

H₂S STRIP TEST FIELD KIT FOR MICROBIAL WATER QUALITY ASSESSMENT:

Feedback on usefulness of a monitoring test for rural communities

**Report on Workshop Feedback for the project: A Field Kit
for Microbial Water Quality Assessment in Small and Rural
Communities**

by

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**WRC No: 1105/1/03
ISBN No: 1-86845-984-5**

February 2003

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EXECUTIVE SUMMARY

Background and Motivation

A simple and visual field kit for monitoring microbial water quality (the H₂S strip test) that permits the evaluation of the sanitary quality of water for small community water supplies has been tested and supported in a previous year by the Water Research Commission (Report number 961/1/99).

This method has the potential to operate as a microbial water quality screening test for small communities not in the vicinity of water testing laboratories, or as an “early-warning” system. Correlations between the H₂S method and standard in indicator organisms (heterotrophic plate counts, total and faecal coliforms) have been found to be statistically significant. This is particularly true for the H₂S strip test carried out at room temperature and faecal coliforms, where a correlation of 0.72 ($p=0.000$) was measured and a percentage agreement between the H₂S strip test and faecal coliforms of 86% calculated. These results indicate that the method is suitable to be carried out without incubation. This has numerous benefits, in that samples can be analysed while in the field, transportation is not required and expensive laboratory equipment will not be required. This implies that environmental health officers, field workers or any other individuals taking responsibility for water quality, will be able to carry out this test.

Continuation of the original study was required. One of the issues that needed to be addressed was to establish the suitability of the test for use by environmental health officers. Additional research was also recommended, but this could not be financed within the scope of the project.

Small community water supplies in South Africa have been shown to have notoriously poor water quality. This highlighted the necessity firstly, to have a rapid and reliable method, which can be used by environmental health officers and community water committees to pinpoint where potential problems exist and secondly, identifying where further investigations or remedial action is necessary. This would allow public health concerns related to water quality to be identified and addressed, thereby assisting in the reduction of the public health burden of small communities. In addition, a simple and visual method to assess water quality could be used to increase the awareness of both the environmental health officers, field workers in the water management arena and communities themselves to potential health risks associated with contaminated water. Thirdly, and most significantly, is the potential of this proposed method for evaluating the microbial quality of water without the need for expensive laboratory equipment.

This method was tested in the field in other countries internationally and was found to be effective in increasing the awareness of the communities regarding water quality issues. The field kit under investigation is based on an H₂S strip test, which causes contaminated water to turn black, providing a very effective visual mechanism for illustrating contamination of water supplies.

Aim

The aim of the project was to test the proposed field kit with environmental health officers for its use in managing small water supply systems, particularly in areas where monitoring would not normally take place. A major component of the project involved technology transfer.

Methodology

This study focused on assessing the usefulness of the H₂S strip test as a microbial water-quality monitoring tool. Environmental health officers were invited to take part in the study to assess the H₂S strip test and provide feedback. Environmental health officers from a large geographical area were included in the study, namely Northern Cape, Free State, Eastern Cape, Western Cape and Kwazulu Natal. The first workshop was held on 28 September 2000 in Bloemfontein where forty participants were given a presentation on the H₂S strip test, followed by a demonstration of the test. They were asked whether they would be prepared to test the methodology and to provide feedback at a follow-up workshop to be held six weeks later. The follow-up workshop took place with 87% of the original workshop participants re-attending to provide feedback on their experiences with the test. Environmental health officers from the Western Cape also participated in the study and attended a similar workshop in Wellington.

Results

The general experiences with the H₂S strip test as a tool for monitoring water quality was exceptionally positive. The negative experiences were minor. The general consensus was that the test was extremely useful and easy to use. The major concern of the environmental health officers, with regards to using the H₂S strip test, was that when laboratory analyses were carried out on the same water samples the results often differed, i.e. the lab tests would be negative for total and faecal coliforms whereas the H₂S test was positive.

Conclusions

The H₂S strip test is a successful and useful test for monitoring microbial water quality in small communities not in the vicinity of water testing laboratories. It is also useful as an “early-warning” system. The environmental health officers found the H₂S strip test a very easy and user-friendly test to use, but a major concern was that on occasion the result differed from the standard indicator organism tests (either total or faecal coliforms) i.e. the lab tests would be negative for total and faecal coliforms whereas the H₂S test was positive.

Recommendations for Future Research

Future research should investigate the robustness of the test, with particular reference to withstanding extreme temperature variations during the test period. This is regarded as extremely important as the test cannot be endorsed if this has not been established.

Technology Transfer

The main focus of this study has been on technology transfer, with the H₂S strip test being demonstrated and explained to environmental health officers throughout a large geographical area.

