AM-TBA-X - Investigating unknown sources of water (DRAFT)

1. Purpose and scope

This procedure describes the approach for investigating sources of water that are unable to be immediately diagnosed as originating from South East Water's (SEW) water network. It describes tests that can be performed in the field and through laboratory analysis to determine some of the chemical constituents of a water sample.

2. Responsibility

The Lead Water Operations Engineer and Water Maintenance Manager are responsible for reviewing this procedure. South East Water employees and contractors are responsible for implementation and adherence to this procedure.

3. Definitions

For the purposes of this procedure, unless otherwise stated, the following definitions apply:

Contractors	A person or company that provides services to South East Water where those services are delivered in a South East Water workplace, on South East Water assets or in the name of South East Water. This includes Principal Contractors, Independent Contractors and Consultants.
Employees	A person who works for South East Water including contract hires, agency staff, temporary staff, apprentices or trainees or student gaining work experience or volunteers.

4. Testing Parameters

There are several parameters that can be used to try and determine the potential source of water when the origin is not immediately clear. When in doubt, the collective results from each of these parameter tests may provide evidence of the source.

Some tests are available for infield testing (EC, Fluoride, and pH). Other tests are more suited to our laboratory partners to undertake, collectively called a 'seepage suite'. Lab results, though slower are more reliable, whilst field tests give a quick provisional view. Field tests should not be relied on as the sole source of investigations and should be used with other forms of investigation e.g. acoustic sounding or other forms of leak detection. The parameters of the seepage suite include the following:

4.1 Electrical Conductivity

Electrical conductivity (EC) measures how well water or any other material can conduct electricity and is a measure of how much salt may be present. Drinking (or potable) water should contain very low levels of salt. Refer to *Appendix 2 - Test value reference guidelines* to view the range of values that may be encountered when testing for EC.

If water has travelled through soil before it surfaces, it may absorb any salts present on its journey. Consideration of this must be taken in reaching a conclusion that a leak is not from the water network or private plumbing when looking only at EC levels.

A hand-held probe, such as the examples shown below in Figure 1, can also be used in field tests to get an EC reading. EC is measured in micro siemens (µs).

IMPORTANT: This method should be used prior to undertaking any laboratory testing as very high readings (e.g. >600µs) may rule out drinking water as the source.

Figure 1: EC testing pens/probes

4.2 Fluoride

Fluoride is added to the drinking water supply at Melbourne Water's storages for health benefits and as a requirement of the Victoria's *Health (Fluoridation) Act 1973.* It can potentially be a good indicator of water leaking from a water main or plumbing. Care must be taken when reaching conclusions however, as fluoride can be leached out of drinking water by the surrounding soil prior to surfacing. Fluoride also occurs naturally in seawater, fresh water, soil and air.

A hand-held probe, such as the example shown below in Figure 2, can be used in field tests to get a fluoride reading. Fluoride is measured in mg/l or parts per million (ppm). The average level of fluoride you can expect to see in drinking water is approximately 0.8 mg/l. (PPM)

Commented [PD1]: is this being used currently?

Commented [DM2R1]: No, however the intent is to get some for the team

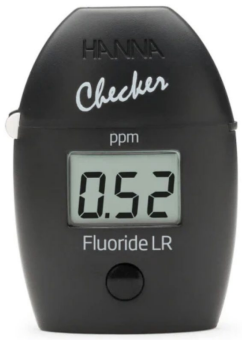

Figure 2: Fluoride low-range checker (0.00 to 2.00 ppm)

4.3 pH

pH is a measure of how acid or alkaline a solution is, and ranges from 0 (acid) to 14 (alkaline) with 7 considered neutral. Drinking water will range from 7 to 9 on the pH scale but, on average, will generally be closer to 7. Water that has been in contact with cement lined pipes, especially in newer water mains, may have a pH above 7, especially if it has travelled for some distance before reaching the sampling point. Refer to the South East Water GIS to determine the pipe material that the local water network has been constructed in when reviewing pH levels.

pH test strips can be obtained for field tests, see figure 3.

Figure 3: pH test strips

The following Tests are only available from laboratory analysis

4.3 Chloride

Commented [PD3]: its mentioned this is an infield test, what equipment is used here?

