

Revision of the Priority 2 Chemical Determinands Identification Programme

Prepared as part of a Ministry of Health
contract for scientific services

by

Chris Nokes

June 2009

Client Report
FW09065

Revision of the Priority 2 Chemical Determinands Identification Programme

Vivienne Smith
Water Programme Manager

Chris Nokes
Project Leader

Jan Gregor
Peer Reviewer

DISCLAIMER

This report or document ("the Report") is given by the Institute of Environmental Science and Research Limited ("ESR") solely for the benefit of the Ministry of Health, Public Health Services Providers and other Third Party Beneficiaries as defined in the Contract between ESR and the Ministry of Health, and is strictly subject to the conditions laid out in that Contract.

Neither ESR nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for use of the Report or its contents by any other person or organisation.

ACKNOWLEDGEMENTS

The author is grateful to Jan Gregor for her review of the report, and to Alan Ferguson for helpful discussions.

TABLE OF CONTENTS

SUMMARY	i
1 INTRODUCTION	1
1.1 Background	1
1.2 The Priority 2 determinand identification protocol used to date.....	2
2 Protocol Development	4
2.1 Introduction	4
2.2 Underlying assumptions.....	4
2.3 Frequency of assessment.....	5
2.4 Different categories of water supply	6
3 Proposed approach to Priority 2 Determinand Identification	7
3.1 Introduction	7
3.2 Proposed protocol	7
3.3 Use of the existing questionnaires	8
3.4 Decision Guides	10
3.4.1 Introduction	10
3.4.2 Determinands to be monitored	11
3.5 Scheduling of supplies for assessment.....	13
3.6 Monitoring programme	13
3.7 Data storage and evaluation	14
3.8 Priority 2 Classification	15
3.9 Priority 2 to Priority 3 reclassification	15
REFERENCES.....	15
Appendix – Decision Guides	17

LIST OF TABLES

Table 3.1	Pros and cons for continued use of the existing P2 Programme questionnaires	9
Table 3.2	Pros and cons for the use of decision guides.....	10
Table 3.3	Determinands assigned as Priority 2 determinands to date.....	11
Table 3.4	Sampling times and locations for each determinand.....	13

LIST OF FIGURES

Figure 1	Key steps in the identification of Priority 2 determinands.....	2
Figure 2	Suggested protocol for the identification of Priority 2 determinands	8

SUMMARY

The *Drinking-water Standards for New Zealand* (DWSNZ) classifies chemical determinands at concentrations exceeding 50% of their maximum allowable value (MAV), as Priority 2 determinands. Water suppliers are required to monitor these for compliance with the DWSNZ.

From 1995 until 2004, the task of identifying these determinands in water supplies was undertaken by the Ministry of Health's (MoH) Priority 2 Chemical Determinands Identification Programme (the P2 Programme). The P2 Programme was funded by the ministry and carried out by ESR and health protection officers/drinking-water assessors (DWAs). The programme has been in abeyance since 2004 because of a shift in the ministry's priorities. However, with the enactment of the Health [Drinking water] Amendment Act 2007, there is a need to ensure there is a sustainable and systematic protocol for up-dating Priority 2 assignments to water supplies. This report proposes a protocol for the way in which this could be done.

The proposed protocol is based on the assumptions that:

- a. Retention of a large, centrally-funded and co-ordinated programme, as the P2 Programme has been in the past, is not favoured.
- b. The direct costs (primarily analysis costs), and costs in time, of identifying Priority 2 determinands for water suppliers need to be minimised.
- c. Factors a) and b) must not impact upon the ability of the protocol to safeguard public health (i.e. overlook potentially health significant determinands in a water supply).

This report proposes that the review of a water supply's Priority 2 assignments be linked to review of the water supply's public health risk management plan (PHRMP), because the PHRMP should identify hazards that may be present in the supply's water. The proposed protocol is essentially the same as that used by the P2 Programme. The primary difference is the way of identifying which determinands are to be monitored as part of the reassessment. This has previously been a time-consuming step for water suppliers and health agencies because of the amount of detail collected using a suite of questionnaires.

Consideration of the pros and cons of the use of the questionnaires leads to the conclusion that this step in the protocol can be stream-lined by providing water suppliers with simple decision guides. The decision guides capture, in a decision tree diagram, the key factors to be considered in deciding whether a determinand needs to be monitored. These are presented in the report's appendix.

The protocol places the responsibility for Priority 2 determinand identification on the water supplier with assistance from the DWA. There is no direct MoH involvement. Some MoH funding will be required to provide for ESR staff time in capturing and storage of monitoring data in WINZ, and assisting DWAs in their roles.

1 INTRODUCTION

1.1 Background

To conserve resources while ensuring public health is safeguarded, the *Drinking-water Standards for New Zealand* (DWSNZ) contains the concept of priority classes. Priority classes provide for the monitoring of health-significant determinands that may be in a water supply, but not those that are unlikely to be present, or have been shown not to be present.

Priority 1 determinands (those of greatest health concern) are all microbiological. The definition of the Priority 2 class of determinands provides for chemical, radiological, and some microbiological determinands to be contained within this class. In practice, the class contains only chemical determinands. The monitoring requirements of the Priority 1 and Priority 2 determinands are different. Priority 1 determinands must be monitored in all water supplies, because there is always the possibility of microbial contaminants arising in a water source, and the consequence of infection by some pathogens can be severe. On the other hand, not all chemical determinands have to be monitored. Monitoring is only required for those found in a water supply at a concentration more than 50% of their MAV (maximum acceptable value). These are classified as Priority 2 determinands, and because the sources of chemical contaminants are not the same for all supplies, water supplies may not have the same Priority 2 determinands assigned to them; indeed, most have none.