ACKNOWLEDGEMENTS

The funding for this project by the Water Research Commission and the constructive contribution by the steering committee are greatly appreciated.

The steering committee included the following individuals:

Mrs APM Moolman (Chair)	Water Research Commission
Ms EA Venter	CSIR
Mr SN Venter	Univ Pretoria
Ms N Potgieter	Univ Venda
Dr MNB Momba	Univ Fort Hare
Ms D Mhlophe	Department of Health
Mr T Pule	Department of Health
Mr RA Roos	SABS
Mr S Mosai	IWQS
Dr M van der Walt	Water Research Commission (Committee Secretary)

The input from the environmental health practitioners that participated in the study is greatly appreciated. A list of all participating environmental health practitioners (EHPs) is provided in Appendix 1. Thanks are particularly due to these EHPs for their willingness to spend time travelling to attend the workshops and to take time out of their busy schedules to participate in the study. This is greatly appreciated by the project team.

Report on Workshop for: A Field Kit For Microbial Water Quality Assessment in Small And Rural Communities

1. INTRODUCTION

A simple field kit for monitoring microbial water quality (the H₂S strip test) that allows the evaluation of the quality of water for small community water supplies has been tested and supported by the Water Research Commission in 1999 (Report number 961/1/99).

The aim of the project was to evaluate the H₂S strip test as a field kit for microbial water quality testing with environmental health officers for its use in managing small water supply systems. This is particularly applicable in areas where monitoring would not normally take place.

The study focused on assessing the usefulness of the H₂S strip test as a microbial water-quality monitoring tool. Environmental health officers were invited to take part in the study to assess the H₂S strip test and provide feedback. Environmental health officers from a large geographical area were included in the study, namely Northern Cape, Free State, Eastern Cape, Western Cape and Kwazulu Natal.

2. METHODOLOGY AND RESULTS

Two main workshops were held. The first workshop served to introduce the kit to the environmental health officers and the second to obtain the feedback on their experiences with the kit.

The first workshop was held on 28 September 2000 at the Free State Technikon in Bloemfontein, where forty participants were given a presentation on the H₂S strip test followed by a demonstration of the test. They were asked whether they would be prepared to test the methodology and provide feedback at a follow-up workshop to be held six weeks later. Approximately 6-10 test kits were provided to each participating office, and background information, together with a one-page instruction sheet, was provided with the kits.

The follow-up workshop took place with 87% of the original workshop attending to provide feedback on their experiences with the test.

A separate (but similar) workshop was also held in Wellington in the Western Cape during the latter part of 2000, involving a small group of environmental health officers. A follow-up workshop was held in Stellenbosch to obtain feedback.

This report describes the feedback and experiences of the participating environmental health officers.

2.1. First Workshop for Environmental Health Officers on the H₂S Strip Test

Held at: Free State Technikon
On: 28 September 2000

A workshop for environmental health officers was held at the Free State Technikon, Bloemfontein. The aim of the workshop was to introduce the H₂S strip test to the environmental health officers. A presentation was given providing background information regarding the test and a demonstration of how to use the test. Sample kits were distributed to the participants and it was agreed that the environmental health officers would test the kit during the course of their duties and be prepared to attend the follow-up workshop to provide feedback on their experiences with the kit.

2.2. Second Workshop for Environmental Health Officers- Feedback on the H₂S Strip Test

Held at: Free State Technikon
On: 9 November 2000

Following the 28 September 2000 workshop, thirty-three environmental health officers from the Free State, Kwazulu-Natal, Northern Cape and Eastern Cape attended the workshop to provide feedback on their experiences of using the H₂S strip tests for assessing drinking water quality (see Appendix 1 for a list of participants).

The environmental health officers were provided with H₂S sample bottles and they presented both results and feedback on the test.

Results were presented in a table format (Table 1) as provided to the environmental health officers and as illustrated below. Feedback was collected during the second, follow-up workshop.

Feedback comments are summarised and presented in Table 2. The detailed feedback from the participating environmental health officers is presented in Appendix 2.

The general consensus was that the test was exceptionally useful and easy to use. The major concern of the environmental health officers with regards to using the H₂S strip test, was that when laboratory analyses were carried out on the same water samples the results often differed, i.e. the lab tests would be negative for total and faecal coliforms whereas the H₂S test was positive.

A user guide is provided in Appendix 3.