Commented [DM4R3]: This is only done via a lab test - will make this clearer

Chloride, a salt ion (Cl-), is a common component in various substances. The geological composition of an area can influence the source of chloride ions in seepage, as can factors like the area being close to a salt water beach or estuaries.

While chlorine is a reactive element used as a disinfectant in the drinking water supply, this is not what we are measuring here. Chlorine residual levels within the drinking water supply may not be indicative of the chloride levels present in seepage water.

Lower levels of chloride may be indicative that the water is coming from a water main or plumbing. Higher levels of chloride may be indicative of groundwater but could also be water that has travelled from a leak in a pipe some distance away.

4.5 Sulphate

Sulphate is a substance that occurs naturally in drinking water in small quantities (<3 mg/L) and can be similar in range to that found in storm water -see Appendix 2 for a comparison. Sulphate concentrations in groundwater can vary widely and be dependent on the soil or rock that it flows through. Concentrations higher than 5mg/L may be indicative of a recycled water leak as well as groundwater. Very high levels (>30 mg/L) may be indicative of a sewage leak

4.6 Ammonia

Ammonia levels in drinking water should be very low (<0.004 mg/L) and is rarely found in unpolluted surface water or groundwater. Seepage analysis in areas that have septic tanks used for onsite sewage management, or areas where there is runoff from stock (e.g. cattle) grazing may have higher than normal levels of ammonia present. Very high (>20 mg/L) levels of ammonia present can be a good indicator of a sewage leak in an area with a reticulated sewerage network, especially if combined with high sulphate

5. Equipment & Method of Collection

Sample bottles as shown in figure 4 are to be used when obtaining a water sample for seepage suite testing. The bottles need to be clearly labelled with the stickers shown.

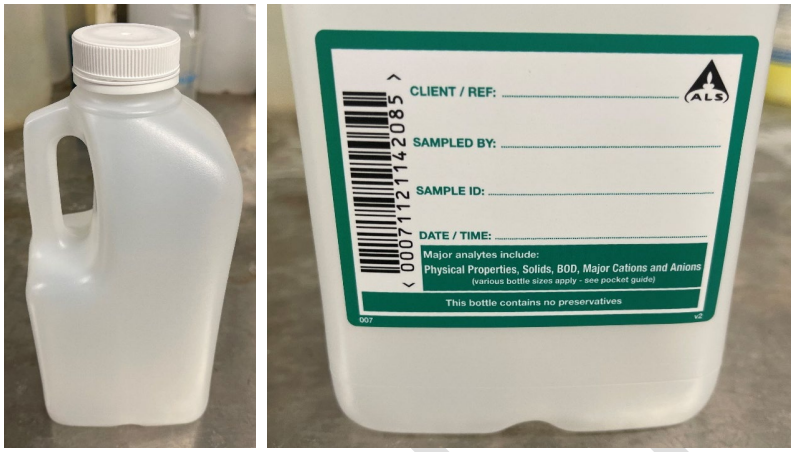

Figure 4: sample bottles and labelling for seepage suite testing

Sample bottles for capturing a water sample are available in the laboratory storage on the Level -1 car park at WatersEdge.

The sample should be collected in a clean bottle, minimising capture of any solids or turbid water, and after at least 24 hours without rainfall if possible. Persons taking the sample should also note if the area is likely to watered regularly with sprinklers.

Once the label has been affixed to the sample bottle, and the sample obtained, the Chain of Custody sheet (see Appendix 2) should be completed. The bottle(s), together with the custody form should be dropped off at the ALS laboratory at 22 Dalmore Drive, Scoresby.

The laboratory will generally be able to provide the test results within 24 hours by email to the person listed on the Chain of Custody form.

Commented [PD5]: do we mention Purchase order, and who receipts the invoices from WQ, i.e. Jed.

Commented [DM6R5]: For the SEW PO 104025 that is on the Chain of Custody form - who's cost centre does that go to?

6. Interpreting results

Due to the variability of results that can be obtained from water samples, it may not be possible to determine with confidence that a leak is coming from a water main or from another source. Results of a seepage suite test should be reviewed collectively to reach a conclusion.