When the priority concept was first introduced into the DWSNZ in 1995, the Ministry of Health (MoH) established the Priority 2 Chemical Determinands Identification Programme (the P2 Programme). The P2 Programme assessed all water supplies serving more than 100 people and identified which chemical contaminants they contained that needed to be classified as Priority 2 determinands, and therefore monitored. On average 212 water supply zones were assessed per annum from 1995–2000. By 2000, most water supplies of this size had been assessed. From 2000–2004 the only supplies being assessed were new supplies, or those in which changes may have affected the levels of chemical determinands in their water. As a result, the numbers of supplies being assessed by the programme fell markedly, ranging from 27–51 per annum.

Since 2004, the P2 Programme has been “on hold” as the MoH’s resources have been required elsewhere, although some *ad hoc* reassessments have been undertaken. For various reasons, a handful of supplies have requested reassessment of their Priority 2 assignments. These assessments have been undertaken using the same protocol as the P2 Programme, but with the water supplier collecting samples and meeting the costs of the monitoring programme.

The need to have Priority 2 determinand assignments up-dated was acknowledged at the programme’s start, because of the potential for the chemical constituents in a water supply to change with time. This may occur through gradual changes in the quality of the source water, or from engineered changes in the supply that may affect the nature of contaminants in the source, the treatment plant or distribution zone. With the Health [Drinking water] Amendment Act in place, there is a need to ensure there is a sustainable and systematic protocol for up-dating Priority 2 assignments to water supplies.

The purpose of this report is to propose a protocol that could ensure the regular up-dating of Priority 2 assignments.

1.2 The Priority 2 determinand identification protocol used to date

The overall process for the identification of Priority 2 determinands, used up until 2004, is depicted in Fig.1. The P2 Programme was funded by the MoH, centrally coordinated by ESR, which also provided data interpretation, and field data and samples were collected by Health Protection Officers (HPOs)/Drinking Water Assessors (DWAs). Water suppliers assisted HPOs/DWAs in the collection of field data.

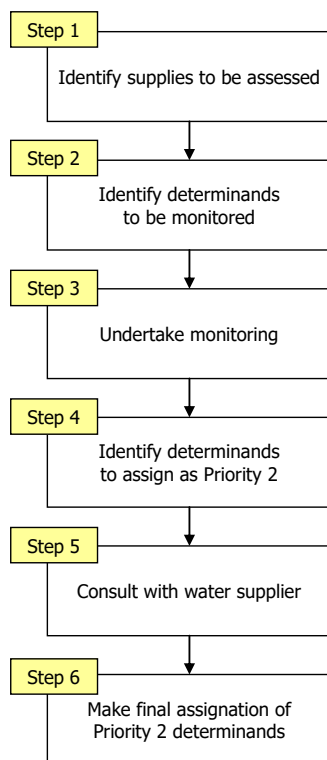


Figure 1 Key steps in the identification of Priority 2 determinands

The most time-consuming and costly parts of the process were Steps 2 and 3. To reduce the analytical costs, not all determinands listed in the DWSNZ were included in the monitoring programme. During Step 2, background information was gathered about the water supply to assist in identifying which determinands were likely be present in the supply, and only these were monitored.

There were three sources of background information:

- Sampling and analysis of a small suite of determinands, mainly metals for which New Zealand data were either scarce or non-existent;
- Historical data from old MoH surveillance programmes;
- Collection of information about contamination risk factors through a suite of three, detailed questionnaires, one each for the source, treatment plant and distribution zone.

ESR identified the determinands to be monitored.

Step 3, the monitoring programme, was split into two sampling rounds: one in spring and the second in autumn. These seasons were chosen because the detection of agrichemicals and disinfection by-products (DBPs) – seasonal contaminants - was most likely at one of these times. (Some agrichemicals are not used during the sampling periods, but logistical difficulties made it impossible to match sampling times with the use of all possible agrichemicals in a catchment.)

In all, the assessment period was a little over 12 months. Once all test results were available ESR identified, for each supply assessed, Priority 2 determinands that had exceeded 50% of the MAV in any sample taken during the assessment period. All these determinands and the supplies to which they should be assigned were contained in an annual report of Priority 2 determinand recommendations to the MoH.

Potentially affected water suppliers were notified of the intended assignments and given time to respond with any reasons why an assignment should not be made. After the response period had expired, any responses were taken into consideration, and the Priority 2 assignments were made official by the MoH. Official assignments were recorded in Water Information New Zealand (WINZ).

2 PROTOCOL DEVELOPMENT

2.1 Introduction

In developing a protocol for on-going identification of Priority 2 determinands several factors need to be considered. A number of these are external factors, unrelated to the science of the process. Their presence or absence has implications for the design of the protocol. Assumptions regarding these factors are discussed in s2.2.

Two other factors are considered in this section: the frequency of reassessment, which is linked to science and some external factors, and whether there is a need to treat supplies that have already been assessed for Priority 2 determinands differently from those that have not.

2.2 Underlying assumptions

To develop an on-going protocol for the identification of Priority 2 determinands a number of assumptions have been made. These are:

- a) Retention of a large, centrally-funded and co-ordinated programme, as the P2 Programme has been in the past, is not favoured.

Implications:

- Reduced funding required from the MoH.
 - Reduced involvement of centralised expertise (ESR) in co-ordinating the programme and interpreting data.
 - The need to train water suppliers and DWAs in interpretation of water supply risk factors, or the development of tools that will avoid the need for interpretation by these stakeholders.
- b) The direct costs (primarily analysis costs), and costs in time, of identifying Priority 2 determinands for water suppliers need to be minimised.

Implications:

- Reassessment of Priority 2 determinands must not be so frequent as to create burdensome costs for water suppliers or be highly-demanding of DWAs' time.
- The present risk-based approach of identifying determinands for monitoring should be retained to reduce analysis costs.

- c) Factors a) and b) must not impact upon the ability of the protocol to safeguard public health (i.e. overlook potentially health significant determinands in a water supply).

Implications:

- Reassessment of Priority 2 determinands must not be so infrequent as to miss determinands reaching health-significant concentrations in a water supply.
- The risk-based approach of identifying determinands for monitoring should retain the precautionary principle, whereby if there is uncertainty over the likelihood of the determinand being in the water, the determinand should be monitored.

