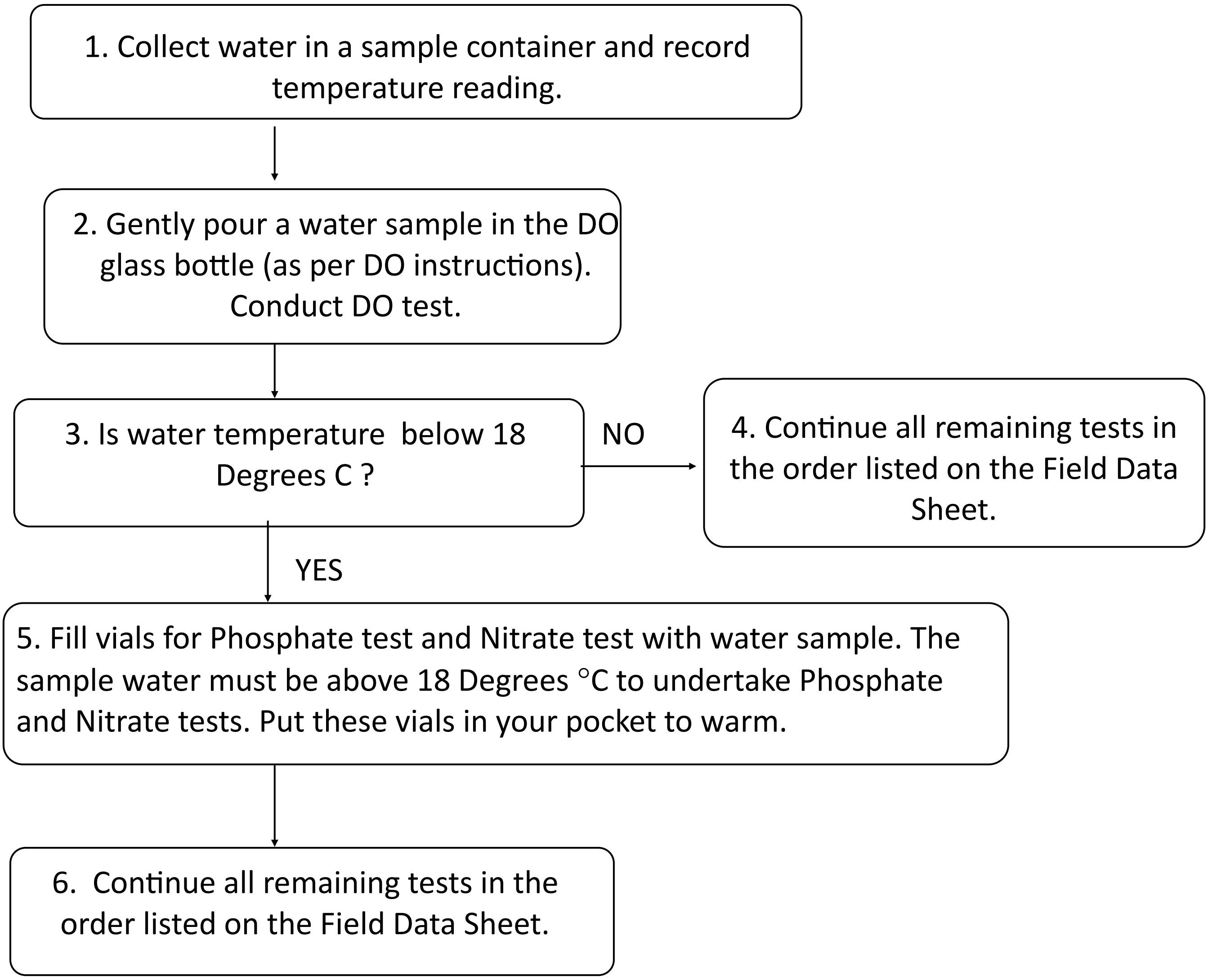
Ensure that you sign and acknowledge these safety guidelines when you review this manual. Please incorporate these safety guidelines into your site visits.

Safety Guideline	Acknowledge
Always use sign on/sign off sheet when undertaking water quality field work (return this sheet to your coordinator when full).	
Undertake water quality field work with a partner; AND/OR Notify someone of your location and expected time of return.	
Take a mobile phone with you into the field or ensure that you have an EPIRB or other communication device (eg. UHF radio) for remote sites outside mobile phone range.	
Wear appropriate personal protective attire including: • enclosed shoes, • Hat and sunglasses, • long pants and long sleeved shirt, • gloves and safety glasses (provided) when using chemicals.	
Make yourself aware of local weather forecasts such as heavy rain and the possibility of flash flooding.	
Make sure you have safe and easy access to your waterway. Take into account the likely level of floodwaters. Do not choose a spot that is prone to flash flooding.	
be aware of biohazards (eg. snakes, spiders, uneven ground, slippery banks and take action to avoid/cater for these.	
Request and use a sampling pole to get water if your site requires one.	
Keep a full stocked first aid kit (including snake bandages) in your vehicle or close to your testing site (provided by your coordinator).	
Be able to swim, in case you fall in.	

Site Monitoring Approach

Waterwatch recommends that you undertake each water monitoring event on the 3rd weekend of the month. If this is not feasible, ensure that you undertake each monitoring event around the same time every month.

Waterwatch recommends that you follow this order when undertaking a monitoring event. This plan is not compulsory but it may speed up your water monitoring if you are sampling in winter.



1. Collect water in a sample container and record temperature reading.

2. Gently pour a water sample in the DO glass bottle (as per DO instructions). Conduct DO test.

3. Is water temperature below 18 Degrees C ?

NO

4. Continue all remaining tests in the order listed on the Field Data Sheet.

YES

5. Fill vials for Phosphate test and Nitrate test with water sample. The sample water must be above 18 Degrees °C to undertake Phosphate and Nitrate tests. Put these vials in your pocket to warm.

6. Continue all remaining tests in the order listed on the Field Data Sheet.

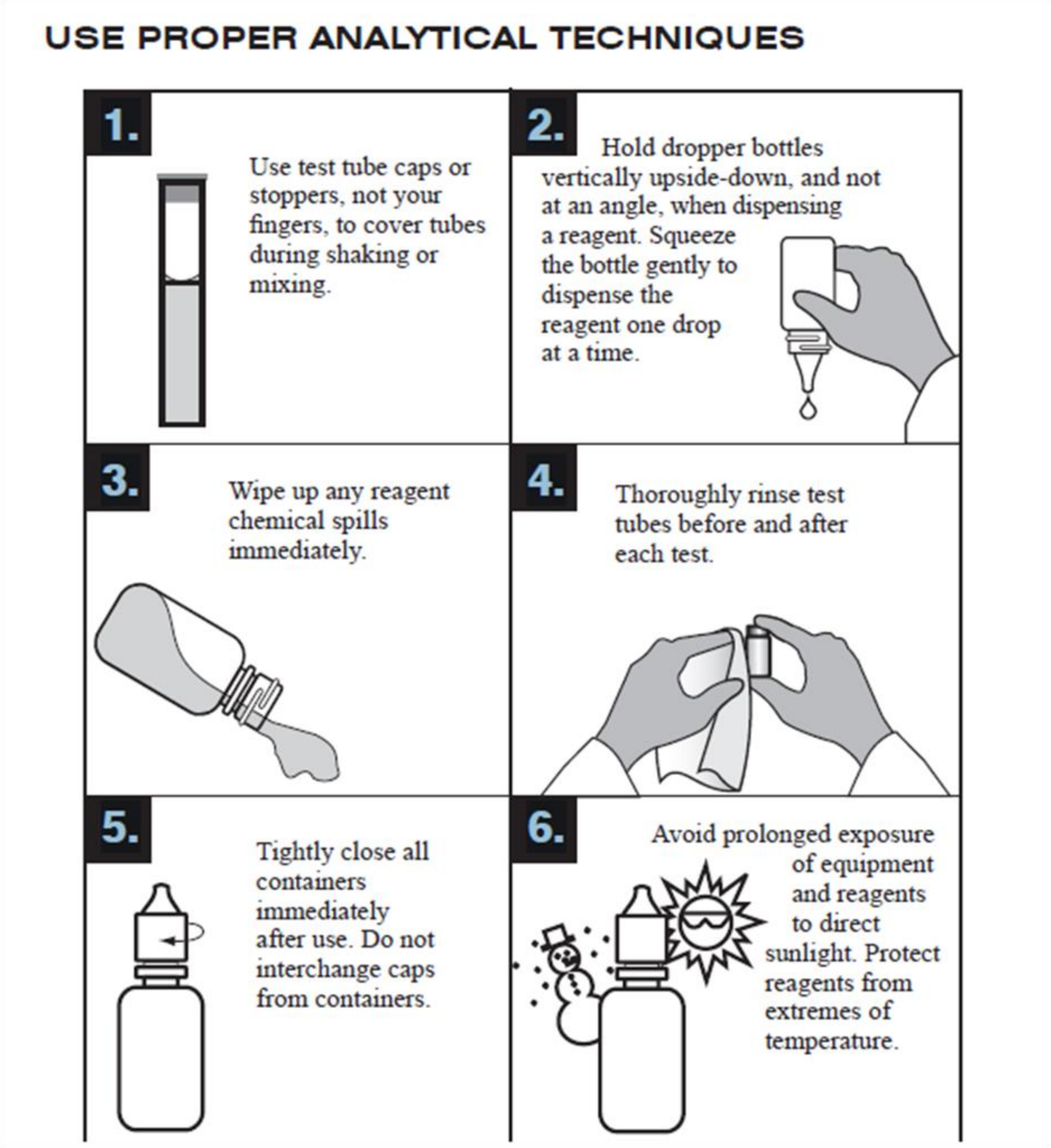
TIP: On particularly cold winter days, you may wish to take a sample and conduct the tests at home. You will, however, need to do the following on site:

- Fill a sample bottle with sample water (1 bottle for each site)
- Take the water temperature and record on data sheet
- ‘Fix’ a sample for your Dissolved Oxygen test (up to and including Step 5)
- Make necessary site observations

Then go home, get warm and complete your Waterwatch testing!

WATERWATCH
Upper Murrumbidgee

Good technique is fundamental to obtaining accurate measurements of water quality. Consider the following techniques to ensure you are collecting good data!