2.2.2 Table 2. Summarised Feedback: comments from participating environmental health officers.

General Feedback		
Positive comments	Negative comments	Points of concern
• Of great help to EHOs, especially in rural areas • No difficulties experienced in carrying out the tests • User friendly and easy to use X8 • No real knowledge of microbiology needed • Very useful and cost effective X3 • Fast result • Useful for indication of faecal pollution • Very handy and portable • Colour change easy to read • Convenient as no large cooler bags needed to transport samples • Easy to transport sample bottles and samples • Cheap, fast and easy • Fast detection of problems • Accurate reflection of water quality • Very easy to use, but if results differ from lab results, then confusing • Cost effective • Excellent tool for Health Education • Of great help to EHOs especially in the rural areas	Unreliable Bottles leaked - Smells bad! Unreliable Results can be confusing when compared to laboratory indicator organism results Results differ from laboratory results of indicator organisms! Are the results accurate when compared to coliforms?	What is the shelf life? X2 Can the empty sample bottles be exposed to temperature fluctuations – i.e can the bottles be left in a hot car? If the results develop faster does that mean there are more organisms present? Will high nitrate / nitrite concentrations inhibit the formation of black colour or interfere in any way with the test? Can the test be used to test milk? Will the community be able to use the test Can the sample bottles be stored at any temperature –i.e. before water is added? Concerned that town's drinking water was positive! If the sample turns black faster, does it mean there are more organisms?

Suggested that a carrying case for the bottles be developed X 3

3. CONCLUSIONS

The H₂S strip test is a successful and useful test for monitoring microbial water quality in small communities not in the vicinity of water testing laboratories. It is also useful as an “early-warning” system. The environmental health officers found the H₂S strip test a very easy and user-friendly test to use, but a major concern was that on occasion the result differed from the standard indicator organism tests (either total or faecal coliforms) i.e. the lab tests would be negative for total and faecal coliforms whereas the H₂S test was positive.

4. RECOMMENDATIONS FOR FUTURE RESEARCH

Future research should investigate the robustness of the test. This will entail investigating the ability of the H₂S strip test to withstand extreme conditions, with particular reference to withstanding extreme temperature variations during the test period. The latter is regarded as extremely important as the test cannot be endorsed if this has not been established. Research will need to confirm that the kit is suitable for remote areas experiencing extreme temperature variations, and that the kit has been adequately tested in the field to allow endorsement of the kit.

Once the final research results are available it is envisaged that the H₂S field kit can be endorsed by both the Department of Health and the Department of Water Affairs and Forestry as a portable, easy to use and affordable microbial water quality monitoring test kit. This comprises the first steps in providing a kit to ensure the protection of public health, by allowing water quality in small communities to be monitored and adequately managed.

APPENDIX 1

Attendance List of Workshop Participants

1st WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIOLOGICAL QUALITY OF WATER (H₂S Strip test)

DATE: SEPTEMBER 28, 2000

	Surname and Name	Title	Organisation	District / Area	Postal address	Tel No	Fax No	E-mail
1	Steyn, Maronel	Ms	CHERD	Bloemfontein	Libertas no.1, Pres. Boshoff Ave	(051) 507 - 3432	(051) 507 - 3355	msteyn@tofs.ac.za
2	Jagals, Corinne	Ms	CHERD	Bloemfontein	PO Box 26206, LHP, BFN, 9300	(051) 507 - 3432	(051) 507 - 3355	cjagals@tofs.ac.za
3	Labuschagne, Andries	Mr	TLC		PO Box 3,	(051) 853 - 1111	(051) 853 1322	buotle@netactive.co.za
4	Nel, Francois	Mr	TLC	Middelburg	PO Box 55, Middelburg	(049) 842 - 1133	(049) 842 - 3582	fnel@intekom.co.za
5	De Wet, Gisela	Ms	District / Health	Welkom	Private Bag X15, Welkom, 9450	(057) 357 - 2428	(057) 352 - 9155	
6	Van Tonder, Izanne	Ms	TLC	Virginia	Private Bag X7, Virginia, 9430	(057) 212 - 3111	(057) 212 - 2885	
7	Groenewald, Piet	Mr	TLC (E.H.)	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8309	(051) 405 - 8310	Genees11@civic.bfncouncil.co.za
8	Swart, Pierre	Mr	TLC	Harrismith	PO Box 43, Harrismith, 9880	(058) 622 - 1061	(058) 623 - 0923	
9	Viljoen, Hannes	Mr	TLC	Harrismith	PO Box 43, Harrismith, 9880	(058) 622 - 1061	(058) 623 - 0923	
10	Molapo, Abie	Mr	District / Health	Botshabelo	Private Bag X527, Botshabelo	(051) 533 - 0203	(051) 534 - 1096	
11	Mokoena, Simon	Mr	District / Health	Thaba Nchu	Private Bag X 707, Selososha, 9783	(051) 873 - 2232	(051) 873 - 2233	
12	Tshikare, Rehilwe	Ms	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 432 - 4776	(051) 405 - 8310	
13	Lepaku, Edward	Mr	TLC	Ladybrand	PO Box 64, Ladybrand	(051) 924 - 0654	(051) 944 - 0020	
14	Swart, Johnny	Mr	Kalahari DR	Kuruman	PO Box 1480, Kuruman	(053) 712 - 1001	(053) 712 - 2502	
15	Du Toit, Pieter	Mr	Kalahari DR	Kuruman	PO Box 1480, Kuruman	(053) 712 - 1001	(053) 712 - 2502	
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17	Coetzee, Deon	Mr	Diamant Field DC	Northern Cape	Private Bag X 6088, Kimberley	(053) 838 - 0981	(053) 861 - 1538	
18	Fisher, Bryan	Mr	Diamant Field DC	Northern Cape	Private Bag X 6088, Kimberley	(053) 838 - 0911	(053) 861 - 1538	ddr@com.za
19	Kirsten, Marius	Mr	Diamant Field DC	Northern Cape	Private Bag X 6088, Kimberley	(053) 838 - 0911	(053) 861 - 1538	
20	Snyman, Kobus	Mr	Municipality	Kuruman	PO Box 4, Kuruman	(053) 712 - 1095	(053) 712 - 3581	
21	Van Rooyen, Alex	Mr	Municipality	Kuruman	PO Box 4, Kuruman	(053) 712 - 1095	(053) 712 - 3581	
22	Du Plessis, Hennie	Mr	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8311	(051) 405 - 8310	