- d) There needs to be adequate justification for the collection and storage of data

Implications:

- An evaluation needs to be undertaken concerning continuing collection of the detailed information that has been collected by the P2 Programme in the past.
- A more streamlined method of identifying determinands for monitoring will need to be developed if the level of detail previously collected is no longer required.

2.3 Frequency of assessment

The WHO, in its publication *Chemical safety of drinking-water: Assessing priorities for risk management* (WHO, 2007), provides no guidance on the frequency at which monitoring in a programme such as the P2 Programme should be undertaken. However, unless a major and abrupt change in a water supply's circumstances (e.g. new water source commissioned) occurs, the rate at which changes in most chemical constituents of a water occur is likely to be slow. Because of this, a high sampling frequency is not warranted.

One of the tasks of a water supplier's PHRMP is to identify "public health risks" associated with a supply. Such risks include chemical determinands. The review of the PHRMP provides an appropriate time at which the Priority 2 determinands assigned to a water supply should also be reviewed. The legislation requires this to be done every five years, at least. A more frequent Priority 2 review for a supply may be needed in the event that a PHRMP is scheduled for more frequent review, or the PHRMP, itself, identifies the need for a more frequent review of the priority status of a determinand, or determinands.

A trend of gradually increasing concentration could result in a determinand exceeding 50% of its MAV, or even the MAV itself, between Priority 2 identification assessments. Provided the duration of exposure to concentrations exceeding the MAV is not long, the exposure will present an insignificant health hazard. This is because MAVs are developed on the basis of a lifetime of exposure.

Acute exposures to very high concentrations of a health-significant determinand, as might result from a spillage, and the implications of this situation for health, may be a different matter. However, the identification and monitoring of Priority 2 determinands is not designed to deal with such exposures; this is the domain of emergency planning contained within risk management systems.

2.4 Different categories of water supply

The new P2 programme will need to accommodate two groups of water supply:

- Supplies that have been assessed through the P2 Programme;
- Supplies that have not been assessed because they were registered after 2004.

These two groups do not need to be handled differently. The five-yearly, or more frequent as needs be, reassessment proposed in s.2.3 would apply to any supply required to undertake compliance monitoring by the legislation.

3 PROPOSED APPROACH TO PRIORITY 2 DETERMINAND IDENTIFICATION

3.1 Introduction

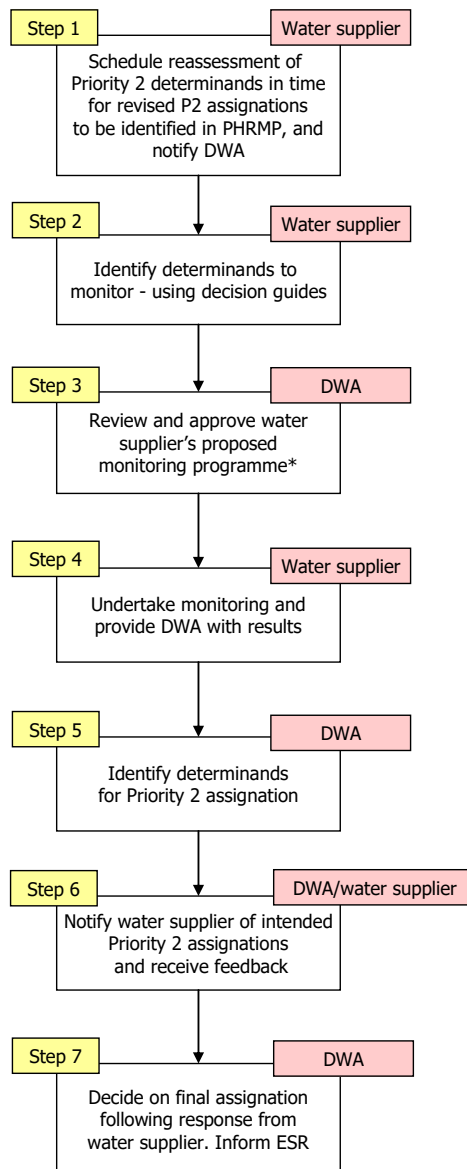
The steps to identifying Priority 2 determinands, used in the P2 Programme, were outlined in s.1.2 and summarised diagrammatically in Fig 1. The proposed approach for the ongoing identification of Priority 2 determinands will retain the same features as those shown in Fig.1, making as much use as possible of existing knowledge to minimise the monitoring required.

The risk assessment process, by which monitoring requirements are identified, is the primary point of difference between the past and proposed protocols. This section presents an overview of the proposed protocol, the suggested changes to the risk assessment process, the reasons for changing the process, and the monitoring details.

3.2 Proposed protocol

The proposed protocol for identifying Priority 2 determinands is shown in Figure 2. Boxes on the right-hand upper corner of each Step box show where responsibility for undertaking the step lies. The assignment of responsibilities is consistent with the assumptions discussed in s.2

In terms of the protocol detail, the greatest difference occurs in Step 2. Identification of which determinands to monitor has previously been undertaken using the set of questionnaires. Continued use of these questionnaires has been considered, but in the light of the assumptions on which the protocol is based, a simplified approach seems preferable. The pros and cons of the use of the existing questionnaires are discussed in s.3.3. S.3.4 sets out the proposed approach for deciding which determinands to monitor.



* The DWA approving the monitoring programme must be different from the one from which the supplier may have sought advice in preparing the programme.

Figure 2 Suggested protocol for the identification of Priority 2 determinands

The water supplies which will need to undertake reassessments for Priority 2 determinands, are those required to undertake compliance monitoring by the legislation, i.e. temporary drinking-water suppliers and self-suppliers do not have to carry out this monitoring.

3.3 Use of the existing questionnaires

The questionnaires that were used in the P2 Programme asked for a large amount of information. This was appropriate when the identification of Priority 2 determinands was in its infancy; the collection of too much information was preferable to having too little. The degree of correlation between risk factors and determinand levels in water supplies was unknown.