USE PROPER ANALYTICAL TECHNIQUES

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

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

3. Wipe up any reagent chemical spills immediately.

4. Thoroughly rinse test tubes before and after each test.

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

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

Measuring Water Temperature

Equipment

Thermometer

Long reach pole

Clean sample container

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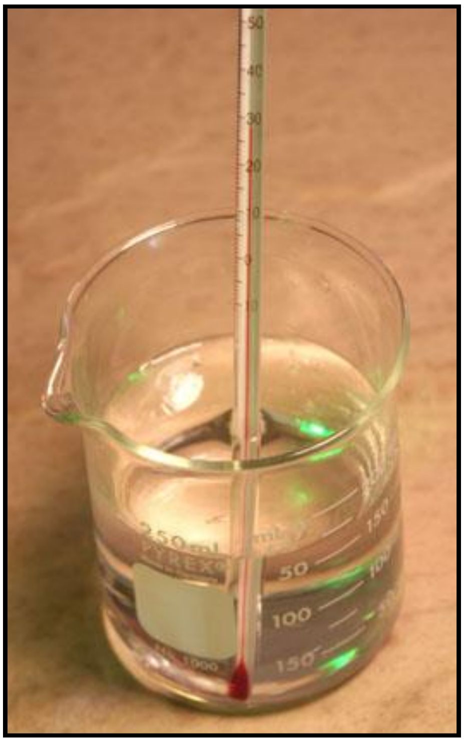
1. Inspect the thermometer for cracks, defects, damage or dirt.
2. Using the long reach pole with a clean container attached, take a water sample from the centre of the water column. Avoid shallow still edges where water will be warmer.
3. Insert the thermometer into the water sample and wait at least 1 minute until the reading stabilises.
4. Read the temperature from eye level while the thermometer is still in the water sample to the nearest 0.5 degrees Celsius.
5. Record the temperature on the field data sheet.



Measuring Dissolved Oxygen

Visocolor HE SA 10 Kit

Equipment

- Sample bottle & stopper
- Oxygen -1
- Oxygen -2
- Oxygen -3 (two bottles)
- Oxygen -4
- Plastic gloves
- TL SA 10
- Syringe
- Test tube
- Waste container
- Safety glasses

Warning: This kit contains harmful chemicals. See MSDS at back of manual for further details

1. Apply suitable personal protective equipment; gloves and glasses.
2. Rinse the sample bottle several times with the water sample and gently fill until it overflows. Try not to mix up the water when doing this as this will alter the oxygen content.
3. Add 4 drops of Oxygen-1.
4. Add 4 drops of Oxygen-2.
5. Close the bottle with the stopper and mix by shaking.
6. After 2 minutes add 12 drops of Oxygen-3.
7. Close the bottle and shake again until the deposit is dissolved.
8. Rinse the test tube with solution from ‘Step 7’, then fill the test tube up to the ring mark.
9. Add 1 drop of Oxygen-4. The solution will become blue-grey to light blue. If needed add more indicator solution.
10. Fill the syringe with titration solution TL SA 10 to the value “0” marked on the side.
11. Adding the titration solution to the test tube: We recommend adding the titration solution drop by drop, lightly swirling the test tube at the same time until the test solution is completely colourless.
12. Read off oxygen content marked on the side of the syringe barrel where the syringe plunger stops. If the syringe has been finished and filled a second time, add 10 mg/L to your result. After the end of the titration, another colour change back to blue should be ignored.
13. Discard solution into waste container.

Acceptable levels of DO	
0 - 4	Poor
4.1 - 7.9	Fair
8 - 12	Good
12 +	Retest

Measuring Dissolved Oxygen

LaMotte Kit

Equipment

Sample bottle
Manganous sulfate solution
Sodium Thiosulfate
Titration tube
Safety glasses
Alkaline Potassium Iodide Azide
Sulphuric Acid
Starch Indicator
Syringe
gloves

Warning: This kit contains harmful chemicals. See MSDS at back of manual for further details

1. <u>Gently</u> pour water into glass sample bottle until overflowing, then screw on cap - try not to mix up the water when doing this as this will alter the oxygen content.
2. Add 8 drops of Manganous Sulfate Solution.
3. Add 8 drops of Alkaline Potassium Iodide Azide.
4. Replace cap quickly and mix well. Allow precipitate to settle for 5 minutes.
5. Add 8 drops of Sulphuric Acid. Replace cap quickly and mix until all dark flecks have disappeared.
6. Fill the titration tube with 20mL of the sample mixture.
7. Add 8 drops of Starch Indicator. The sample will turn blue/black in colour.
8. Fill the syringe with Sodium Thiosulfate to the “0” marked on the side. Insert into the lid of the titration tube.
9. Slowly add Thiosulfate drop by drop and swirling the sample to mix the solution. Stop adding drops of Thiosulfate as soon as the solution becomes <u>colourless</u>.
10. Record the number on the side of the syringe where the plunger has stopped. If the syringe has been finished and filled a second time, add 10 mg/L to your result.
11. Discard solution into waste container.

Acceptable levels of DO	
0 - 4	Poor
4.1 - 7.9	Fair
8 - 12	Good
12 +	Retest

Measuring Water pH

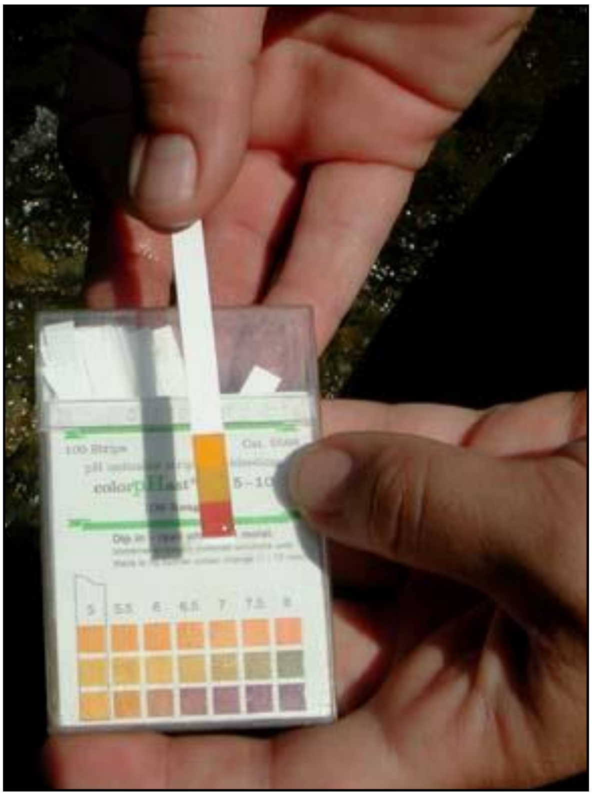
Equipment

pH Strips kit

Clean sample container

1. Collect a sample of water in a clean sample container.
2. Immerse 1 test strip into the water for **5 minutes**, with all test pads covered.
3. Remove test strip and let the colour develop (30 sec).
4. Compare the coloured test pads on the strip with the colour blocks on the label of the pH strips container.
5. Find the value nearest to the colours indicated on the test strip. Record to the nearest 0.25.
6. Record the pH on the field data sheet.

NB: Do not put the colour chart in the container with the strips as the chart may be wet. Moisture will compromise the quality of the strips.



At most sites, the acceptable level of pH is between 6.0 and 9.0.

Measuring Phosphorus

Visocolor HE (LOW) Phosphate Kit
0.01 - 0.25 mg/L

Equipment	Gloves
Comparator block and disc	P-1 & P-2
Waste container	2 glass test tubes

Warning: This kit contains harmful chemicals. See MSDS at back of manual for further details

The water temperature should be between 18 and 30 degrees C.

1. Set up the comparator block by inserting the colour comparison disc into the slot. The colour comparison disc should rotate freely.
2. Open both round glass tubes, and rinse thoroughly with sample water.
3. Fill both tubes up to the mark indicated.
4. Place a cap on 1 tube and place it in the left hand position of the comparator block. Insert the other open tube into the right hand position of the comparator block.
5. Add 1 level black measuring spoon (or 15 drops if in liquid form) of PO4-1 to the right hand glass tube. Close the cap and mix.
6. Add 15 drops of PO4-2 to the right hand glass tube, close the cap and mix. Wait 5 minutes <u>(TIP: Conduct EC test while waiting).</u>
7. Remove the caps from both vials to begin reading.
8. Turn the colour comparison disc until both colours of the liquid match both colours of the colour comparison disc underneath.
9. Read test results indicated on the comparator disc. Intermediate values can be estimated. Record the value on your datasheet.
10. After use, clean both round glass tube thoroughly, and close the caps. Dispose of samples into your waste container.

Phosphorus concentrations greater than 0.1 mg/L are considered to be very high.

Measuring Nitrates

Visocolor ECO Nitrate
1-120 mg/L

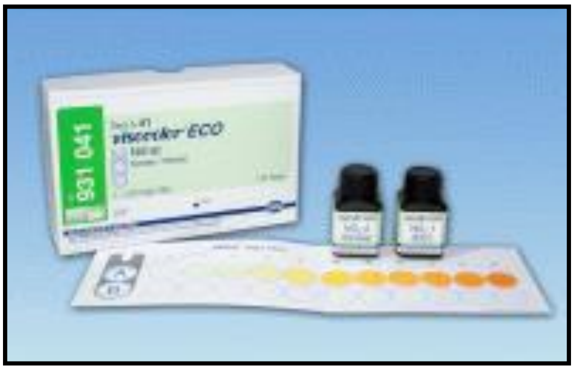
Equipment

Gloves
Waste container
Syringe and spoon
NO3 - 1 & NO3 - 2
2 test tubes
Colour comparator chart

The water temperature should be between 18 and 30 degrees C.

1. Collect a water sample in both glass test tubes and fill to the 5mL mark indicated on the side.
2. Insert one vial (without lid) into the black comparator block into position **"A".** Align the block with the image on the colour comparator chart.
3. Only add reagents to vial **"B".** Add 5 drops of NO3 - 1 to vial B and mix with the lid sealed.
4. Add 1 level measuring spoon of NO3 - 2 to vial B. Seal and shake the mixture for 1 minute.
5. Wait 5 minutes and remove the lid. Insert vial B into position on the black comparator block.
6. Using the colour chart, slide the comparator block along the coloured circles until the colours match when viewing from above.
7. Read off the nitrate level indicated on the colour chart. Record this value on the field data sheet.
8. Discard solution into waste container.

Nitrate concentrations greater than 4 mg/L are considered to be very high.



Measuring Electrical Conductivity

EUTECH EC Testr 11

Equipment

Electrical conductivity meter
Sample cup from PO4 kit
1413µS/cm calibration solution
Tap water

Calibrate the Meter

1. To maintain a high standard of quality control, always calibrate the meter before you undertake this test.
2. Ensure electrodes on the meter are free of dirt/mould. Rinse the electrodes with tap water. Fill the PO-4 sample cup with a small amount of calibration solution.
3. Turn meter on. Immerse electrodes into cup of calibration solution.
4. Gently swirl the EC meter in the solution. Wait for the reading to stabilise.
5. If the meter displays a value different to the value of the calibration solution (i.e. 1413µS/cm), you need to adjust your meter until the reading coincides with the calibration solution (or as close as possible).
6. Use the buttons located inside the battery compartment to increase or decrease the reading until it matches 1413µS/cm.
7. The display will flash after 5 seconds to confirm the calibration. Discard the calibration solution. The meter is now ready to be used for the EC test.