1st WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIOLOGICAL QUALITY OF WATER (H₂S Strip test)
DATE: SEPTEMBER 28, 2000

	Surname and Name	Title	Organisation	District / Area	Postal address	Tel No	Fax No	E-mail
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24	Smith, William	Mr	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8315	(051) 405 - 8310	
25	Jacquire, Russell	Mr	Dept of Health	DC 16. S-FS	PO Box 69, Phillipolis	(051) 447 - 2194		
26	Du Toit, C	Mr	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8746	(051) 405 - 8310	Genees23@civic.bfncouncil.co.za
27	Rode, Ludwig	Mr	TLC / POR	Odendaalsrus	PO Box 21, Odendaalsrus, 9480	(057) 391 - 8523	(057) 398 - 2072	
28	Matlhabu, Moses	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0143	(058) 713 - 0318	
29	Ntsoara, George	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0515	(058) 713 - 0318	
30	Motlatla, Mokete	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0515	(058) 713 - 0318	
31	Janse v Rensburg, Lizel	Ms	Dept of Health	Bethlehem	PO Box 560, Bethlehem, 9700	(058) 303 - 5581	(053) 303 - 5063	
32	Van Zyl, Johan	Mr	TLC	Frankfort	PO Box 2, Frankfort, 9830	(058) 813 - 1051	(058) 813 - 3072	fftmun@lantic.net
33	VD Westhuizen, Leon	Mr	Dept of Health	Kroonstad	PO Box 728, Kroonstad, 9500	(056) 212 - 2271	(056) 52317	
34	Els, Riaan	Mr	Dept of Health	Zastron	PO Box 20, Zastron, 9950	(051) 673 - 1018	(051) 673 - 1055	
35	Rispel, Melanie	Ms	Dept of Health	Jan Kempdorp NC	PO Box 241, Jan Kemp, 8550	(053) 456 - 0111	(051) 456 - 0022	
36	Jacobs, Paulus	Mr	DD Council	Northern Cape	Private Bag X6088, Kimberley, 8300	(053) 838 - 0909	(053) 861 - 1538	ddr@com.za
37	Mbane, Zanozuko	Mr	DD Council	Eastern Cape	Private Bag 102, Barkley East, 9786	(045) 971 - 1058	(045) 971 - 0251	
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39	Mkula, Frank	Mr	TLC	Phuthaditjhaba	Private Bag 805, Phuthaditjhaba	(058) 713 - 0884	(058) 713 - 5101	
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FOLLOW - UP WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIOLOGICAL QUALITY OF WATER (H₂S Strip test)