Bearing in mind the effort required to complete these questionnaires and the need to minimise the costs of continued Priority 2 determinand identification, the advantages and

disadvantages of continued use of the questionnaires have been reviewed. These are set out in Table 3.1.

Table 3.1 Pros and cons for continued use of the existing P2 Programme questionnaires

Pros
1. Detailed information about supplies, which is held centrally, could be used for purposes other than identifying determinands for monitoring.
2. Modification to WINZ is not required to accommodate the questionnaire information, as WINZ already contains the necessary fields for the data.
3. The information collected through the questionnaires provides a general picture of the factors that may influence water quality. The questions are not based on assumed links between these factors and the determinands to which they may be linked. Consequently, more flexible interpretation of the data is possible.
Cons
1. To date, the data collected by the P2 Programme have been rarely used for purposes other than targeting determinands for monitoring.
2. Answers to many of the questions asked, particularly concerning the catchment, have been “guesses” or not answered at all. This is because either water suppliers do not have the information, or it is unknown (e.g., aquifer recharge areas).
3. For many supplies, the rigor of the answers is in question. This is partly a consequence of 2), and partly because there is no formal process by which the quality of the data is checked. Checking is not easy because the information is often unknown to DWAs as well as water suppliers.
4. The process of completing the questionnaires is time consuming, and may well duplicate work done by the water supplier in preparing their PHRMP.
5. Experience has shown that in most instances associations between risk factors (from questionnaires) and the presence of determinands in the water supply are poor.
6. Training and guidance in interpretation of the questionnaire results will be required.

The conclusions to be drawn from Table 3.1 are:

- a) There is little use of the data for additional research purposes, which might add to the justification for collection of the detailed information;
- b) The ability to make use of the detailed information for the identification of determinands of potential concern is limited;

- c) The usefulness of the detailed information is questionable anyway, if its reliability is uncertain;
- d) There is likely duplication of effort put into PHRMP by requiring the collection of similar information through the questionnaires;
- e) It may be difficult to get acceptance for the continued collection of detailed information from water suppliers given a), b) c) and d).

These conclusions indicate that a simpler path for identifying determinands for monitoring, which does not require the level of information previously sought, should be considered.

3.4 Decision Guides

3.4.1 Introduction

The decision guides discussed in this section offer a simplified means of deciding which determinands should be monitored as part of the Priority 2 assessment. They are flow diagrams requiring small amounts of information about a supply to direct the user in planning their monitoring. Water suppliers would not be required to limit themselves to the sampling requirements shown by the guides; additional determinands could be monitored if this seemed prudent. The guides show the minimum monitoring that a water supplier must undertake given the characteristics of their supply.

The guides make use of linkages between risk factors and water quality that have been found from the P2 Programme. They avoid collecting information about factors for which linkages have not been found. As a consequence, although there is a reduction in the amount of information used in identifying determinands to monitor, the reliability of monitoring decisions should not be any worse than that using the detailed questionnaires.

The advantages and disadvantages of the use of the decision guides are listed in Table 3.2.

Table 3.2 Pros and cons for the use of decision guides

Pros
1. Little time is required to identify determinands to monitor, thereby reducing costs.
2. Little time is required for the DWA to check the how the water supplier arrived at their proposed monitoring programme.
3. Entry into, and storage in, WINZ of a large number risk factor data is not required.
4. The reliability of the monitoring decisions should be similar to that based on the detailed questionnaires, because links found between risk factors and determinands, by the P2 Programme, have been used in the guides.
Cons
1. Loss of detailed information, which could hinder future research projects, or make it difficult for the MoH to provide statistics about the risk factors affecting New Zealand water supplies.

3.4.2 Determinands to be monitored

A helpful finding from the P2 Programme was that only a small percentage of the health-significant chemical determinands contained in the DWSNZ are detected in water supplies at concentrations exceeding 50% of their MAV. These determinands have been grouped in Table 3.3. They are the determinands most *likely* to be identified during monitoring.

Restricting reassessments to these determinands would greatly simplify the process of identifying Priority 2 determinands. However, possible changes in the nature of the chemical threats to water supplies could occur with time. For this reason, two other broad categories of determinand need to be considered: agrichemicals and industrial chemicals. Changes in agricultural practices or growth in industrial activity in a catchment could lead to determinands in these groups eventually appearing in water supplies in which they have been absent to date.

The detection of the heavy metals antimony, cadmium, copper, chromium, lead and nickel in water supplies is due mainly to the dissolution of plumbing. In these situations the metals are not classified as Priority 2 determinands; they are dealt with through the plumbosolvency requirements of the DWSNZ¹.

Table 3.3 Determinands assigned as Priority 2 determinands to date

Group	Determinands
Metals	antimony, barium, cadmium, copper, chromium, lead, mercury, nickel
Metalloids	arsenic, selenium
Non-metals	boron, fluoride ¹
Manganese and nitrate ²	
Disinfection by-products	trihalomethanes (THMs), haloacetic acids (HAAs)

¹ Naturally-occurring fluoride was assigned as a Priority 2 determinand in only one zone.

² Manganese and nitrate are placed in their own group because their concentrations can change markedly on relatively short timescales, unlike most other determinands in source waters.

For some determinands in Table 3.3, samples should be taken *every time* a supply is assessed, irrespective of a supply's risk factors. This is advised because guidance based on risk factors is too unreliable. Determinands for which samples should be collected at each reassessment are: antimony, cadmium, copper, chromium, lead, mercury, nickel, arsenic, barium, fluoride, selenium, and manganese. It was noted above that some of these metals arise from plumbing. They are included in this list to handle the metals arising from sources other than plumbing.

¹ No monitoring is required for these determinands. However, the water supplier is required to provide advice to consumers to flush their taps before drawing water for use.

The cost of analysis for this suite is not great, which should lessen the concern over the proposed requirement for their inclusion in all Priority 2 assessments. (At the time of writing the analytical cost is ca. \$95 plus GST).