Measuring Electrical Conductivity

1. Take a sample of water from the waterway in a clean container (use the plastic beaker from your Phosphate kit) that has been rinsed with sample water.
2. Immerse the electrodes into the water sample and swirl the EC meter.
3. Press HOLD to pause the results on the screen. Record the results onto your datasheet.
4. Rinse, clean and dry your meter

Pure rainwater	<15 µS
Freshwater rivers	0 –1600 µS
Brackish water	1600-4800µS

Ensure that you inform the Waterwatch Coordinator if your EC levels are abnormal.

Measuring Electrical Conductivity

Eco Testr EC Low EUTECH

Equipment

Electrical conductivity meter

Sample cup from PO-4 kit

1413µS/cm calibration solution

Tap water

Calibrate the Meter

1. To maintain a high standard of quality control, always calibrate the meter before you undertake this test.
2. Ensure electrodes on the meter are free of dirt. Rinse the electrodes with tap water. Fill the PO-4 sample cup with a small amount of calibration solution.
3. Turn meter on. Immerse electrodes into the cup of calibration solution and wait for the value on the screen to stabilise.
4. Press button “cal” to begin calibration. Display will show “CAL” and blinks a default reading.
5. Press and hold the “Hold/Ent” button. The display will scroll through values.
6. Stop pressing/release button when the value reaches 1410 i.e. the closest match to the calibration solution of 1413µS/cm. (Releasing the “Hold/Ent” button accepts the displayed calibration value.)
7. Discard the calibration solution. The meter is now ready to be used for the EC test.

Measuring Electrical Conductivity

1. Take a sample of water from the waterway in a clean container (use the plastic beaker from your Phosphate kit) that has been rinsed with sample water.
2. Immerse the electrodes into the water sample and swirl the EC meter.
3. Let the reading stabilise and note the measured value on the field data sheet.
4. Press button “Hold/Ent” to hold the measured value on the screen.
5. Rinse, clean and dry your meter.

Pure rainwater	<15 µS
Freshwater rivers	0 –1600 µS
Brackish water	1600-4800µS

Ensure that you inform the Waterwatch Coordinator if your EC levels are abnormal.

Measuring Turbidity

Equipment

Turbidity tube

Clean sample container

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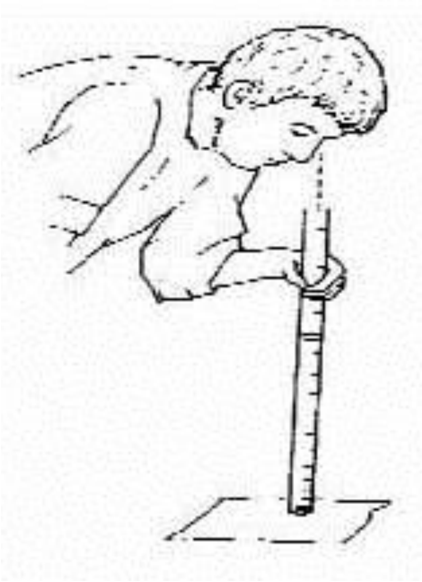
1. Use the sample of water collected in your clean sample container.
2. Ensure the water sample is well mixed. Hold the turbidity tube out of direct sunlight, and over a white background, if possible.
3. Gradually pour some of the water sample into the turbidity tube.
4. Hold the tube ~20cm from your eye and look down the tube: You should be able to see 3 distinct wavy lines.
5. Add a little more water to the tube, and look down the tube again.
6. Keep adding water until you can no longer identify 3 distinct wavy lines. If the lines are still distinct, add more sample water.
7. Note the result from the scale on the side of the turbidity tube (to the nearest marking). Record on the field data sheet.
8. If you fill the tube and can still see 3 distinct wavy lines, record as the last (top-most) value on your turbidity tube.



Acceptable levels of turbidity

Good	<10 NTU
Fair	10 - 15 NTU
Poor	>15

Waterwatch Data Collection Kit

Waterwatch monitoring kits contain the following equipment. Contact your Waterwatch Coordinator at any time if your kit lacks the following working essentials:

- Waterwatch manual
- Thermometer
- Electrical conductivity meter
- pH strips
- Nitrate test kit
- Turbidity tube
- Phosphate test kit (low)
- Dissolved oxygen test kit
- Fist aid kit
- Gloves
- Safety goggles
- EC1413mS/cm calibration solution
- Tap water (for rinsing)
- Waste water bottle (Dispose of waste solution in sink or toilet preferably with mains sewage treatment. Individual kit quantities can be deposited into septic tank systems)

Your kit may also contain:

- Phosphate test kit (high)
- Paper towels
- Long reach pole

Check your equipment regularly for cracks, defects, dirt, mould or damage. Carefully clean (wash with warm water) and dry your equipment after use. **Do not** test with malfunctioning equipment. Request a replacement from your Waterwatch Coordinator.

Your Waterwatch monitoring equipment remains the property of Upper Murrumbidgee Waterwatch. If for some reason you can not continue monitoring, please return your test kit to your Waterwatch Coordinator.

What is Waterwatch?

What is Waterwatch?

Upper Murrumbidgee Waterwatch is part of a community water quality monitoring program that brings people together from all parts of the community to raise awareness, educate, monitor, restore and protect our precious waterways.

Who is Waterwatch?

Waterwatch involves local community, catchment groups, Landcare, as well as residents, schools, utilities and landowners to regularly monitor the water quality of local creeks, wetlands, lake, rivers and stormwater drains.

Why Waterwatch?

Healthy catchments indicate healthy ecosystems with thriving fish, frogs, birds, plants and people. Waterwatch raises awareness of water quality issues by engaging the whole community in promoting change and stewardship of our waterways.

Waterwatchers Make a Difference

Water quality information collected throughout the catchment provides a picture of the health in a waterway. Waterwatch groups have initiated numerous positive community based conservation activities such as creek restoration, willow removal, litter clean-ups, weed eradication, habitat development and reduced use of pesticides and fertilisers.

For more information contact your Waterwatch Coordinator

WATERWATCH
Upper Murrumbidgee

Waterwatch for CHIP

What is CHIP?

Two primary functions of the Waterwatch program are to facilitate community engagement and provide data (water quality, waterbug and riparian condition) to support an early warning system for riverine health issues. A key output of this data is the annual **Catchment Health Indicator Program (CHIP).** The CHIP provides a numerical score of catchment health using the data collected by Waterwatch volunteers.

CHIP and data confidence

The CHIP is recognised in the new *ACT Water Strategy 2014-44* as a way to 'Enhance knowledge and spatial planning for water and catchment management'. Upper Murrumbidgee Waterwatch maintains guidelines for coordinators and participants to ensure a medium to high level of data confidence so the CHIP is an accurate assessment of current waterway health. All waterwatch data is available online at: http://root.ala.org.au/bdrs-core/umww/home.htm

Waterwatch volunteers for CHIP

Volunteers maintain their Data Confidence Certification by attending annual quality assurance and control (QA/QC) training. QA/QC training is important for maintaining Waterwatch data confidence for the CHIP report. If you cannot attend set training days, make arrangements with your coordinator for an alternative training opportunity.

Training in riparian assessment, macroinvertebrate surveying and platypus and frog monitoring are regularly offered.

The latest CHIP report can be found on the website: www.act.waterwatch.org.au

What do we measure?

KEY PARAMETERS

Electrical Conductivity: Measures the inorganic materials including calcium, bicarbonate, nitrogen, phosphorus, iron, and sulphur ions dissolved in a water body. Variation in conductivity are a result of groundwater, industrial, agricultural and sewage effluent and stormwater runoff.

Total Phosphorus: Total Phosphorus is a limiting factor to plant growth in most fresh water ecosystems. Total Phosphorus, which come from either animal/human waste or fertilizer, cause rapid plant growth in waterways and often contribute to algae blooms if over 0.05mg/L.

pH: The pH of pure water is 7. In the Canberra region, with its limestone outcrops, some alkalinity is natural. Acid mine drainage and seasonal leaf fall from deciduous trees can cause dips in pH.

Temperature: Water temperature has a strong effect on growth and activity of aquatic organisms. Excessively cold water, especially out of season can interfere with fish breeding behaviour.

Turbidity: High turbidity affects aquatic animals' ability to navigate underwater, can be damaging to gill structures and can reduce habitat availability for macro-invertebrates and fish.

Nitrates: As an indicator of Total Nitrogen, Nitrates indicates animal/human waste and/or fertilizer run-off. Like phosphorus, it promotes plant growth and algal blooms.

Dissolved oxygen: Low dissolved oxygen can severely impact upon macroinvertebrate and fish. Low dissolved oxygen levels (below 2mg/L) can lead to major fish kills. Generally, tolerant organisms such as mosquito larvae, leeches and carp thrive in low oxygen environments.

Macro-Invertebrates (Waterbugs): Waterbugs can be useful indicators of freshwater ecological health. Some macro-invertebrates are more tolerant to pollution than others and will be found in larger numbers in a polluted stream than intolerant waterbugs. If a habitat is close to pristine, tolerant types will be found alongside equal numbers of more sensitive macro-invertebrates.

Riparian health: Riparian vegetation is the zone immediately adjacent to a waterway, which both directly receives and contributes to the aquatic ecosystem.