DATE: NOVEMBER 09, 2000

	Name and Surname	Title	Organisation	District / Area	Postal address	Tel No	Fax No	E-mail
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4	Snyman, Kobus	Mr	Municipality	Kuruman	PO Box 4, Kuruman	(053) 712 - 1095	(053) 712 - 3581	
5	Mooi, Armstrong	Mr	Dept of Health	Bethulie		(051) 673 - 1018	(051) 673 - 1550	
6	Mbane, Zanozuko	Mr	DD Council	Eastern Cape	Private Bag 102, Barkley East, 9786	(045) 971 - 1058	(045) 971 - 0251	
7	Mkula, Frank Mongezi	Mr	TLC	Phuthaditjhaba	Private Bag 805, Phuthaditjhaba	(058) 713 - 0884	(058) 713 - 5101	
8	Du Plessis, Hennie	Mr	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8311	(051) 405 - 8310	
9	Du Toit, C	Mr	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8746	(051) 405 - 8310	Genees23@civic.bfncouncil.co.za
10	Le Grange, Hannes	Mr	TLC	Bloemfontein	PO Box 20007, Willows, 9320	(051) 405 - 8302	(051) 405 - 8310	
11	VD Merwe, JJ	Mr	TLC	Bloemfontein		(051) 405 - 8313	(051) 405 - 8310	
12	Tshikare, Rehilwe	Ms	TLC	Bloemfontein	PO Box 3704, BFN, 9300	(051) 432 - 4776	(051) 405 - 8310	
13	Majoro, Tshidi	Mrs	TLC	Phuthaditjhaba	PO Box 805, Phuthaditjhaba	(058) 713 - 0884	(058) 713 - 5101	
14	Ntsoara, George	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0515	(058) 713 - 0318	
15	Motlatla, Mokete	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0515	(058) 713 - 0318	
16	Letona, Mohlahli	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0515	(058) 713 - 0318	
17	Matlhabu, Moses	Mr	Dept of Health	Qwa Qwa	PO Box 824, Witsieshoek, 9870	(058) 713 - 0143	(058) 713 - 0318	
18	Swart, Pierre	Mr	TLC	Harrismith	PO Box 43, Harrismith, 9880	(058) 622 - 1061	(058) 623 - 0923	
19	Viljoen, Hannes	Mr	TLC	Harrismith	PO Box 43, Harrismith, 9880	(058) 622 - 1061	(058) 623 - 0923	

Cont. FOLLOW - UP WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIOLOGICAL QUALITY OF WATER (H₂S Strip test)

DATE: NOVEMBER 09, 2000

	Name and Surname	Title	Organisation	District / Area	Postal address	Tel No	Fax No	E-mail
20	Nel, Francois	Mr	TLC	Middelburg	PO Box 55, Middelburg	(049) 842 - 1133	(049) 842 - 3582	fnel@intekom.co.za
21	Groenewald, Piet	Mr	TLC (E.H.)	Bloemfontein	PO Box 3704, BFN, 9300	(051) 405 - 8309	(051) 405 - 8310	Genees11@civic.bfncouncil.co.za
22	Mokoena, Simon	Mr	District / Health	Free State Prov	Private Bag X 707, Selososha, 9783	(051) 873 - 2232	(051) 873 - 2233	
23	Sekhabisa, PJ	Mr	TLC	Thaba Nchu		(051) 874 - 1296	(051) 875 - 1391	
24	Lencoe, Kale	Mr	TLC	Botshabelo		(051) 533 - 0203	(051) 534 - 1096	
25	Rispel, Melanie	Ms	Dept of Health	Jan Kempdorp NC	PO Box 241, Jan Kemp, 8550	(053) 456 - 0111	(051) 456 - 0022	
26	Jacquire, Russell	Mr	Dept of Health	DC 16. S-FS	PO Box 69, Phillipolis	(051) 447 - 2777	(051) 673 - 1550	
27	Els, Riaan	Mr	Dept of Health	Zastron	PO Box 20, Zastron, 9950	(051) 673 - 1018	(051) 673 - 1055	
28	Swart, Johnny	Mr	Kalahari DR	Kuruman	PO Box 1480, Kuruman	(053) 712 - 1001	(053) 712 - 2502	Genees23@civic.bfncouncil.co.za
29	Du Toit, Pieter	Mr	Kalahari DR	Kuruman	PO Box 1480, Kuruman	(053) 712 - 1001	(053) 712 - 2502	
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35	Jagals, Corinne	Ms	CHERD	Bloemfontein	PO Box 26206, LHP, BFN, 9300	(051) 507 - 3432	(051) 507 - 3355	cjagals@tofs.ac.za
36	Nel, Saartjie	Ms	Technikon Free State	Bloemfontein		(051) 507 - 3134	(051) 507 - 3355	saartjie@scientist.com

And in the Western Cape: Julian Kruger of the Winelands District Council, Stellenbosch; tel 021-887 2900, fax 021-8879365

Appendix 2
Workshop Feedback

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H2S STRIP TEST)					
FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	051 447277	Remarks
Russell Jacquire	DC 16	Posbus 227 Bloemfontein 9300	Fax		
			E-mail	jacquir@doh ofs.gov.za	
Date	Location	Type of sample (eg tap water ground water etc)	H2S strip response +/-		
00.10.17	Dairy	Tap from borehole/ in melkshed	+		
00.10.17	Petrusburg Clinic	Tap from borehole	-		Water is chlorinated
00.10.17	Petrusburg District Farm School	Bottles at school from borehole +/- 200m from source	-		Not sure if water is chlorinated
00.11.06	Jagersfontein hospital (Spring water)	Tap	-		Chlorinated

**WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING**

Person	District / Area	Postal Address	Tel	058-3035331 x2109 058-3035581	Remarks
Mej E Janse van Rensburg	Bethlehem	Omgewingsgesondheid Posbus 560 Bethlehem 9700	Fax	058-3034548	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.11.01	Elim Kleinhowe Bethlehem Distrik	Boorgat	-		
00.11.01	Pekalong Hospitaal Bethlehem	Kraan	-		
00.11.02	Arizona Restaurant Senekal Distrik	Kraan in voedselperseel (boorgat)	+		swart
00.11.02	Mokoadi B&B Clocolan distrik	Kraan in voedselperseel (boorgat)	-		
00.11.02	Clocolan Hospitaal Clocolan	Kraan in Teater	-		
00.11.02	Elim Kleinhowe Bethlehem distrik	Boorgat	+		swart
00.11.02	Susanna's vlei Bethlehem distrik	Boorgat	-		

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	057 3918523	Remarks
Ludwig Rode	Odendaalsrus	Posbus 21 Odendaalsrus TLC 9480	Fax	057 3982072	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.10.09	Klein Bftn. Farm Onrus	Bore-Hole (Tap) Dairy	Pos +		Sampled 10h00 – positief na 2 dae
00.10.11	Odendaalsrus Stortingsterrein	Kraanwater vir Arbeidershuise	Pos +		Monster 10h00 begin swart kolle op Bottelbodem – 100% + na 5 dae
00.10.12	Arbeidershuise Mun. Weikamp	Kraanwater – Munisipaal	Pos +		Positief na +/- een week
00.10.17	Plaas – Klein Bloemfontein	Boorgatwater/Melkstal Opvolgmonster	Pos + 18/10/2000		

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)				
FEEDBACK FROM FIELD TESTING				
Person	District / Area	Postal Address	Tel	058 7130884
Tshldi Majoro	Phuthaditjhaba Qwa Qwa Area	Private Bag X805 Phuthaditjhaba 9866	Fax	058 7135101
			E-mail	
Date	Location	Type of sample (eg tap water ground water etc)	H₂S strip response +/-	
00.10.06	Kolla-Tshwene	Catchment Area	Positively	
00.10.12	Mabolela	Tap	No Response	
00.10.16	Disaster Area	Informal Settlement House	Positive	

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)					
FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	051- 8732233	Remarks
M S Mokoena	Thabanchu	Movoka Hospital Private bag X707 P O Selosesha 9783	Fax	051-8732233	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H₂S strip response +/-		
00.10.13	Thabisi – Ramahidsi Primary School	Ground water	+		Source of water:- Borehole water kept in the Cement Reservoir. This borehole was broken for two years. The principal was doubtful about the contamination of the water especially from this Cement Reservoir. The sample was taken of the tap situated next to the school building.

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	057-3521453	Remarks
G a de Wet	DC 18 (Welkom)	Private Bag X15 Welkom 9460	Fax	057-3529155	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H₂S strip response +/-		
00.10.23	Herzogville	Tapwater	Neg -		
00.10.23	Dealesville	Tapwater	Neg -		
00.10.23	Tewaranang Dealesville	Tapwater	Pos +		
00.10.23	Wesselsbron	Tapwater	Pos +		
00.10.31	Kopano	Tapwater	Neg -		
00.11.06	Vierhoekskool	Tapwater	Pos +		
00.11.06	Theunissen	Tapwater	Neg -		

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)					
FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	056-2122271	Remarks
Leon vd Westhuizen	Kroonstad	Posbus 728 Kroonstad 7500	Fax	056-2151673	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.11.01	Viljoenskroon	Tapwater	+	Sample taken at Take Aways	
00.11.01	Viljoenskroon	Borehole water	+	Sample taken at home baking premises on farm	
00.11.01	Viljoenskroon	Borehole water	+	Sample taken at informal settlement on farm	
00.11.02	Koppies	Borehole water	-	Sample taken at cash store	
00.11.06	Kroonstad	Tap water	-		