Decision guides have not been prepared for these determinands. They should be sampled at every reassessment for one, or more, of three reasons:

- a. Changes in their concentration with time are subtle.

Gradual changes in the concentrations of these determinands may be controlled by the rate of natural geological processes. We cannot tell when previously undetectable concentrations may develop to a level of significance. Often, as in the case of the heavy metals, the MAVs for these determinands are low and relatively close to their limits of detection.

- b. Their concentration may change substantially on a relatively short timescale.

This applies to manganese. Risk factors may indicate the likelihood of the determinand being present in a water, but cannot reliably indicate whether their concentration will exceed 50% of their MAV.

- c. The association between risk factors in a supply and the occurrence of the determinand is poorly understood.

For example, the likelihood of finding unacceptably high concentrations of arsenic in a water source is generally greater in geothermal regions than non-geothermal regions. However, groundwater sources, well removed from geothermal activity, have been found to contain elevated arsenic concentrations. Barium is another determinand for which the factors influencing its appearance in New Zealand water supplies are unknown.

Decision guides for the remaining determinands or groups of determinands (DBPs, agrichemicals, industrial chemical, nitrate, and boron) are given in the Appendix. Reference to the Ministry of the Environment's document *An Introduction to Drinking Water Contaminants, Treatment and Management: For users of the National Environmental Standard for sources of human drinking water* (Nokes, 2008) may be of assistance in deciding which specific determinands, particularly within the "Industrial chemicals" group, might need to be monitored. This document was prepared by ESR to support regional council staff in implementing the *National Environmental Standard for Sources of Human Drinking Water Regulations* (2007) and contains an appendix that sets out catchment activities and the contaminants they may potential introduce into water sources.

The decision guides are designed to be precautionary i.e., if there is uncertainty about the presence of a contaminating or mitigating activity the diagrams lead to sampling and analysis. There may be concern over this approach for determinands that have rarely been detected in drinking waters by the P2 Programme, and even less frequently found at concentrations near or above 50% of their MAV. Agrichemicals and industrial chemicals

are two examples of this type of determinand. A precautionary approach is considered necessary in these cases because:

- a. the conditions that might lead to their appearance in a supply are still unclear;
- b. there may be changes in the potential contamination sources over time.

3.5 Scheduling of supplies for assessment

To ensure the inclusion of monitoring programmes for the appropriate determinands in a water supplier's PHRMP, the necessary reassessment steps (Figure 2) will need to be taken in advance of the review date of the PHRMP. In most instances, this will occur on a five-yearly basis, but for some water suppliers, reassessment may be more frequent (see s.2.3).

It would be preferable for the DWA workload created by these reassessments to be spread evenly over the five-yearly cycle. However, the time will depend on the scheduling of PHRMP preparation.

3.6 Monitoring programme

The monitoring required during the Priority 2 identification reassessment consists of taking two samples for each determinand over a 12 month period. All determinands do not need to be sampled at the same time; indeed, the optimum sampling time may not necessarily be the same for all determinands. Table 3.4 shows when samples for each determinand should be taken and the required sampling location.

Table 3.4 Sampling times and locations for each determinand

Determinand	Sampling location	Sampling time/season	Additional notes
Metals	Anywhere in the reticulation	No specific time	Sample must be taken from a well-flushed tap to avoid detecting metals derived from the dissolution of plumbing fittings
Metalloids	Anywhere in the reticulation, or from the water leaving treatment plant	No specific time	
Non-metals	Anywhere in the reticulation, or from the water leaving treatment plant	No specific time	If the boron could be associated with seawater intrusion, the sample should be taken at high tide.
Manganese	Anywhere in the reticulation	No specific time	If complaints about manganese are associated with high flows in the reticulation (e.g. hydrant flushing), samples should be taken at these times.

Nitrate	Anywhere in the reticulation	Early spring	Nitrate levels are high in some parts of the country when the spring thaw flushes nitrate into the groundwater.
DBPs	At the extremities of the distribution system	Spring and autumn and after a rain event that has increased the colour of the water.	Sufficient delay should be allowed after the rain event to allow the slug of treated dirty water to get to the system extremities. The FAC residual at the extremity must be at its normal level, and if this is less than 0.1 mg/L, <i>E. coli</i> must be tested for and found absent.
Agrichemicals	Anywhere in the reticulation, or from the water leaving treatment plant	During season in which the potential agrichemical(s) of concern are used.	
Industrial chemicals	Anywhere in the reticulation	No specific time, unless there are seasonal factors influencing the possible contamination source	

It is the water supplier's responsibility (Step 2) to identify the determinands they believe should be monitored. For suppliers serving fewer than 5,000 people, help in doing this can be obtained through the MoH's Technical Assistance Programme. Once a monitoring schedule has been prepared, listing the determinands to be monitored, the proposed sampling date (approximate) and location, it must be checked by the DWA who has responsibility for the supply (Step 3).

The water supplier must take the samples, arrange for their analysis at a Ministry of Health recognised laboratory, and either provide the DWA with an electronic copy of the results, or transfer the data into web-based WINZ (Step 4).

When a Priority 2 determinand is already being monitored monthly for compliance purposes, this monitoring will provide the information needed for the reassessment of this determinand, and no additional monitoring for reassessment is needed.

3.7 Data storage and evaluation

The analytical results, sampling date, and sampling location (treatment plant or zone code, whichever is relevant) will be stored within WINZ, to provide a record of the supply's water quality, and to ensure that the DWA has access to the results.

Once test results from both sampling rounds for all determinands being monitored have been entered into WINZ, the DWA will review the data (Step 5). Any determinand that has exceeded 50% of its MAV in any sample is regarded as a potential Priority 2 determinand. Before a potential Priority 2 determinand can be assigned officially to a

supply, the DWA must notify the water supplier of the intention to officially classify the determinand as Priority 2 (Step 6).