ADDITIONAL INFORMATION

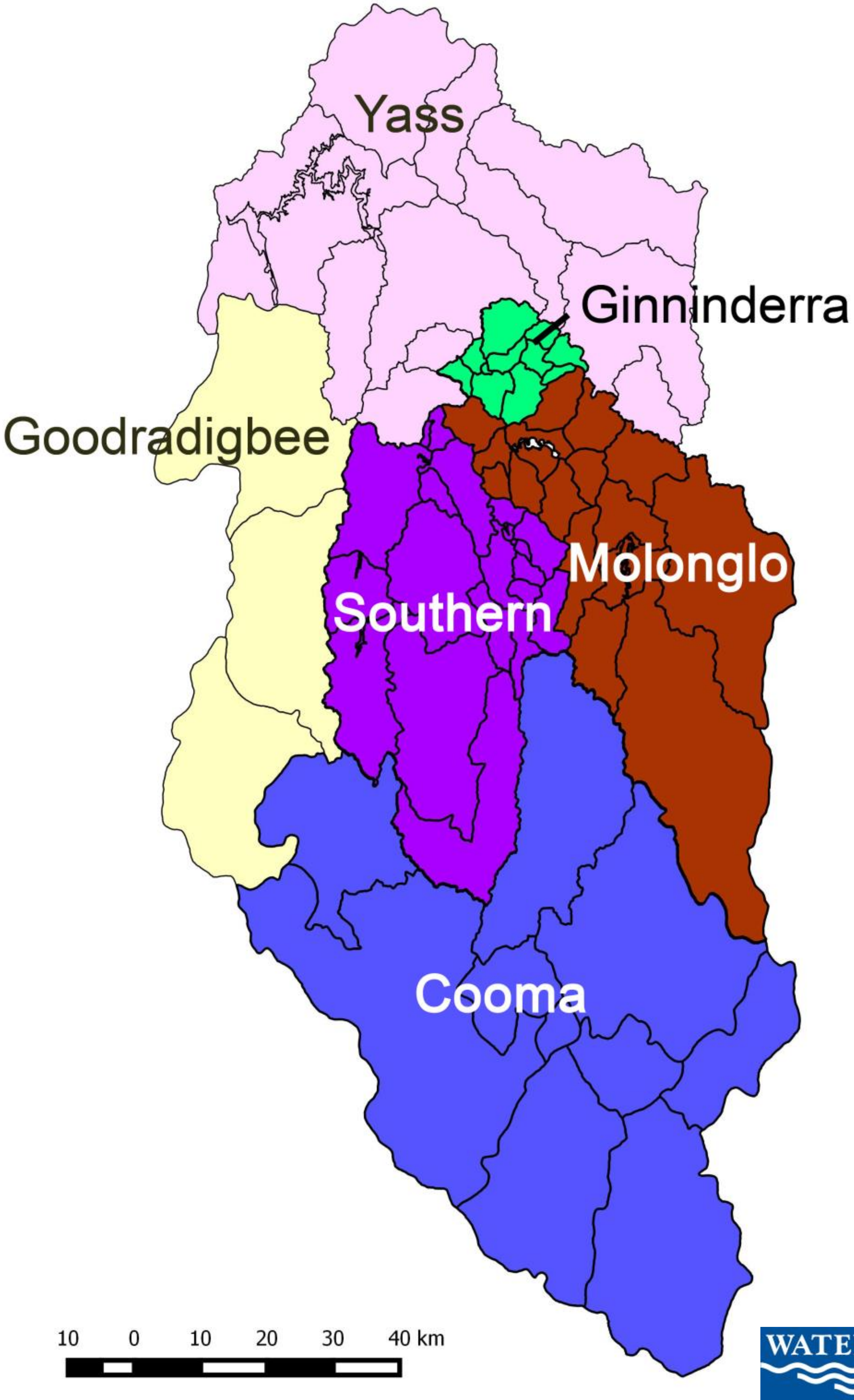
Frogs: Because of their semi-permeable skins and close contact with water in their larval stage, frogs have been shown to be excellent indicators of water quality and waterway health. See the Frogwatch website for more information: http://frogwatch.ginninderralandcare.org.au/

Platypus: Platypus are also strong indicators of the overall health of a waterway.

Algae: Like macro-invertebrates, algae can give a long term picture of waterway health.

Feral fish: Feral fish may be an indicator for deleterious environmental impacts. Many feral species have negative impacts on native species and ecosystems. For more information, and to report sightings of feral fish, go to: www.feralfishscan.org.au/uppermurrumbidgee

Upper Murrumbidgee Waterwatch Catchment Regions



WATERWATCH
Upper Murrumbidgee

Upper Murrumbidgee Waterwatch Contacts

Regional Facilitator - Woo O'Reilly
Phone: (02)6207 2246
Email: waterwatch@act.gov.au
Website: www.act.waterwatch.org.au
Address: 16 Challis St, Dickson 2602

Ginninderra Coordinator - Bruno Ferronato
Phone: (02) 6278 3309
Email: waterwatch@ginninderralandcare.org.au
Website: www.ginninderralandcare.org.au
Address: PO Box 446, Holt 2615

Molonglo Coordinator - Deb Kellock
Phone: (02) 6299 2119
Email: waterwatch@molonglocatchment.org.au
Website: http://www.molonglocatchment.org.au
Street Address: 89 Tennant St, Fyshwick, ACT 2609

Southern ACT Coordinator - Martin Lind
Phone: (02) 6296 6400
Email: waterwatch@sactcg.org.au
Website: www.sactcg.org.au
Street Address: Erindale Business Park, 2 Lansell Circuit, Wanniassa ACT 2903

Cooma Region Waterwatch Coordinator - Antia Brademann
Phone: 0429778633
Email: antia@coomawaterwatch.org.au
Website: www.coomawaterwatch.org.au
Address: South East Local Land Services Office, 5 Dawson St, Cooma NSW 2630

Other Important Contacts

To report a Pollution Incident, Illegal Dumping, or Sharps/Syringes

- In ACT: Call the ACT Environment Protection Agency: 13 22 81
- In NSW: Call the NSW Environment Protection Agency: 131 555
- Snowy-Monaro Regional Council: 1300 345 345
- Queanbeyan-Paerang Regional Council: 1300 735 025
- Yass Valley Council: 02 6226 1477

To report injured wildlife

- Access Canberra: 13 22 81 (Injured Kangaroos in ACT)
- WIRES: 13000WIRES or 1300 094 737 (NSW—north of Bredbo)
- LAOKO (south of Bredbo) 02 64561313
- ACT Wildlife: 0432 300 033 (ACT)
- Wildcare: 6299 1966 (NSW)
- RSPCA ACT: 02 6287 8113 (Business Hours)

  or 0413 495 031 (After Hours)

Report a crime scene/dumped car or request non-emergency attendance

- Police assistance line (NSW and ACT): 131 444
- Poisons Information Centre: 13 11 26

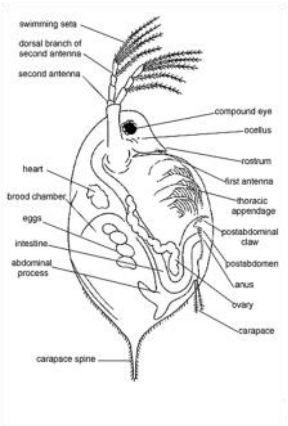
THE FOLLOWING PAGES PROVIDE MORE DETAIL ABOUT THE PARAMETERS YOU MEASURE AND WHY THEY ARE SO IMPORTANT.

THESE WERE WRITTEN BY OUR FORMER COLLEGUE
DR STEPHEN SKINNER - THANK YOU STEPHEN.

Why do we measure pH?

Hydrogen ions drive the direction of chemical reactions. When there are plenty of them, they dominate the system and reactions are acid-like. When there are only a few of them free in the system the other active ions act as bases. Where there are pairs of hydrogen ions and other active ions, a balance in reactions occurs and the system is neutral. As concentrations are measured in negative powers of 10, with strongly acid at $10^{-1}$and very basic as 10^{-14}, you get a straight line anyone can read which converts to the **negative log of the concentration of Hydrogen ions** or **pH** - 1 (very acid)–7 (neutral)–14 (very basic).

Now...think of yourself as a water flea - the lowest level herbivorous consumer in an aquatic food chain! No, really, try to view the world from the position of a tiny planktonic animal. This is about the only way I can put the importance of pH into perspective.



Your outer skin is made of a protein very similar to that of our fingernails. Your outside moving parts are all coated with the same stuff, and you live inside an articulated **suit of armour**. Inside this armour you have the **muscles, nerves and brains** plus a **fluid filled cavity** that acts as a transport system, a buoyancy vest and a shock absorber. With an **array of jointed appendages,** you feel, smell and taste the world, you swim, you exchange gases with the water and manage matters reproductive! **Small changes in pH may have dramatic effects on any or all of these parts.**

In the morning the green algae and the **cyanobacteria** you are grazing on are really photosynthesising so the water may have lost much of its CO_2 and now have a raised pH - up from 7.2 to 7.6. This will probably mean any CO_2 you release will be grabbed by the water, and you may get rather more O_2 than you were counting on. Conversely, that night, when everything else is pumping out CO_2 (plants, fungi, bacteria) you may find that it is harder to get as much O_2 as you want and the pH has gone down to 6.9!

Humans are OK at distinguishing sweet (pH 7.0 to 8.0) from sour (pH 5.5–6.9) and bitter or tinny (pH 8.1 +), I'll bet water fleas' sense of taste is much finer than that! You, as a water flea, may be well aware of the dynamics of the water you are swimming through, but are only rarely perturbed by small changes in pH. Large changes, such as those from **different local geologies** are rather more important. If you are a water flea living in waters that run off limestone (a natural pH level around 8.0) and you get washed into a basalt lined pond (natural pH 6.2), you may fizz and crackle as the lime on your armour is etched off and that armour would leak. The **acids in rotting leaves** are organic, like tannin and humic acid, may clog things up by attaching to the lipids and other fats in our water flea joints and openings. The pH may only be 6.1, but if you are not a local, your species may not be ready to cope with the change. Worse still if bacteria in oxygen-poor mud, leaches out **sulphuric acid**. With pH potentially as low as 5.0, us water fleas may have cracking or tearing joints which may result in ulcers or tumours. This is not uncommon in fish or turtles that encounter acid sulphate conditions.

There is another, more sinister reason for watching the variation in pH in waterways...**urban run-off** and what it carries. The pH change may be a minor one, 7.2 goes to 7.5, but the dissolved substances that brought about that change may cause real harm. Remember all those jointed appendages that you have? Well, detergents may make them stiff or wonky depending on what may dissolve out of them. Detergents may unravel the cell membranes where they meet the outside, and the whole cavity may leak or rupture.

So pH works at the cell wall level and from the water flea up, and as we can see, it has a dramatic effect on our biological parameters. While it can indicate that water quality is under stress, we must recognise that it does naturally vary to some extent, so pH needs to be viewed in the context of our water quality parameters to get a clearer understanding of where those stressors lie.

For more information contact your Waterwatch Coordinator

WATERWATCH
Upper Murrumbidgee

Electrical Conductivity;
not salt content but mineral content!

What is EC and how is it measured?