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST) FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	053-712 1095	Remarks
JA van Rooyen	Kuruman	PO Box 4 Kuruman 8460	Fax	053-712 3581	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00-10-17	Office	Tap water	+ after 48 h		First became murky then black Tested for Total coliforms and E coli- both negative!
00-10-17	Mothibistad Admin block building	Tap	-		
00-10-17	Moroping Settlement	Community tap (Donkey cart 10 containers for distribution)	+ after 30 hours		Water could possibly be contaminated – reservoir –pipeline-tap
00-10-17	Ncweng	Container water	+ after 48 h		Some people complained of dysentery. Water has a bad taste (brackish). Water from borehole-windmill - reservoir
00-10-17	Bankhara	Community tap along road near school	+ after 30 hours		Water from boreholes-reservoir reticulation community taps
00-10-17	Plot 2428	tap on plot	+ after 24 hours		Water also tested for coliforms and E coli – both positive (58 & 36/100ml) Investigation showed that water from irrigation canal may have contaminated borehole
00-10-17	Bambi Creche	Kitchen tap Plot borehole	+ after 24 h		Borehole could be contaminated by 3 pit latrines. NB Crèche is attended by 100 children so must be further investigated. Follow up sample was negative for coliforms and E coli.

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST) FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	053-712 1095	Remarks
JA van Rooyen	Kuruman	PO Box 4 Kuruman 8460	Fax	053-712 3581	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00-10-17	Clive Butchery	Open container with a cup attached to a string for all to use	—		Result is NOT trusted as there are so many routes for contamination to occur.
00-10-17		unpasteurized milk	— ¹		

¹ We now know that the test does not work on milk

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST) FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	051-4058313	Remarks
J. v.d. Merwe	Bloemfontein TLC	Bus 3704 Bloemfontein 9300	Fax	051-4058310	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H₂S strip response +/-		
00/10/09	B.J's Avenham	Borehole	+	Sample 1	12/10/00 – Black Colour
00/10/16	M. Le Roux	Borehole	-	Sample 2	20/10/00 – Brown/Yellow colour
00/10/26	A Buys (Rooiwal)	Borehole	-	Sample 3	30/10/00 - Brown/Yellow colour
00/10/12	J. Taljaard (Eden)	Borehole	+	Sample 4	16/10/00 - Black Colour

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	051 533 0203	Remarks
T A Molapo	Botshabelo	Botshabelo Hospital P/Bag x527 Botshabelo	Fax	051 534 1096	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.10.09	Sectrion F	Groundwater-well	+		Visible contamination could be observed
(15h20)	Farming Project	Groundwater-piped	+		No visible contamination
					Results were obtained in less than 48 hrs.
00.10.11	Hospital Kitchen	Tap Water	+		Results were obtained in less than 48 hrs
(08h15)		(purified water)			
00.10.13	Hospital Kitchen	Tae Water			Repeat samples
		- Sterile Tap	+		
		- Unsterile Tap	+		
00.10.16	1736 Block F	Tap Water	-		Changed colour after ~ 21 days!
(11h35)					
00.10.16	Bots Municipality	Tap Water	-		Changed colour ~ 5 days

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)				
FEEDBACK FROM FIELD TESTING				
Person	District / Area	Postal Address	Tel	051-8531111
Andries Labuscagne	Bultfontein	P.O. Box 3 BULTFONTEIN 9670	Fax	051-8531332
			E-mail	buotlc@netactive.co.za
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-	
00/10/02	Kalkdam (Farm)	Borehole	+	
00/10/05	Clinic Bultfontein	Tap – Water Treatment Facility	+	
00/10/05	Marquard Str (412)	Tap – Water Treatment Facility	-	
00/10/05	Pastorie Str (407)	Borehole	-	
00/10/20	Technical Offices	Tap – Water Treatment Facility	-	
00/10/20	Phahameng	Tap – Water Treatment Facility	-	
00/10/20	Lusernkamp	Municipality – Borehole	-	

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	053 7121221	Remarks
P.D. Du Toit	Kalahari Distriks-Raad	Posbu 1480 Kuruman 8460	Fax	053 7122502	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00/10/17	Vanzylrus: Hotel	Drinkwater	+		Op 20/10/00 4H30 nie verkleur Psitief op Maandag 23/10/00
00/10/17	Vanzylrus: Skool	Riool	+		Positief binne 72 uur
00/10/17	McCarty'srest	Swembad water	-		Negatief
00/11/06	Burgershoop	Drinkwater	-		Negatief
00/11/06	Beginsel	Drinkwater	+		Positief binne 72 uur
00/11/06	Kaufmann	Swembadwater	-		Negatief
00/11/06	Alex	Drinkwater	+		Positief binne 72 uur

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)					
FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	Remarks	
Lepaku Edwards	Ladybrand	P.O. Box 64 Landybrand 9745	Fax		
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00/09/29	Municipal office in town	Tap	-	No further samples taken	
00/09/29	Municipal offices Township	Tap	-	No further samples taken	
00/09/29	Clinic	Tap	-	No further samples taken	
00/09/29	Township	Tap	-	No further samples taken	
00/10/02	Reservoir	Reservoir	-	No further samples taken	
00/09/02	Bakery	Tap	-	No further samples taken	
00/09/02	Township	Tap	-	No further samples taken	