If official Priority 2 classification is to be avoided, the water supplier must provide the DWA with evidence that the exceedence found during the Priority 2 identification process is not a typical occurrence. This usually requires the water supplier to provide 12 monthly test results all of which are less than or equal to 50% of the MAV, but the DWA may use their discretion as the evidence required.

3.8 Priority 2 Classification

If the water supplier is unable to provide evidence that a determinand should not be assigned Priority 2 status, the DWA will make the Priority 2 classification official, notifying in writing the water supplier, and ESR for assignment in WINZ (Step 7).

3.9 Priority 2 to Priority 3 reclassification

The reclassification of determinands from Priority 2 to Priority 3 is not accomplished as part of the process described in this section. The DWSNZ does not stipulate how Priority 2 identification is to be carried out. However, the process for reclassification to Priority 3 is stated in the DWSNZ, and is based on compliance monitoring results.

REFERENCES

Nokes C, 2008, *An Introduction to Drinking Water Contaminants, Treatment and Management: for users of the National Environmental Standard for sources of human drinking water*, ESR Report for the Ministry for the Environment. Available at: <http://www.mfe.govt.nz/laws/standards/drinking-water-source-standard.html>

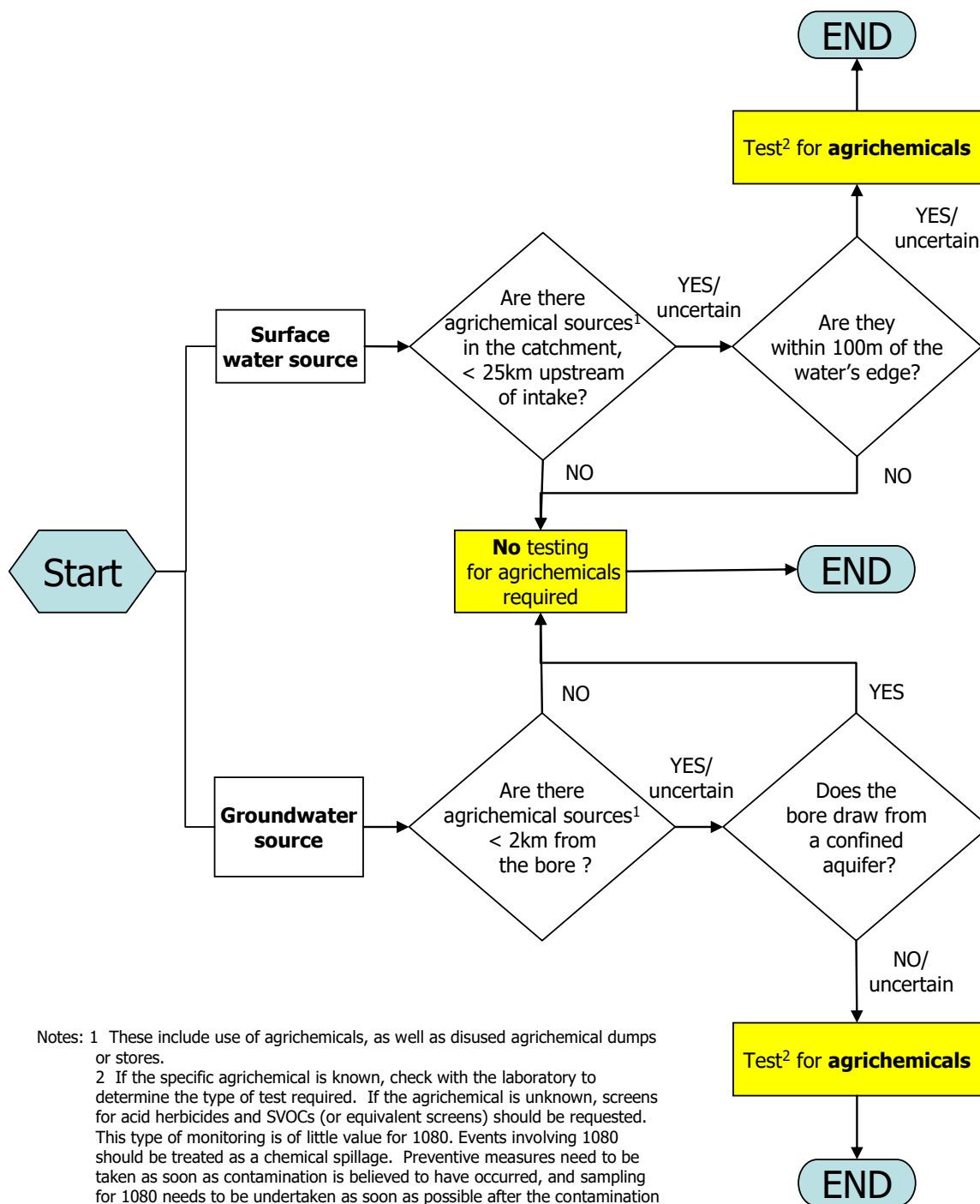
WHO, 2007, *Chemical safety of drinking-water: Assessing priorities for risk management*, World Health Organization, Geneva.

Williams H, Callander P, Nokes C, Close, M and Ball A, 2005, *Methodology for delineating water catchments*, Pattle Delamore Partners Ltd and ESR Report for the Ministry for the Environment.