Electrical Conductivity (EC) is another measurement we use in Waterwatch to keep an eye on the **materials dissolved or suspended in the water**.
Inorganic substances are usually a combination of a metal and a configuration of non-metals. For example, the Sodium (metal) plus the combination of Nitrogen and three Oxygens (non-metal) is Sodium nitrate ($NaNO_3$). When in water, these two components tend to separate and become surrounded by buffers of water molecules. In separating, the metal gives away shared electrons and becomes slightly positively electrically charged. The non-metal configuration collects electrons and so becomes slightly negatively charged. This results in the solution having the potential to carry a **weak electric current.**

How easily a current can flow in a material is called **conductance** and is measured in Siemens (S). Confused? Well there is more. The ability of a solution to transfer electric current is called **e**lectrical **c**onductivity, and is measured as the conductance divided by the distance the charge has to travel, and so ends up as **micro-Siemens per centimetre or µS.cm^{-1}.**

What creates high EC and what are the effects?

In **natural and rural areas**, the charged particles come from the minerals in the country rock and the soil. Ground water percolating through **limestone** picks up calcium and bicarbonate ions and so has an elevated EC. **Shales,** another example, is of a marine origin and may lose a wide range of ions to the ground water. **Clay minerals** are the most common in this region and generally carry a low EC. There are, however, other minerals (nitrates, sulphates, chlorides and phosphates) that became attached to the clay eons ago when the rocks were being formed and together these will start to increase the natural presence of EC when it eventually dissolves into the groundwater.

In **rural areas** where pasture has been **waterlogged** and the minerals in the soil have been concentrated at the top of the soil, there are many more charged particles in rather less water, so the EC goes up. In a waterlogged rural paddock, the main metal ion may be Sodium while the non-metal may be Chlorine or Sulfate. These can combine as salt ($NaCl$), sodium sulphate (Na_2SO_4) and gypsum ($CaSO_4.2H_2O$) and then dry out as the salt crust on bare ground. This is a salt scald. The pasture plants have died because these minerals have sucked the water out of them. The salt tolerant plants survive because they have ways of keeping the minerals away from their working tissues.

In **town**, the main metal ion may be Calcium from the cement or Iron from the reinforcing in the concrete, and the non-metals will vary. When there is food waste or rotting leaves in, say, your gross pollutant trap, the anions may include a number of organic acids, like acetate from fruit and tannate from leaves.

During long, dry times, the amount of charged particles increases as the water level drops, the Calcium and Iron become corroded by the food acids and so the EC goes up. This can quite literally weaken infrastructure such as concrete pipes.

So a high EC reading in urban areas is probably telling you that infrastructure such as your gross pollutant trap needs to be cleaned out. What does it mean for the aquatic systems? Well the high EC will not necessarily harm the system but the causes of the high EC, like the rotting organic matter mentioned above, will. Persistence of elevated EC changes the soil condition and biodiversity, both aquatic and riparian, in a waterway. This is why it's important to read EC in the context of the other water quality parameters in order to properly diagnose the cause of the problem.

Solution	***EC (µS.cm$^{-1)}$***
Tap Water	Up to **800**
Water in ACT region	**80 – 1500**
Sea Water	**56,000**

Why are we measuring Nitrates??

Total Nitrogen takes on many forms. Nitrate (NO_3^-) and Ammonia (NH_4^+), the two soluble forms of nitrogen, are most easily released into aquatic systems. **Nitrates are more abundant in the system** and so by measuring them we are getting a good indication of the Total Nitrogen present. Nitrates and ammonia can be released into aquatic systems from both point and diffuse sources.

The main **point sources** are:

- seepage and waste water from intensive livestock operation (dairies, shearing sheds) and aquaculture operations;
- municipal and industrial sewage works; and
- runoff from waste disposal sites and gross pollution traps/stormwater.

The common **diffuse sources** include:

- Nitrogen that gets collected by specialised cyanobacteria as well as the nodules in crops such as legumes and pulses. This build up of Nitrates and Ammonia then get released into the soil or aquatic system;
- runoff from animal manure or inorganic fertilizer; and
- post burn-off/bush fire runoff.

In combination with Phosphorus, Nitrogen stimulates the growth of plant life. Nitrogen is important in the proteins, DNA and hormones that help all organisms (plants and animals) grow and reproduce. Most hormones and all the DNA bases have quite high levels of Nitrogen. We need to measure Nitrates to know how much potential there is for rapid growth of the primary produces (phytoplankton and aquatic plants) as this sets the balance in the system.

Total Nitrogen and **Nitrates are measured in mg/L** and the range should not exceed 4mg/L (ideally it would be more like 1mg/L). What happens if readings exceed this? With high Total Phosphorus, a little turbidity, high water temperature and low flow, this could lead to a **cyanobacterial bloom (blue-green algae)**. Ammonia, in association with elevated water temperatures and pH, may lead to **mortality in fish, frogs and turtles.**

Phosphorus

What it is?

There is a wonderful biochemical process that keeps every cell in the world going, the Krebs Cycle or the Citric Acid Cycle. The marvellous thing about the mechanism is that by reconfiguring fragments of carbohydrates, lipids and proteins cells are able to capture the energy from these deconstructions. As cells use plenty of this stuff, and most organisms have large numbers of cells, every bit of Phosphorous in the biosphere is greedily snapped up as soon as it is released...or that is the plan.

How it gets into the system?

The availability of Phosphorus in the biosphere depends on:

- the presence of mineral phosphates in the country rock (a situation that is critical in much of continental Australia where the soils are old and long washed out),
- the pH of the soil and the soil water (phosphates are more readily soluble in basic conditions), and
- organic phosphates from decomposition.

Once again the contrast between the Northern hemisphere annual leaf fall and the Southern hemisphere continuous litter accumulation and breakdown has to be remembered when interpreting phosphate levels. In a healthy ecosystem, in the southern hemisphere, there should be little free phosphate at any time of the year.

The usual sources of blips in PO_4 levels are road works, building or other ground breaking activities in urban areas, and similarly ploughing or other works in rural areas, and seepage from sewage infrastructures. Such pulses are usually rain dependant where water courses are 'flood & dry' systems. High levels of phosphorus in today in urban areas probably arises from soil, over-generous applications of Dynamic Lifter and decomposing green waste.

What the measurements mean?

On the rare occasions that there is uncaptured Phosphorus in a waterway, and it is usually in the form of PO_4^{-3}, its presence in combination with iron and ammonia or nitrate will help stimulate the growth of photosynthetic organisms. That is why it is associated with phytoplankton blooms (or blanket weed blooms, or cumbungi invasions or too many reeds etc.). The first phytoplankton that exploit the situation are cyanobacteria - the dreaded Blue-Green Algae. Most of them are benign. Only a few are noxious and fewer still are potentially toxic.

Dissolved Oxygen

Dissolved oxygen refers to the amount of oxygen (oxygen molecules) that are suspended within water. It is this oxygen that is produced by photosynthesis by aquatic plants, algae and cyanobacteria, and is consumed by the bacteria, waterbugs and fish in order to breathe.

What is a normal level of DO

The amount of oxygen the water can hold depends on the temperature of the water. The maximum solubility of oxygen in water at standard air pressure at sea level ranges from about 15mg/L at 0°C down to 8mg/L at 30°C. Chilled water can keep hold of twice as much water as standing water in the sun on a hot day.

How does it build up

Surface water is often saturated or even supersaturated with oxygen. Rapidly moving water tends to contain plenty of dissolved oxygen. Mixing and aeration occur in riffles and cascades. When there are energetic processes going on in the water like photosynthesis, tumbling of water over riffles and cascades, down waterfalls, or the rise and fall of waves there is the possibility that even more O_2 will be collected in the amazing water molecule array.

Why does it become depleted

Oxygen gets depleted

- by changes in temperature,
- as a consequence of chemical oxidation of other things in solution,
- by respiration by aquatic animals and microorganisms. The microorganisms most actively respire when they are decomposing plant matter or other organic detritus.

What is Hypoxia?

Hypoxia is the technical term for the condition of undersupply of available oxygen. In those cases where the DO has fallen below 4.0mg/L for shorter or longer periods, the ecosystem will select for those organisms that can obtain oxygen directly from the air. This is why you may observe large numbers of water boatmen and backswimmers and midge and mosquito larvae in warm ponds in summer, when everything else has disappeared.

DO level In mg/L	**Water quality of life**
0.0 – 2.0	not enough oxygen to support most animals
2.1 – 4.0	only the tough fish (carp) and macroinvertebrates (flatworms and bloodworms) can survive
4.1 – 7.0	moderate for most kinds of aquatic life, air breathers (water boatmen) do well
7.1–11.0	good for most aquatic life, gill breathers (native fish and mayflies) thrive
11.1 and higher	water may be artificially aerated; embolisms in fish

Water Temperature

All too often we measure the water temperature, add it into the results and happily ignore it! We may be missing a large source of information.

Like all our monthly measurements it is no more than a spot check, but it does point to the general condition of a waterway. You would never expect the Water Temperature in an urban creek/drain to be low on a clear summer day. The warmth of such water could be used as an indication that a riparian restoration scheme would improve catchment health, by mollifying the temperature.

Water Temperature reflects

- Flow
- Depth
- Streambed complexity
- In-stream vegetation
- Canopy cover
- Water source.

Flow

It is generally observed that standing water is somewhat warmer than corresponding moving water. There is probably some point, close to the frost point where, in the depths of winter, there is a cross-over in favour of the higher energy state, but at most times of the year and most climates, standing water remains warmer.

Depth

Shallow water is warmer than deeper water in response to a number of factors including the penetration depth of radiation, the viscosity, the shading effect of the water over the top, and the relation between volume, pressure and temperature in liquids. Like your shins and your calves when you stand in front of the hearth, the water closest to the heat source gets warmest!

Streambed Complexity

A wide concrete drain will have warmer water in it than a more pipe-like gutter, and will have a quite even temperature. A creek bed, with pools, runs, riffles, holes and sandbars will induce a mosaic of temperatures in its water, and this complexity will lower the net temperature.

In-stream Vegetation

In-stream vegetation obviously creates special irregularities and localised shading, but on top of that the plant tissues act as heat sinks and will compete for incident radiation.

Canopy Cover

The water in a shaded pool or in a well vegetated creek line will be rather cooler than a similar volume of water in a non-shaded pool or a bare creek line. Even the dappling of incident radiation can, like wave action, break continuity of absorption onto the black body. More or less continuous absorption of light, of useable wavelengths, by a tree canopy will leave water noticeably cooler underneath.

Water Source

If the water in a creek is delivered from a wide, shallow open lake, then it will be carrying the heat load from the lake; if it comes from an underground spring it may be cool or warm depending on the hydrology; if it comes from an artesian spring, then it is generally hot. The water from the sluice gates of a weir will be cooled by the action of cascading but will be warm in comparison to the water pumped from the base of a deep reservoir.

What does it matter?

Most organisms, in water or out, have temperature range tolerances. Many chemical processes will go forward at one set of temperatures and go backward at an opposite set. These two related processes are important for Water Quality.