Samplers should confer with the Water Quality team to provide further insight into interpretation of results if required.

7. Safety Requirements

All persons must adhere to BS2769 PPE Requirements for South East Water Sites and BS1565 Ultraviolet Protection & Inclement Weather Procedure.

All persons who perform any trenching and excavation works, regardless of depth, must adhere to BS 2823 Trenching and Excavation Procedure.

If the works are considered high risk construction work (HRCW), a Safe Work Method Statement (SWMS) must be developed for the work and reviewed, agreed and understood by the work party prior to any person entering the space. A list of HRCW activities can be found at the Work Safe website. The BS1209 Safe Work Method Statement Template should be used.

8. Environmental Requirements

Contractors and employees should consider and minimise the environmental risks associated with their works. This includes, but is not limited to, storing materials and vehicles away from trees and vegetation, appropriate storage and management of fuels, oils and chemicals to prevent spills, appropriate waste management, minimising dust generation, air emissions, noise and vibration and preventing sediment laden runoff leaving the site to surrounding land and waterways. The worksite is to be maintained and left in a clean and tidy condition.

9. Related Documents

BS2769 PPE Requirements for South East Water Sites

BS1565 Ultraviolet Protection & Inclement Weather Procedure

BS 2823 Trenching and Excavation Procedure

BS1209 Safe Work Method Statement Template

Revision status

Date	Description	By	Approval by
29/5/2025	Creation of document	Declan McCreesh	

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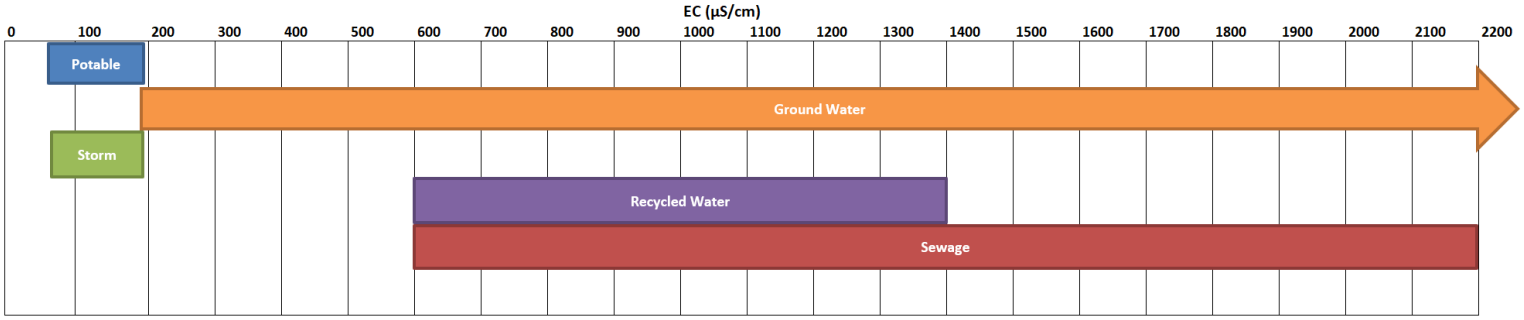
Appendix 1: Test value reference guidelines

Average EC values for seepage analysis



Notes:

- It is possible for potable water to travel a distance and pick up salts that can give a misleading elevated EC, so best to submit a sample to the lab for the seepage parameters if there is no obvious drinking water leak.
- Put comments in Montage referencing whether there has been rain as this may dilute the parameter concentrations within the sample.
- Salt water swimming pool has an EC of 5,970-8,955
- Sea water has an EC of around 55,000