APPENDIX – DECISION GUIDES

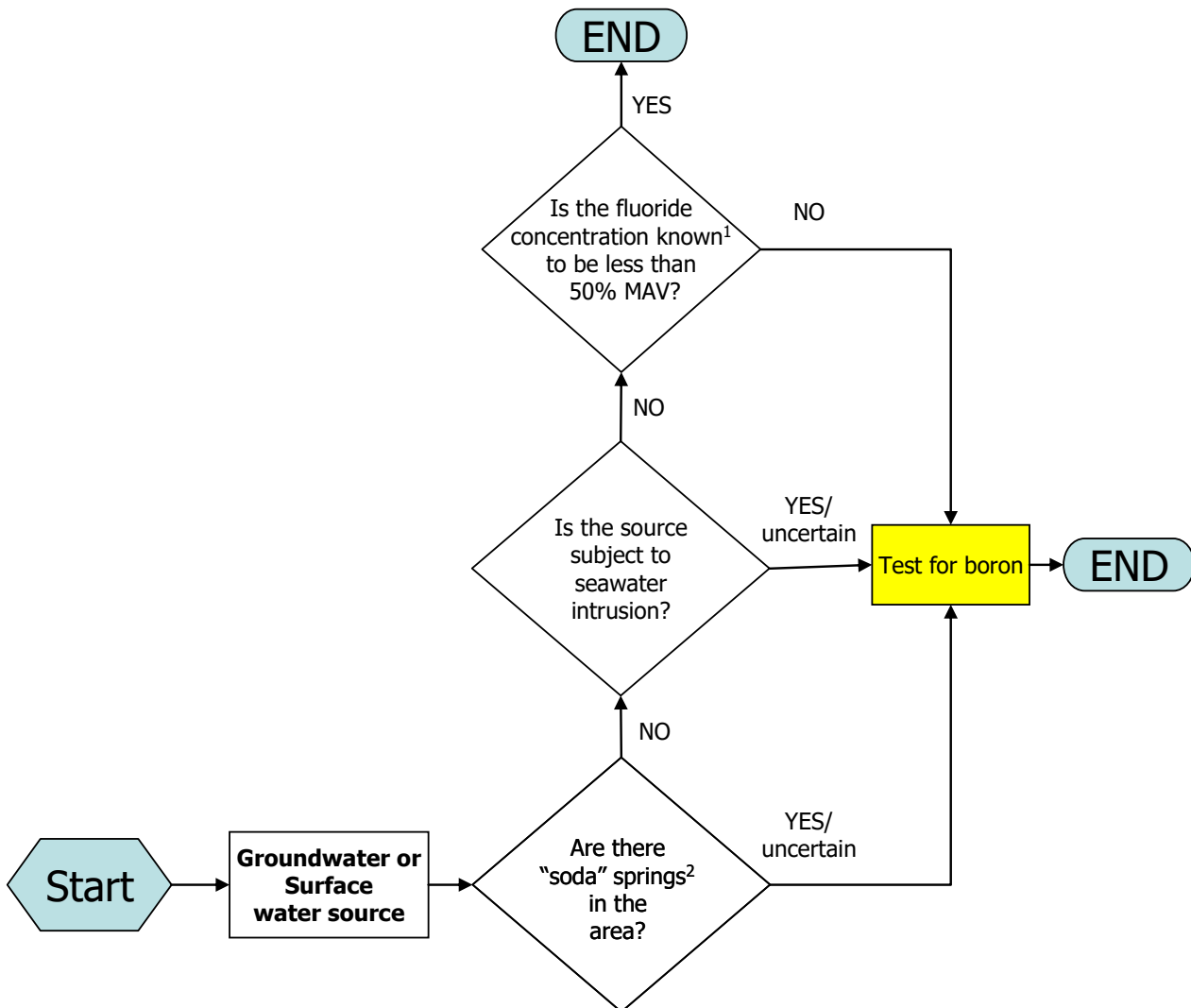
Note: Distances of contaminant sources from surface and groundwaters contained in the decision guides for agrichemicals, industrial chemicals and nitrate are based on recommendations from Williams *et al* (2005).

Agrichemical Monitoring Decision Guide



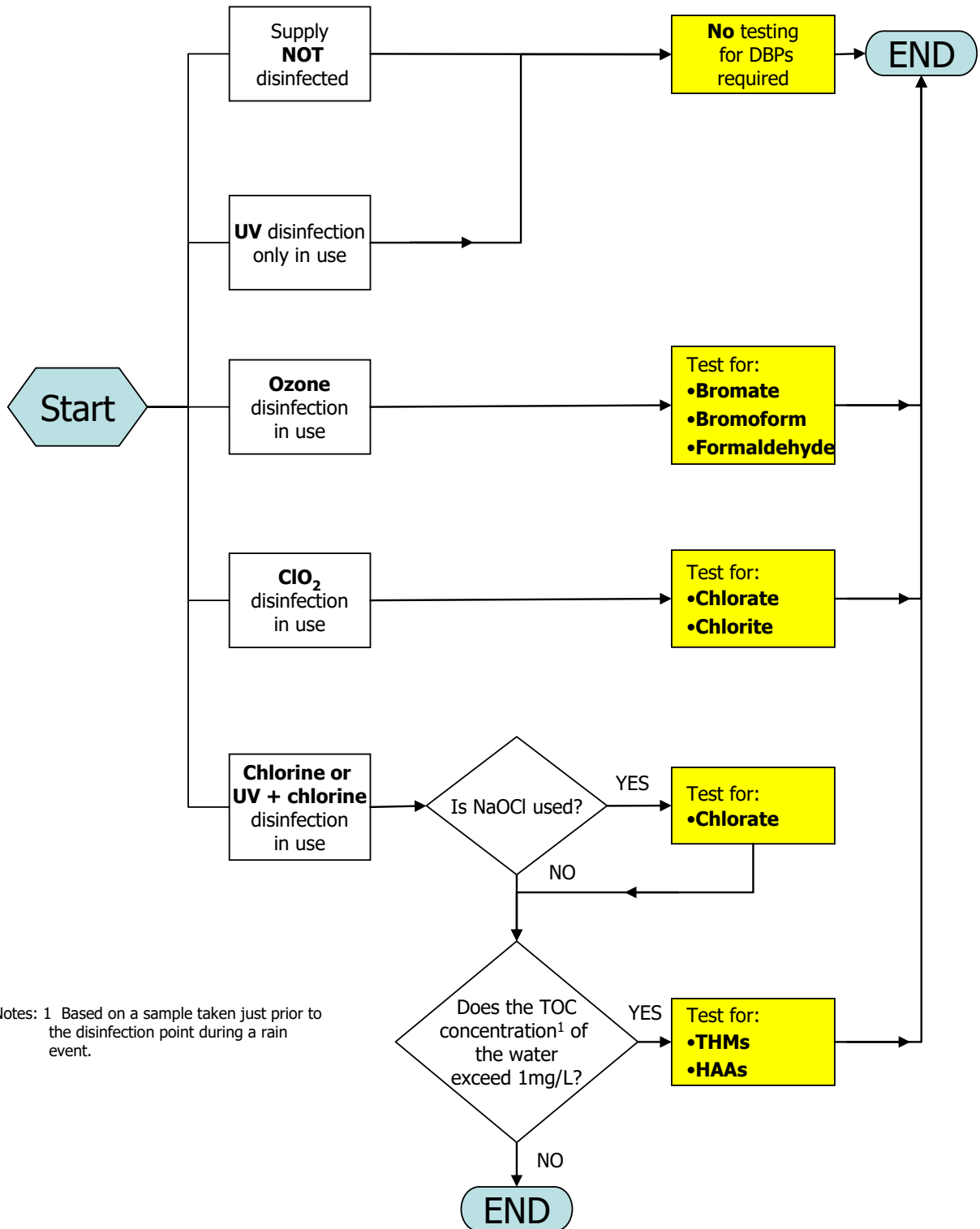
Notes: 1 These include use of agrichemicals, as well as disused agrichemical dumps or stores.
 2 If the specific agrichemical is known, check with the laboratory to determine the type of test required. If the agrichemical is unknown, screens for acid herbicides and SVOCs (or equivalent screens) should be requested. This type of monitoring is of little value for 1080. Events involving 1080 should be treated as a chemical spillage. Preventive measures need to be taken as soon as contamination is believed to have occurred, and sampling for 1080 needs to be undertaken as soon as possible after the contamination event. Any longer than a few days, and the 1080 will have decomposed.