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H ₂ S STRIP TEST)					
FEEDBACK FROM FIELD TESTING					
Person	District / Area	Postal Address	Tel	051 482 4776 ext. 281	Remarks
Rehilwe Tshikare	Mangaung Bloemfontein	P O Box 3704 Bloemfontein 9300	Fax	051 405 8310	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.11.06	Batho Clinic	Tap Water	Negative		(03h00)
00.11.06	8918 Joe Slovo	Tap Water	Negative		(15h30)
00.11.06	Phelindaba	Tap Water	Negative		(19h30)
00.11.06	Hostel 1	Tap Water	Positive		(16h45) Changed colour within 24 hrs.
00.11.07	Pelonomi Hospital	Scoop from dam Supplying hosp. (Reservoir)	Negative? became Postive		(10h20)

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST)
FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	049 842 1133	Remarks
P Nel	Middelburg Eastern Cape	P O Box 55 Middelburg 5900	Fax	049 842 3582	
			E-mail	fnel@intekom.co.za	
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00.10.10	Midios	Tap	-		Easy ran quick screening of H ₂ O
00.10.25	Town	Tap	-		Of supply ????
00.11.02	Town	Tap	-		
00.11.02	KwanorizamR	Tap	-		Big Help in Health Education
00.11.03.	KwanorizamR	Tap	-		Health Workers can use it
00.11.03	Lusaka	Bucket	+		No bacteriological knowledge needed
00.11.03	Lusaka	Bucket	+		
00.11.03.	Lusaka	Tap	-		

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

[illegible]

WORKSHOP: A FIELD KIT FOR ASSESSING THE MICROBIAL QUALITY OF WATER (H₂S STRIP TEST) FEEDBACK FROM FIELD TESTING

Person	District / Area	Postal Address	Tel	051 8732233	Remarks
M.S. Mokoena	Thaba’Nchu	Movoka Hospital Private Bag X707 Selosesha 9783	Fax	051 8732233	
			E-mail		
Date	Location	Type of sample (eg tap water ground water etc)	H ₂ S strip response +/-		
00/10/02	Mevino	Tapwater	-		Sample taken at a communal watertap No 32. The residents obtain water by means of water coupons.
00/10/09	Tabale	Groundwater	+		Sample was taken at the reservoir cement tank. This sample was taken at the same reservoir where resampling was done and this was taken to Bloemfontein Medical Research Council – Result was positive Sample was taken at the reservoir sement tank. was taken to L/V Medical Research Council – Result was negative
00/10/16	Tweefontein	Groundwater	+		Took water and sent it to Medical Research for Bacteriological test. Results were negative
00/10/23	Balaclava	Groundwater	+		Took water and sent it to Medical Research for Bacteriological test. Results were negative

Appendix 3

End-user Guide for the H₂S strip test

**CSIR
Environmentek
P O Box 320
STELLENBOSCH
7600 South Africa
Tel 021 888 2498 or 888 2581**

H₂S Strip Test Methodology for Assessing the Microbial Quality of Water

Introduction:

The H₂S strip method is used as a field kit to assess the microbial quality of water. The H₂S strip method detects hydrogen sulphide producing bacteria.

The H₂S strip method was developed for testing water. It is a simple, affordable, on-site method, which has >85 % correlation when compared to faecal coliforms normally used to assess water quality. The method does not require expensive laboratory equipment such as filtration apparatus and incubators.

Methodology:

- Aseptically, fill sterile sample bottles provided (containing the paper strips) up to the black line (20ml sample volume). The colour of the water will change to a clear brownish solution. (If sample bottles are broken or damaged do not use as they may give false results)
- Keep sample bottles at room temperature (Indoors out of direct sunlight)
- Examine daily, up to 2-3 days, for **black colouration**. This is considered to be a positive result (See photo below- centre bottle)
- A negative result is considered to be a lack of black colour development. The sample may appear murky, but if no black colouration occurs, the sample is still considered to be negative. (See photo below - right hand bottle). If black colouration occurs after 3 days it is NOT considered to be positive.



Empty sample bottle positive result negative result

What to do if the result is positive

A positive result using the H₂S strip method provides an indication that the water quality is not suitable to be used as drinking water, and further investigations are recommended.

Take another water sample and send it to the local authorities (eg the municipality, the water provider or local Department of Health)

Boil or treat the water until further results are obtained and you know the water is safe to drink.

If bottles are damaged do not use.