Several of our native fish, like the Yellowbelly, the Macquarie Perch and the Murray Cod are partially dependant on water temperature for reproduction. For instance, Macquarie Perch spawn when water temperatures are approximately 16 degrees. Releases of cold water from the bottom of dams at the wrong times of the year (spring) have not only caused fish kills, but have also set back breeding.

Turbidity

Turbidity is a measure of how hard it is for light to penetrate the water. Or, how dirty the water is. The scale, in Nephelometric Turbidity Units, goes from clear to totally opaque, and, as you are measuring light extinction, and that happens increasingly rapidly, it is logarithmic. That is why the numbers are all at funny spacings along the tube. Our eyes give out at the clear end of the scale, so anything under 10 NTU judged by eye is the same reading (even when the tube is marked to 9 or 7).

The Turbidity reading you take once a month depends on two things: the regular conditions at your site, and the kind of disturbance that led to a difference. The regular conditions depend on the basement of the waterway, the use of the site and its riparian zone, and the water chemistry. The causes of elevated turbidity nearly always come back to rain events and their consequences.

The Effect of the Waterway Basement.

Basement form	What you see	NTU range
bedrock	Clear water	<10
Outcrops, gravel and cobbles	Clear water	<10
Sand slugs and bars	Dirty, but translucent water	10–30
Woody debris or leaf litter	Stained or yellow water	10–15
Silt or mud	Dirty water, easily stirred up	10–20

The lowland parts of our big rivers and many lakes, natural and artificial have consistent turbidity between 10 and 30 NTU. This does not mean that the water quality is impaired, just that if you want to use it for domestic purposes, then it needs to be filtered.

Where there are stock watering points, active erosion points or building activities in the vicinity of a sample site, turbidity may be variable. Well vegetated, stable banks should support consistent turbidity readings. Streams with dense growth of emergent vegetation will also give clear water readings for turbidity, even where the luxurious growth is the result of upstream contamination or disturbance.

Water running through areas of high mineralisation may show increased Turbidity because of the products of the chemical activity. In Captain's Flat, the water carries flocs of hydrated rust (iron and zinc oxides, sulphides and hydroxides surrounded by water that makes the particles visible and fluffy). The turbidity is hard to read, but it is higher than 10 NTU. In the bogs in the mountains, where the amount of humus is very high the water may look black in the creek, and tea in the tube. This will often be very consistent from reading to reading. The acid conditions in the bog lead to the colour.

<u>Sudden changes, and are they a worry.</u>

In a rain event, three kinds of flow may occur:

- Overground Flows that last a few minutes beyond the downpour, are high energy, and usually sheet flows. Rarely these build slowly with persistent light rain, then the barrier gives way and off they run.
- Subsurface flows build up in the first few inches of the soil, and run slowly through for hours or days after a downpour
- Groundwater flows are a combination of percolated water from a storm event and water in the soil because of its hydrology. Groundwater flows fluctuate but are there as long as the aquifer will hold them, so flow all the time.

Overground flows will push all before them: woody debris and leaf litter, loose dry soil, country rock if they activate a nick point. After long, dry periods, the soil is often poorly receptive to water and overground flows can be erosive. Turbidity from these events can look like Turkish coffee, and have readings of 1100 NTU as Kambah Pool did after the New Years Eve storm during the long drought.

The impact of subsurface flows on turbidity is very much milder, but can be more persistent.

Groundwater flows are generally clean, as they use the natural spring systems. In Woolshed Creek and similar streams, you can pick them out because of the upwelling of some clearer water into the muddy mainstream.

MATERIAL SAFETY
DATA SHEET
SUMMARIES

Material Safety Data Sheet Summary

VISOCOLOR HE kit Oxygen SA 10 Kit- Ref. 915009—page1 of 2

1. Identification of the Substance/Mixture and of the Company

1.1 Identification/Product Name

REF: 915009 Product name: VISOCOLOR HE kit Oxygen SA 10
1 x 30 mL Oxygen-1 1 x 10 mL Oxygen-4
1 x 30 mL Oxygen-2 1 x 100 mL TL SA 10
2 x 30 mL Oxygen-

1.2 Manufacturer

MACHEREY-NAGEL GmbH & Co. KG, Neumann-Neander-Str. 6-8, 52355 Dueren, GERMANY
Tel.: +49 2421 969 0 E-mail: msds@mn-net.com

2. Hazard Identification

2.1 Hazard Symbols of Product

Hazard ID	Hazard phrase
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H411	Toxic to aquatic life with long lasting effects.

Signal word: DANGER

2.2 Hazard Description

Possible Hazards from physicochemical Properties

Generally in the case of pH values are less than 2 or higher than 11.5 then it is corrosive.

Information pertaining to particular Risks to Human and possible Symptoms

Causes varying degrees of acid burns on the skin, to the eyes and to the mucous membranes and wounds which do not heal quickly depending on the concentration, temperature and the exposure time. Vapours especially which steam from hot liquids and mist can have a severe irritant effect upon the eyes and the respiratory organs.

Information pertaining to particular Risks to the Environment

Avoid contact of chemical/mixture to environment.

2.3 Hazard description of the components

30 mL Oxygen-1

Hazard ID	Hazard phrase
H302	Harmful if swallowed.
H411	Toxic to aquatic life with long lasting effects.

Signal word: WARNING

30 mL Oxygen-2

Hazard ID	Hazard phrase
H314	Causes severe skin burns and eye damage.

Signal word: DANGER

30 mL Oxygen-3
Same hazard description as **30 mL Oxygen-2**

Hazard ID	Hazard phrase
H314	Causes severe skin burns and eye damage.

10 mL Oxygen-4
Signal word: do not need labelling as hazardous

100 mL TL SA 10
Signal word: do not need labelling as hazardous

3. Composition/Information on Ingredients

3.1 Hazardous Components

30 mL Oxygen-1
Chemical: *manganese chloride* CAS No.: 7773-01-5
Concentration: 25 - 83 %
Formula: $MnCl_2$

30 mL Oxygen-2
Chemical: *sodium hydroxide solution* CAS No.: 1310-73-2
Concentration: 20 - 55 % Pseudonym: soda lye

VISOCOLOR HE kit Oxygen MSDS page 2 of 2

Concentration: 10 - 100 %
Formula: KI

30 mL Oxygen-3
Chemical: *sulphuric acid* CAS No.: 7664-93-9
Concentration: 51 - 80 %
Formula: H_2SO_4

10 mL Oxygen-4
Chemical: *starch* CAS No.: 9005-84-9
Concentration: < 1,00 %
Formula: $(C_6H_{10}O_5)_n$

4. First Aid Measures

4.1 General Information

Place injured person out of danger zone to fresh air immediately. Ensure quiet, warmth, and provide resuscitation if necessary. If necessary contact medical advice. Remove contaminated clothing. Show product package, packing insert and this material safety data sheet to the doctor.

4.1.1 After SKIN Contact

Remove contaminated clothing immediately. Rinse the affected skin or mucous membrane thoroughly for min. 15 minutes under running water. (If possible) use soap. Avoid neutralisation. Then apply a loose bandage.

4.1.2 After EYE Contact

After contact with the eyes rinse thoroughly under running water with the eyelid wide open for min. 10 minutes with eye washing bottle, eye douche or running water (protect intact eye). Before (if possible) apply eye drops Proxymetacaine 0.5%, if the opening the eyelid convulsion is painful. Further treatment to be carried out by an eye specialist.

4.1.3 After INHALATION of Vapours

After inhalation of foam or vapour fresh air should be inhaled. Keep airways free. If vomiting and if insensible place patient in recovery position and keep airways free.

4.1.4 After ORAL Intake

After oral intake lots of water with activated charcoal supplement should be drunk after it has been ingested. Do not induce vomiting under any circumstances. Do not make any efforts to neutralise it. Contact medical advice for possible consequences.

4.2 Further Medical Treatment/Attention

CORROSIVE DAMAGE: After SKIN CONTACT rinse with water for a long time. Efforts to neutralise the substance can frequently make matters worse. Apply glucocorticosteroides following inflammatory reactions. After EYE CONTACT rinse immediately with plenty of water for a long time. Eyelid convulsion measures. Name the corrosive chemical. Further treatment must to be carried out by an eye specialist. After INTAKE administer aluminium oxide drug suspensions. Administer a prophylaxis to counter pulmonary oedema following the INGESTION of corrosive aerosols. In the event of RESPIRATORY DISTREES ensure that the patient inhales oxygen.

5. Accidental Release Measures

5.1 Personal Precautions

Do not breathe vapours. Wear suitable protective gloves (see 8.2.2). Wear eye protection, respectively face protection. Regular staff training is necessary, indicating hazards and precautions on the basis of operating instructions. Restrictions on activity must be observed.

5.2 Methods of Cleaning-up

Bind any escaping liquid with universal binder. And dispose in accordance to local regulations for the disposal of hazardous chemicals.Clean any contaminated equipment and floors with plenty of water. Collect small amounts of leaked liquid and flush with water into drains.

6. Handling and Storage

6.1 Handling

In accordance with the testing instructions, that comes with the product.

6.2 Storage

The original product package of MACHEREY-NAGEL allows a safe storage.

7. Exposure Controls/Personal Protection

7.1 Exposure Controls

Good ventilation and extraction system in the room, floor resistant to chemicals with floor drainage and washing facilities. The highest level of cleanliness must be maintained at the workplace.

7.1.1 Respiratory Protection

Only if additional recommendations in test instruction or packing insert.

7.1.2 Hand Protection

Yes, gloves according EN 374 (permeation time >30 min - level 2), consist of PVC, natural latex, Neopren, or Nitril. Use for short times chemical resistant latex gloves with code EN 374-3 level 1.

7.1.3 Eye Protection

Yes, safety glasses according EN 166 with integrated side shields or wrap-around protection or face protection.

7.1.4 Skin Protection

Recommended to avoid clothing damage, and to avoid contamination with these hazards.

7.1.5 Personal Hygiene

Eating, drinking, smoking, taking snuff and storage of food in work areas and at outdoor workplaces is prohibited. Avoid contact with the skin, eyes and clothing. Rinse any clothing on which the substance has been spilled, and soak it in water. Wash hands thoroughly with soap and water when stopping work and before eating, and then apply protective skin cream

8. Disposal Considerations

Please observe local regulations for collection and disposal of hazardous waste and contact waste disposal company, where you will obtain information on laboratory waste disposal. Normally it is possible to empty small amounts (diluted!) into drains. Empty containers of corrosive reagents prior to disposal, rinse with water.