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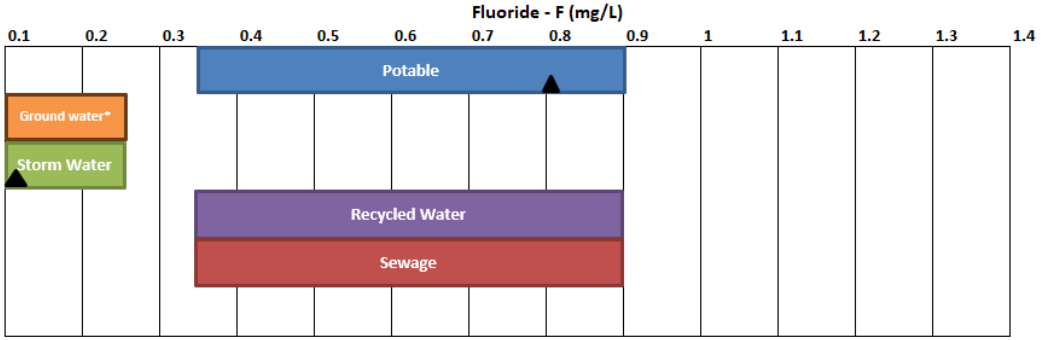
Range of fluoride content for seepage analysis



Notes:

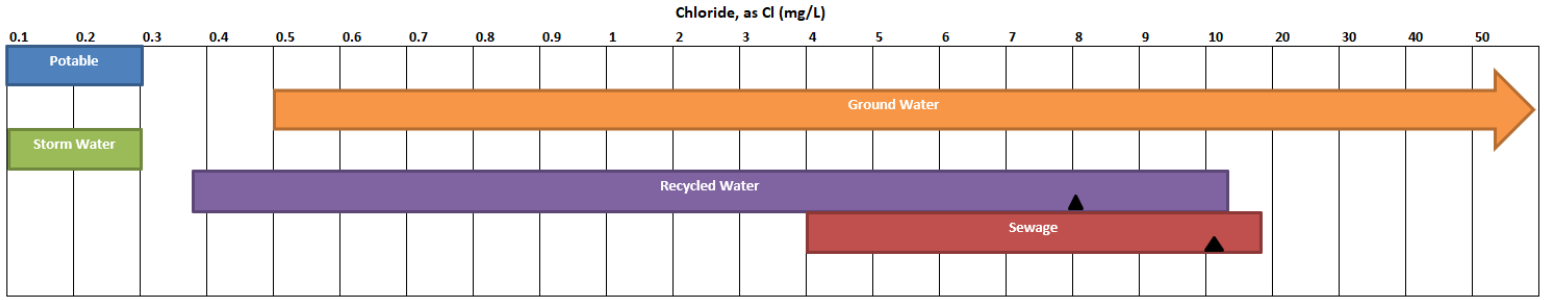
▲ 1-yr average

Source: Mt Martha final effluent analysis for recycled water
Mt Martha influent analysis for sewage
Mornington Backlog sampling ground water
Mornington Backlog sampling stormwater

- *Groundwater can have naturally occuring fluroide in some instances (not common) - if unsure, an upstream sample of groundwater in the area should be sampled for comparison

South East Water

Range of Chloride content for seepage analysis



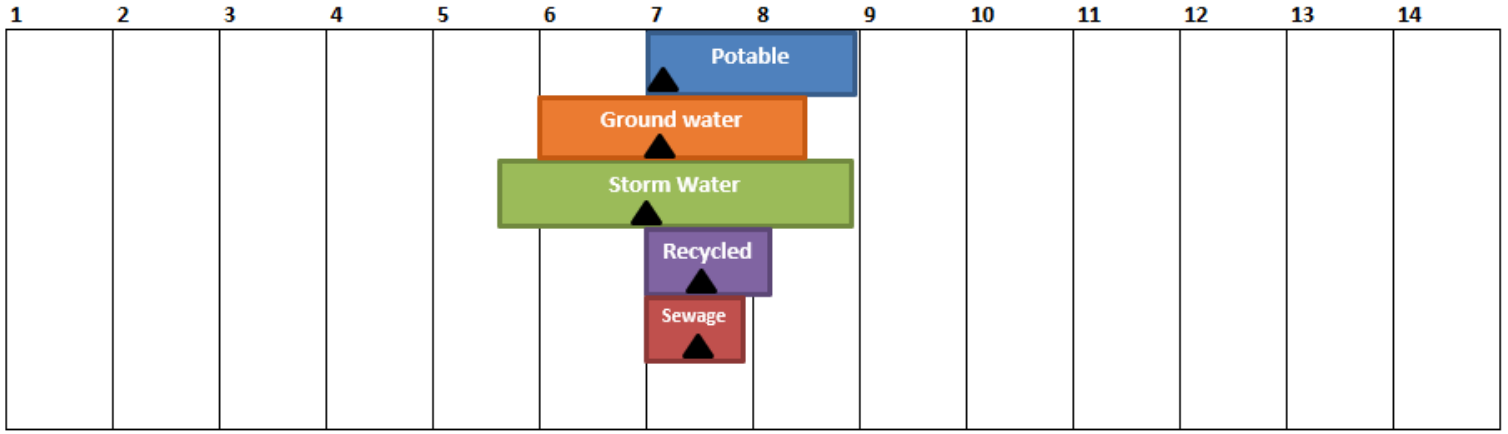
Notes:

▲ 5-yrs average

- This is Chloride, not Chlorine (two different parameters)
- We do not test for Chlorine for a seepage test, as it quickly dissipates from water, so it is not an accurate test to confirm if the water is potable (drinking water) or not

South East Water

Range of pH content for seepage analysis



Notes:

▲ 5-yrs average

Source: Mt Martha final effluent analysis for recycled water
Mt Martha influent analysis for sewage
Mornington Backlog sampling ground water
Mornington Backlog sampling stormwater

- pH of ground water typically 6-8.5
- Storm water potentially lower pH as rain can absorb enough CO_2 to drop pH down to 5.6.

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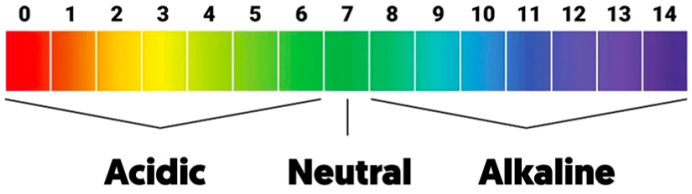
The pH scale is a measure of the acidity or alkalinity of a solution. It ranges from 0 to 14, with 7 considered neutral. A pH value below 7 indicates acidity, with lower values representing stronger acidity.

Values above 7 indicate alkalinity, with higher numbers indicating stronger alkalinity. The scale is logarithmic, meaning each unit change represents a tenfold difference in acidity or alkalinity. It is widely used in chemistry, biology, and environmental science to quantify the acidity or basicity of substances like water, soil, and various chemical solutions.



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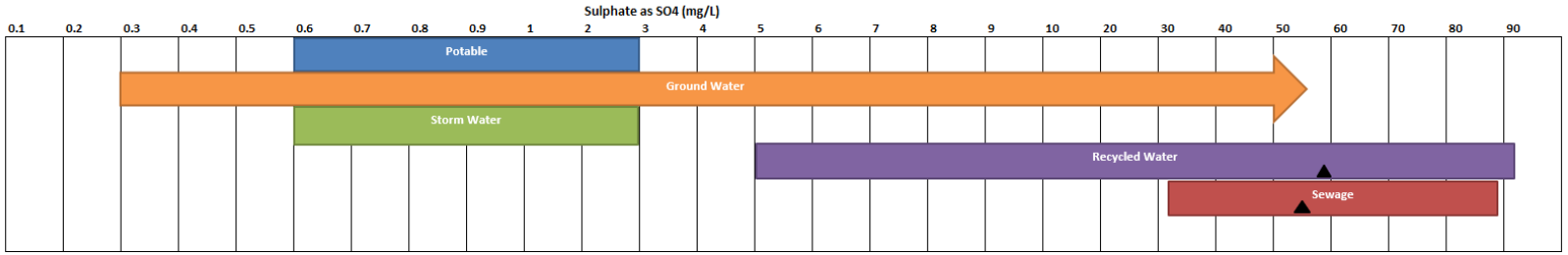
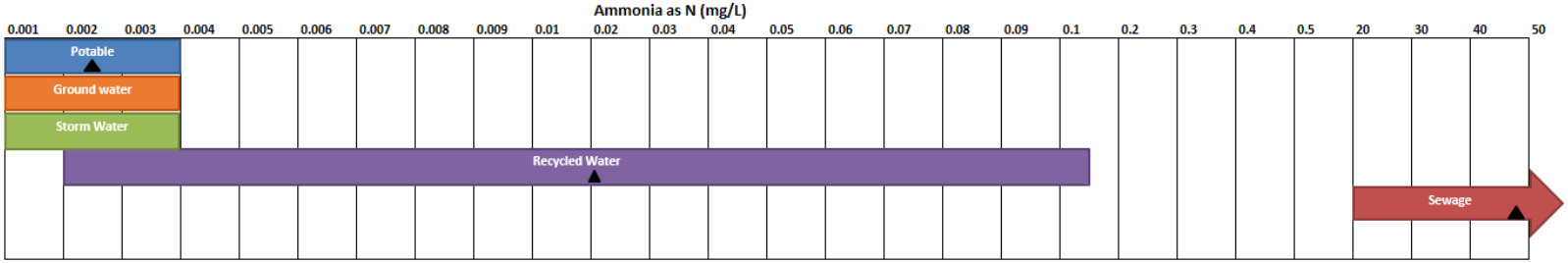
Range of sulphate content for seepage analysis