Boron Monitoring Decision Guide

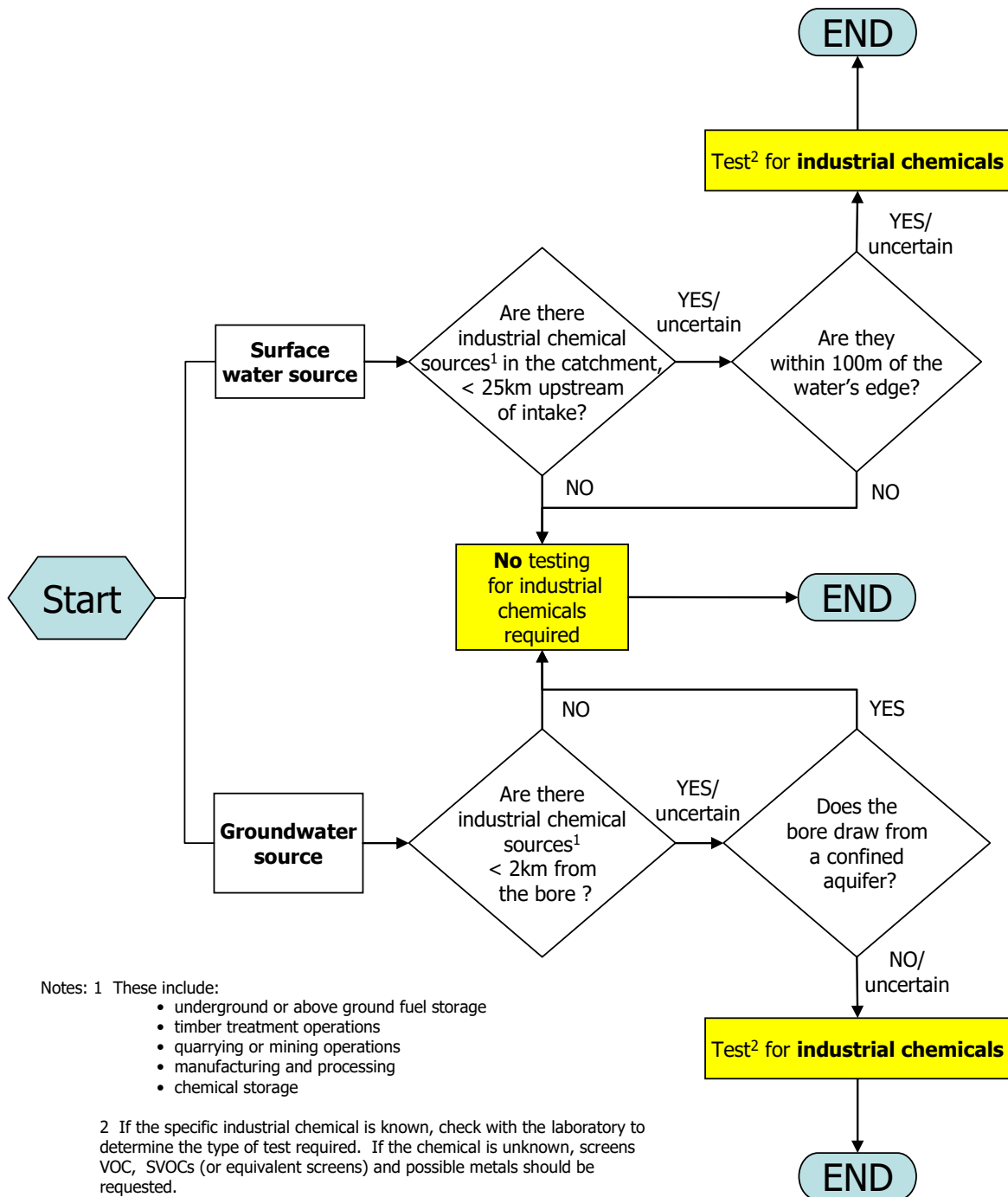


Note: 1 Work from existing test data, or take additional samples for fluoride if necessary.
2 Springs high in sodium and bicarbonate or carbonate

Disinfection By-product Monitoring Decision Guide



Industrial Chemical Monitoring Decision Guide



Nitrate Monitoring Decision Guide