Full MSDS Datasheet for this Kit available at:

La Motte Dissolved Oxygen Kit

(5 products headed in red - page 1 of 5)

Manganous Sulfate Solution

Product Code(s)	4167

HAZARDS IDENTIFICATION

Emergency Overview

Harmful if swallowed
May irritate eyes and skin
Appearance: Clear, pink, Physical State: Liquid, Odor: None

Potential Health Effects

Principle Routes of Exposure	Skin contact, Ingestion

Acute Toxicity

Eyes Irritating to eyes.	
Skin	Irritating to skin.
Inhalation	May cause irritation of respiratory tract.
Ingestion	Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Chronic Effects	Chronic manganese poisoning primarily involves the central nervous system.

FIRST AID MEASURES

General Advice	Do not get in eyes, on skin, or on clothing.
Eye Contact	**Rinse thoroughly** with plenty of water for at **least 15 minutes**, lifting lower and upper eyelids. Consult a physician.
Skin Contact	**Wash off** immediately with soap and plenty of water for at **least 15 minute**s while removing all contaminated clothing and shoes. Consult a physician.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration and **call emergency immediately on 00 or 112 .**
Ingestion	DO NOT induce vomiting unless directed to do so by a physician or poison control center. **Never give anything by mouth to an unconscious person.** Consult a physician.
Protection of First-aiders	**Use personal protective equipment.** Do not use mouth-to mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

ACCIDENTAL RELEASE MEASURES

Avoid contact with skin, eyes and clothing.

Methods for Containment	Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.
Methods for Cleaning Up	Use personal protective equipment. Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations. Following product recovery, flush area with water.

La Motte Dissolved Oxygen Kit (page 2 of 5)

Sodium Thiosulfate, .025 N

Product Code(s) 4169

HAZARDS IDENTIFICATION

Emergency Overview

May cause skin and eye irritation
Large oral doses may cause gastrointestinal irritation
Appearance: Colorless, Physical State: Liquid, Odor: None

Potential Health Effects

Principle Routes of Exposure Skin and eye contact.

Acute Toxicity

Eyes	Contact with eyes may cause irritation.
Skin	Substance may cause slight skin irritation.
Inhalation	Not an expected route of exposure.
Ingestion	May cause gastrointestinal discomfort if consumed in large amounts.

FIRST AID MEASURES

General Advice	Do not get in eyes, on skin, or on clothing.
Eye Contact	**Rinse thoroughly** with plenty of water for at **least 15 minutes**, lifting lower and upper eyelids. Consult a physician.
Skin Contact	Wash off with warm water and soap. If skin irritation persists, call a physician.
Inhalation	Not expected. Move to fresh air.
Ingestion	Drink plenty of water. If symptoms persist or develop contact physician. **Never give anything by mouth to an unconscious person**.
Protection of First-aiders	**Use personal protective equipment.** Do not use mouth-to mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

ACCIDENTAL RELEASE MEASURES

Personal Precautions	Use personal protective equipment. Avoid contact with skin, eyes, and clothing.
Methods for Cleaning Up	If local regulations permit, rinse to drain with excess water. After cleaning, flush away traces with water.

Starch Indicator Solution

Product Code(s) 4170

HAZARDS IDENTIFICATION

Emergency Overview

Avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes, and clothing.
May be harmful if swallowed.
May cause eye irritation.
Appearance: Colorless, Physical State: Liquid, Odor: None

Potential Health Effects

Principle Routes of Exposure Skin and eye contact

La Motte Dissolved Oxygen Kit (page 3 of 5)

AcuteToxicity

Eyes	Contact with eyes may cause irritation.
Skin	No hazard from product as supplied.
Inhalation	Not an expected route of exposure.
Ingestion	May cause gastrointestinal discomfort if consumed in large amounts.
Chronic Effects	Prolonged skin contact may cause skin irritation and/or dermatitis.

FIRST AID MEASURES

General Advice	Do not get in eyes, on skin, or on clothing.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If irritation persists or develops, contact a physician.
Skin Contact	Wash off with warm water and soap. If skin irritation persists, call a physician.
Inhalation	Not expected.
Ingestion	Drink plenty of water. Do not induce vomiting without medical advice (pH 3). Consult a physician. **Never give anything by mouth to an unconscious person**.
Protection of First-aiders	**Use personal protective equipment.** Do not use mouth-to mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

ACCIDENTAL RELEASE MEASURES

Personal Precautions	Use personal protective equipment. Avoid contact with skin, eyes, and clothing.
Methods for Cleaning Up	Neutralize spill with alkaline material (sodium bicarbonate), being careful to prevent splattering, then containerize slurry and hold for later disposal. If local regulations permit, dilute slurry with water and rinse to drain with excess water. Keep in suitable and closed containers for disposal. After cleaning, flush away traces with water.

SULFURIC ACID, 1:1

Product Code(s) 6141

HAZARDS IDENTIFICATION

DANGER POISON / EMERGENCY OVERVIEW

Corrosive
Liquid and mist can cause severe burns to all body tissue
May be fatal if inhaled or swallowed
Water reactive
Appearance: Clear and Colorless, Physical State: Liquid, Odor: Ordorless

Potential health effects

Principle Routes of Exposure	Inhalation, skin contact, and ingestion.

Acute toxicity

Eyes	Corrosive to the eyes and may cause severe damage including blindness.
Skin	Corrosive. Can cause redness, pain, and severe skin burns. May discolor the skin. Harmful if absorbed through skin.
Inhalation	**Poison - may be fatal if inhaled**. Inhalation of corrosive mist may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. **Call emergency 000 or 112**

La Motte Dissolved Oxygen Kit (page 4 of 5)

Ingestion	Corrosive. Causes burns. MAY BE FATAL IF SWALLOWED. Can cause immediate pain and burning in the mouth, throat, esphogus and GI tract. May cause nausea, vomiting, and diarrhea, and in severe cases death.
Chronic effects	Chronic exposure to corrosive mists or vapors may cause erosion of the teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravated Medical Conditions	Hypersensitivity may occur in those with preexisting skin disorders. Respiratory disorders. Preexisting eye disorders.

FIRST AID MEASURES

General advice	Do not get in eyes, on skin, or on clothing. Do not breathe dust/fume/gas/mist/vapors/spray.
Eye contact	Immediately flush eyes with gentle stream of water for at least 15 minutes, occasionally lifting upper and lower eyelids. Call a physician immediately.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes while removing all contaminated clothing and shoes. Excess acid on skin can be neutralized with a 2% solution of sodium bicarbonate in water. Call a physician immediately.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration and contact emergency personnel. Call a physician immediately.
Ingestion	Do NOT induce vomiting. Drink plenty of water. Clean mouth with water. **Call a physician immediately**. Never give anything by mouth to an unconscious person.
Protection of First-aiders	**Use personal protective equipment**. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

ACCIDENTAL RELEASE MEASURES

Personal precautions	Ensure adequate ventilation. Avoid contact with skin, eyes, and inhalation of vapors. Use personal protective equipment. Methods for cleaning up Neutralize spill with alkaline material (sodium bicarbonate), being careful to prevent splattering, then containerize slurry and hold for later disposal. If local regulations permit, dilute slurry with water and rinse to drain with excess water. After cleaning, flush away traces with water.

ALK. POTASSIUM IODIDE AZIDE

Product Code(s) 7166

HAZARDS IDENTIFICATION

DANGER POISON / Emergency Overview

Corrosive
Liquid and mist can cause severe burns to all body tissue
May be fatal if inhaled or swallowed
Water reactive
Appearance: Clear, colorless, Physical State: Liquid, Odor: Odorless

Potential health effects

Principle Routes of Exposure	Inhalation, skin contact, and ingestion.
Acute	Toxicity
Eyes	Corrosive to the eyes and may cause severe damage including blindness.
Skin	Corrosive. Contact with skin causes irritation to severe burns. Can cause redness, pain, and severe skin burns. Harmful if absorbed through skin.
Inhalation	**Poison - may be fatal if inhaled.** Inhalation of corrosive mist may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Depending on exposure, the effects from inhalation of corrosive mists can vary from mild irritation to serious damage to respiratory tract.

La Motte Dissolved Oxygen Kit (page 5 of 5)

Ingestion	Toxic if swallowed. Corrosive. Can cause immediate pain and burning in the mouth, throat, esphogus and GI tract. May cause nausea, vomiting, and diarrhea, and in severe cases death. Probable lethal dose of Potassium thiocyanate:between 15-30 grams.(100ml of 5116 solution will contain 10grams Potassium thiocyanate).
Chronic Effects	Prolonged exposure may cause chronic effects.
Main Symptoms	Prolonged contact has a destructive effect on tissue.
Aggravated Medical Conditions	Hypersensitivity may occur in those with preexisting skin disorders. Respiratory disorders. Preexisting eye disorders.

FIRST AID MEASURES

General Advice	Do not get in eyes, on skin, or on clothing. Do not breathe dust/fume/gas/mist/vapors/spray. Do not delay care and transport of a seriously injured person.
Eye contact	Immediately flush eyes with gentle stream of water for at least 15 minutes, occasionally lifting upper and lower eyelids. Call a physician immediately.
Skin Contact	Wash off immediately with soap and plenty of water for at least 15 minutes while removing all contaminated clothing and shoes. Remove and wash contaminated clothing before re-use. Immediate medical attention is required.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration and contact emergency personnel. Call a physician immediately.
Ingestion	DO NOT INDUCE VOMITING. Drink large quantity of water. Immediate medical attention is required. Never give anything by mouth to an unconscious person.
Protection of First-aiders	Use personal protective equipment. See Section 8 for more detail. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

ACCIDENTAL RELEASE MEASURES

Personal Precautions	Ensure adequate ventilation. Avoid contact with skin, eyes, and inhalation of vapors. Use personal protective equipment.
Methods for Containment	Soak up with inert absorbent material, containerize, and hold for disposal. Do not flush to sewer.
Methods for Cleaning Up	Neutralize spills with acid such as acetic, hydrochloric or sulfuric, absorb with vermiculite or other inert substance, and package in a suitable container for disposal. Prevent product from entering drains.

Material Safety Data Sheet Summary

VISOCOLOR HE Phosphate Kit 0.01-0.25mg/l Ref. 920080 (page 1 of 2)

1. Identification of the Substance/Mixture and of the Company

1.1 Identification/Product Name

REF: 920080	Product name: VISOCOLOR HE Phosphate 0.01-0.25mg/l
1 x 5 g PO_4 -1	1 x 80 mL PO_4 -2

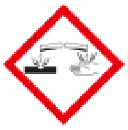
1.2 Manufacturer

MACHEREY-NAGEL GmbH & Co. KG, Neumann-Neander-Str. 6-8, 52355 Dueren, GERMANY
Tel.: +49 2421 969 0 E-mail: msds@mn-net.com

2. Hazard Identification

2.1 Hazard Symbols of Product

C



Signal word: DANGER

Hazard identification	Hazard classes/categories
H314	Causes severe skin burns and eye damage.