Notes:
▲ 5-yrs average
Source: Mt Martha final effluent analysis for recycled water
Source: Mt Martha influent analysis for sewage

Average ammonia content for seepage analysis



Notes:
▲ 5-yrs average
- Ammonia can indicate that this is a leak from sewer or septic tank

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Appendix 2: Chain of Custody template to be used for Seepage Suite Analysis

CHAIN OF CUSTODY
Water
ABN: 94 105 060 320
Page.....of.....

Melbourne Office:
22 Dalmore Drive
Scoresby VIC 3179
Phone: 03 8756 8000
Fax: 03 9763 1862
Email: melbournewrg@alsglobal.com

Bendigo Office:
15 Wellsford Drive,
East Bendigo VIC 3550
Phone: 03 5441 0700
Fax: 03 5444 5208
Email: bendigowrg@alsglobal.com

Geelong Office:
16 Crown Street
South Geelong VIC 3220
Phone: 03 5246 9403
Email: geelongwrg@alsglobal.com

Wangaratta Office:
48 Faithfull Street,
Wangaratta VIC 3677
Phone: 03 5722 2688
Fax: 03 5722 4727
Mobile: 0419 007 749
wangaratta@alsglobal.com

Traralgon Office
4/55 Hazelwood Rd,
PO Box 1469
Traralgon VIC 3844
Phone:03 5176 4170
Fax: 03 5176 4473
paul.whiffen@alsglobal.com

Client:	South East Water				**ALS PROGRAM**		SEWMISC						
Contact:					**SEW Ref:**							**ALS Project No:**	
Address:	101 Wells Rd FRANKSTON VIC 3199												
Tel:					W-EC Elec Conductivity	W-F Flouride	W-CL Chloride	W-PH pH	W-SO4-DA Sulphate	W-NH3-DA Ammonia	**Comments**		
Email:											Seepage Suite		
P/O No.:	SEW104025	**Sampler**											
T/A Time:	24 hours												
ALS Sample Number	**Test-list**	**Sample Description**	**Date sampled**	**Time Sampled**									
	SEEPAGE												
	SEEPAGE												
	SEEPAGE												
	SEEPAGE												
	SEEPAGE												
	SEEPAGE												
Special Instructions:	Bottles per sample: **1 x 500mL P (green label)**												

Relinquished By:	**Company:**	**Date:**	**Time:**	**Received By:**	**Company:**	**Date:**	**Time:**
					ALS WRG Scoresby		

This form is for recording of sample data after prior consultation with an analyst regarding sampling procedures and does not over-ride pricing agreements, OHS requirements and our terms and conditions.

As an Occupational Health and Safety consideration, it is a requirement of ALS Water Resources Group that all samples received be undamaged and prior advice given in writing of any potential health risks.

LAB USE ONLY Sample conditions: Samples received undamaged [Yes/No] Samples adequately preserved [Yes/No] Samples within recommended holding times: [Yes/No] Samples transported at appropriate temperature [Yes/No]

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