2.2 Hazard Description

Possible Hazards from physicochemical Properties

Generally in the case of pH values are less than 2 or higher than 11.5 then it is corrosive.

Information pertaining to particular Risks to Human and possible Symptoms

Causes varying degrees of acid burns on the skin, to the eyes and to the mucous membranes and wounds which do not heal quickly depending on the concentration, temperature and the exposure time. Vapours especially which steam from hot liquids and mist can have a severe irritant effect upon the eyes and the respiratory organs.

Information pertaining to particular Risks to the Environment

Avoid contact of chemical/mixture to environment.

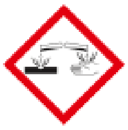
2.3 Hazard description of the components

5 g PO_4 -1

Signal word: do not need labelling as hazardous

80 mL PO_4 -2

C



Signal word: DANGER

Hazard identification	Hazard classes/categories
H314	Skin Corr. 1A

3. Composition/Information on Ingredients

3.1 Hazardous Components

5 g PO_4 -1

Chemical: *L (+)-ascorbic acid* CAS No.: 50-81-7
Concentration: 90 - 100 %
Formula: $C_6H_8O_6$
Pseudonym: vitamin C

80 mL PO_4 -2

Chemical: *ammonium heptamolybdate* CAS No.: 12054-85-2
Concentration: 1 - 5 %
Formula: $H_{24}Mo_7N_6O_{24}$
Pseudonym: ammonium molybdate

Chemical: *sulphuric acid* CAS No.: 7664-93-9
Concentration: 30 - 51 %

VISOCOLOR HE Phosphate Kit 0.01-0.25mg/l Ref. 920080 (page 2 of 2)

4. First Aid Measures

4.1 General Information

Place injured person out of danger zone to fresh air immediately. Ensure quiet, warmth, and provide resuscitation if necessary. If necessary contact medical advice. Remove contaminated clothing. Show product package, packing insert and this material safety data sheet to the doctor.

4.1.1 After SKIN Contact

Remove contaminated clothing immediately. Rinse the affected skin or mucous membrane thoroughly for min. 15 minutes under running water. (If possible) use soap. Avoid neutralisation. Then apply a loose bandage.

4.1.2 After EYE Contact

After contact with the eyes rinse thoroughly under running water with the eyelid wide open for min. 10 minutes with eye washing bottle, eye douche or running water (protect intact eye). Before (if possible) apply eye drops Proxymetacaine 0.5%, if the opening the eyelid convulsion is painful. Further treatment to be carried out by an eye specialist.

4.1.3 After INHALATION of Vapours

After inhalation of foam or vapour fresh air should be inhaled. Keep airways free. If vomiting and if insensible place patient in recovery position and keep airways free.

4.1.4 After ORAL Intake

After oral intake lots of water with activated charcoal supplement should be drunk after it has been ingested. Do not induce vomiting under any circumstances. Do not make any efforts to neutralise it. Contact medical advice for possible consequences.

4.2 Further Medical Treatment/Attention

CORROSIVE DAMAGE: After SKIN CONTACT rinse with water for a long time. Efforts to neutralise the substance can frequently make matters worse. Apply glucocorticosteroides following inflammatory reactions. After EYE CONTACT rinse immediately with plenty of water for a long time. Eyelid convulsion measures. Name the corrosive chemical. Further treatment must to be carried out by an eye specialist. After INTAKE administer aluminium oxide drug suspensions. Administer a prophylaxis to counter pulmonary oedema following the INGESTION of corrosive aerosols. In the event of RESPIRATORY DISTREES ensure that the patient inhales oxygen.

5. Accidental Release Measures

5.1 Personal Precautions

Do not breathe vapours. Wear suitable protective gloves (see 8.2.2). Wear eye protection, respectively face protection. Regular staff training is necessary, indicating hazards and precautions on the basis of operating instructions. Restrictions on activity must be observed.

5.2 Methods of Cleaning-up

Bind any escaping liquid with universal binder. And dispose in accordance to local regulations for the disposal of hazardous chemicals. Clean any contaminated equipment and floors with plenty of water. Collect small amounts of leaked liquid and flush with water into drains.

6. Handling and Storage

6.1 Handling

In accordance with the testing instructions, that comes with the product.

6.2 Storage

The original product package of MACHEREY-NAGEL allows a safe storage.

7. Exposure Controls/Personal Protection

7.1 Exposure Controls

Good ventilation and extraction system in the room, floor resistant to chemicals with floor drainage and washing facilities. The highest level of cleanliness must be maintained at the workplace.

7.1.1 Respiratory Protection

Only if additional recommendations in test instruction or packing insert.

7.1.2 Hand Protection

Yes, gloves according EN 374 (permeation time >30 min - level 2), consist of PVC, natural latex, Neopren, or Nitril. Use for short times chemical resistant latex gloves with code EN 374-3 level 1.

7.1.3 Eye Protection

Yes, safety glasses according EN 166 with integrated side shields or wrap-around protection or face protection.

7.1.4 Skin Protection

Recommended to avoid clothing damage, and to avoid contamination with these hazards.

7.1.5 Personal Hygiene

Eating, drinking, smoking, taking snuff and storage of food in work areas and at outdoor workplaces is prohibited. Avoid contact with the skin, eyes and clothing. Rinse any clothing on which the substance has been spilled, and soak it in water. Wash hands thoroughly with soap and water when stopping work and before eating, and then apply protective skin cream.

8. Disposal Considerations

Please observe local regulations for collection and disposal of hazardous waste and contact waste disposal company, where you will obtain information on laboratory waste disposal. Normally it is possible to empty small amounts (diluted!) into drains. Empty containers of corrosive reagents prior to disposal, rinse with water.

Full MSDS Datasheet for this Kit available at:**www.mn-net.com/tabid/10787/default.aspx**
or from your WaterWatch Co-ordinator

Material Safety Data Sheet Summary

VISOCOLOR ECO Nitrate Kit- Ref. 931041 (page 1 of 2)

1. Identification of the Substance/Mixture and of the Company

1.1 Identification/Product Name

REF: 931041
Product name: VISOCOLOR ECO Nitrate
1 x 30 mL NO3 -1
1 x 5 g NO3 -2

1.2 Manufacturer

MACHEREY-NAGEL GmbH & Co. KG, Neumann-Neander-Str. 6-8, 52355 Dueren, GERMANY
Tel.: +49 2421 969 0 E-mail: msds@mn-net.com

2. Hazard Identification

2.1 Hazard Symbols of Product

Signal word: WARNING

Hazard identification	Hazard phrase
H315	Causes skin irritation.
H411	Toxic to aquatic life with long lasting effects.

2.2 Hazard Description

Possible Hazards from Physicochemical Properties

In the case of pH values are less than 5 or higher than 9 then it is irritant.

2.3 Hazard description of the components

30 mL NO 3 -1

Signal word: WARNING

Hazard identification	Hazard phrase
H315	Causes skin irritation.

5 g NO3 -2

Signal word: do not need labelling as hazardous

Hazard identification	Hazard phrase
H411	Toxic to aquatic life with long lasting effects.

3. Composition/Information on Ingredients

3.1 Hazardous Components

30 mL NO3 -1

Chemical: *m -phenylenediammonium dichloride* CAS No.: 541-69-5
Concentration: < 1,00 %
Formula: $C_6H_{10}Cl_2N_2$

Chemical: *citric acid* CAS No.: 77-92-9
Concentration: 10 - 20 %
Formula: $C_6H_8O_7$

5 g N 3 -2

Chemical: *zinc powder* CAS No.: 7440-66-6
Concentration: 2,5 - 25 %
Formula: Zn

4. First Aid Measures

4.1 General Information

Place injured person out of danger zone to fresh air immediately. Ensure quiet, warmth, and provide resuscitation if necessary. If necessary contact medical advice.

4.1.1 After SKIN Contact

Remove contaminated clothing. Rinse the affected skin or mucous membrane thoroughly under running water. (If possible) use soap.

VISOCOLOR ECO Nitrate Kit- Ref. 931041 (page 2 of 2)

4.1.2 After EYE Contact

After contact with the eyes rinse thoroughly under running water with the eyelid wide open with eye washing bottle, eye douche or running water (protect intact eye).

4.1.3 After INHALATION of Vapours

After inhalation of foam or vapour fresh air should be inhaled. Keep airways free.

4.1.4 After ORAL Intake

After oral intake lots of water should be drunk after it has been ingested.

4.2 Further Medical Treatment/Attention

No additionally recommendations.

5. Accidental Release Measures

5.1 Personal Precautions

Do not breathe vapours. Regular staff training is necessary.

5.2 Methods of Cleaning-up

Bind any escaping liquid with universal binder. Collect small amounts of leaked liquid and flush with water into drains.

6. Handling and Storage

6.1 Handling

In accordance with the testing instructions, that comes with the product.

6.2 Storage

The original product package of MACHEREY-NAGEL allows a safe storage.

6.2.1 Requirements for Stock Rooms and Containers

Keep original product packages tightly closed during handling and storage.

7. Exposure Controls/Personal Protection

7.1 Exposure Controls

Good ventilation and extraction system in the room, floor resistant to chemicals with floor drainage and washing facilities. The highest level of cleanliness must be maintained at the workplace.

7.1.1 Respiratory Protection

Only if additional recommendations in test instruction or packing insert.

7.1.2 Hand Protection

Yes, gloves according EN 374 (permeation time >30 min - level 2), consist of PVC, natural latex, Neopren, or Nitril. Use for short times chemical resistant latex gloves with code EN 374-3 level 1.

7.1.3 Eye Protection

Yes, safety glasses according EN 166 with integrated side shields or wrap-around protection.

7.1.4 Skin Protection

Not necessary.

7.1.5 Personal Hygiene

Eating, drinking, smoking, taking snuff and storage of food in work areas and at outdoor workplaces is prohibited. Avoid contact with the skin, eyes and clothing. Rinse any clothing on which the substance has been spilled, and soak it in water. Wash hands thoroughly with soap and water when stopping work and before eating, and then apply protective skin cream.

8. Disposal Considerations

Please observe local regulations for collection and disposal of hazardous waste and contact waste disposal company, where you will obtain information on laboratory waste disposal. Normally it is possible to empty small amounts (diluted!) into drains.

Full MSDS Datasheet for this Kit available at:**www.mn-net.com/tabid/10787/default.aspx**
or from your WaterWatch Co-ordinator