

The cleanup and management of polluted groundwater



Environment
Protection
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Guideline

These guidelines provide details on EPA's requirements and expectations for developing and implementing the cleanup and management of polluted groundwater, to ensure the protection of human health and the environment.

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1. Protection of groundwater quality in Victoria

Groundwater is an important and often overlooked part of the environment. Groundwater discharges to surface water, supporting ecosystems (for example, rivers and wetlands) and is utilised for a range of beneficial uses including drinking, irrigation, stock and industrial uses.

The focus of groundwater quality protection is on the prevention of groundwater pollution, however, where groundwater has become polluted, it must be cleaned up and managed to ensure the ongoing protection of human health and the environment.

Where polluted groundwater has been identified, EPA Victoria's (EPA's) role is to require cleanup. If it is impracticable to clean up groundwater to the level needed to restore beneficial uses, EPA may accept that cleanup to the extent practicable has occurred and that, subject to appropriate ongoing management, further cleanup is not required. Polluted groundwater can be identified by investigations prompted either by the application of EPA's statutory tools (for example, notices) and programs (for example, environmental audits) or by investigations that do not directly involve EPA, such as corporate risk management programs and land sale agreements. Where

polluted groundwater is identified but cleanup has not been required by statutory means or by EPA programs, it is recommended that EPA be consulted regarding the cleanup/management strategy.

Any plan for cleanup and/or management of polluted groundwater should specifically address Sections 3 to 8 of these guidelines. A generic procedure for the cleanup and management of polluted groundwater is presented in appendix 1. These guidelines are primarily directed towards circumstances where investigations have found pollution to exist.

1.1 The State Environment Protection Policy (SEPP) (Groundwaters of Victoria) 1997

The *State Environment Protection Policy (SEPP) (Groundwaters of Victoria) 1997* (Groundwater SEPP) sets out a framework for the protection of groundwater quality in Victoria.

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The *Groundwater SEPP* identifies the:

- segments of the groundwater environment according to total dissolved solids (TDS) (approximates the salinity of the groundwater)
- beneficial uses to be protected in each segment of the groundwater environment (for example, potable water supply, agriculture, parks and gardens, and maintenance of ecosystems)
- groundwater quality objectives by which to measure the protection of these beneficial uses.

The *Groundwater SEPP* requires the protection of *existing* and *potential* beneficial uses of groundwater from pollution. Unless stated otherwise in these guidelines, the term 'beneficial uses' refers to both existing and potential uses.

A beneficial use may be considered 'existing' where there is a receptor (bore, spring or creek) in the vicinity of the site.

'Potential' beneficial uses are those that could be supported by the background groundwater quality. Some potential beneficial uses are more likely to be realised than others. A potential beneficial use of groundwater is considered 'likely' in circumstances including, but not limited to, where:

- groundwater is used in the same hydrogeological setting nearby or elsewhere in Victoria
- the existing and likely future land uses, both at the site and in the vicinity of the site, are compatible with the beneficial use.

Contamination is defined in the *Groundwater SEPP* as a change in water quality that produces a noticeable or measurable change in groundwater characteristics. Clause 10(3) of the *Groundwater SEPP* states that groundwater quality is to be maintained as close as practicable to background levels (that is, to minimise any change to groundwater quality).

Pollution of groundwater includes situations where groundwater quality is changed such that the groundwater is no longer suitable for a beneficial use. Such situations are defined as occurring where groundwater quality objectives for any protected beneficial use (referred to in table 3 of the *Groundwater SEPP*) are exceeded or where there is otherwise a detriment to a beneficial use (for example, irrigation water becomes odorous to such an extent that it is no longer used).

The groundwater quality objectives for most beneficial uses of groundwater apply at any point in the aquifer from which groundwater could be abstracted for use via a bore. However, for the beneficial use 'maintenance of ecosystems', the objectives apply at the point of discharge to surface water (that is, prior to dilution and mixing with the surface water). Where contaminated groundwater present at a site could discharge to surface water, the quality of the discharging groundwater should not exceed the *Groundwater SEPP* objectives for 'maintenance of ecosystems'.

Where groundwater has been polluted:

- Groundwater should be cleaned up such that the protection of beneficial uses (existing and potential) is restored. In some cases this will not be possible or feasible, however, in all cases polluted groundwater must be cleaned up to the extent practicable (as described in Section 6.2 of these guidelines).
- Cleanup and management must address the full extent of groundwater pollution both onsite and offsite.
- Ongoing management must continue until the protection of beneficial uses is restored (that is, the groundwater is no longer polluted) or EPA is satisfied that ongoing groundwater management is not required or can cease.

2. The role of EPA in the cleanup and management of polluted groundwater

EPA implements the *Groundwater SEPP* through its statutory tools (that is, works approvals, licences and notices), programs such as environmental auditing and through the provision of information to industry and the broader community.

Where EPA becomes aware of groundwater pollution, it may require cleanup and/or management of polluted groundwater (consistent with these guidelines) by notice under Sections 31A/B and 62A of the *Environment Protection Act 1970*. Such notices are issued in accordance with EPA's Enforcement Policy (EPA Publication 384) after considering the degree and extent of pollution and likelihood of detriment posed to beneficial uses.

Where polluted groundwater is identified through a statutory environmental audit, EPA may use its statutory tools to give effect to the conditions of any statement of environmental audit related to groundwater pollution, or to otherwise require cleanup.

Responsible parties are encouraged to inform EPA of groundwater pollution at the earliest opportunity to enable consistency and certainty in the outcome for the responsible party. Responsible parties, typically the polluter and/or occupier, are those responsible for the cleanup and management of polluted groundwater consistent with the abatement and cleanup provisions of the *Environment Protection Act 1970*. If sought, EPA will provide advice on:

- whether source removal or groundwater cleanup has occurred to the extent practicable (see Sections 4.1 and 6.2 in these guidelines)
- risk assessment methodology used to derive groundwater quality objectives where there is no stated objective or where *Groundwater SEPP* objectives may be inappropriate (see Section 5 below)
- cleanup objectives (where they are above *Groundwater SEPP* objectives) (see Section 6 below)

- the preparation and implementation of any plan to manage polluted groundwater (including agreeing to monitoring requirements, trigger levels, contingency plans, controls on groundwater use and periodic review of practicability of cleanup) (see Section 7)
- when to cease cleanup and management of polluted groundwater (that is, when beneficial uses are protected) (see Section 7.6).

Regardless of whether EPA is directly involved in the cleanup and management of polluted groundwater at or from a site, only EPA can determine:

- the segment to which groundwater in any aquifer belongs (clause 8, *Groundwater SEPP*) and therefore the beneficial uses to be protected
- whether a beneficial use specified in table 2 of the *Groundwater SEPP* does not apply (for example, where there is insufficient aquifer yield to sustain a beneficial use or the background quality is detrimental to a beneficial use, or where a use is impracticable due to one or more soil characteristics) (clause 9(2), *Groundwater SEPP*)
- whether there is no unacceptable risk posed to any beneficial use of groundwater by a non-aqueous phase liquid (NAPL) present in an aquifer (clause 18, *Groundwater SEPP*)
- whether groundwater has been cleaned up to the extent practicable (clause 19, *Groundwater SEPP*) or in accordance with Section 13.6 of EPA Publication 759, which details the role of environmental auditors in these determinations
- whether *the Groundwater SEPP* objectives will be met at the completion of the project and no detriment will occur to beneficial uses beyond the premises for groundwater remediation projects involving the injection of uncontaminated water or the reinjection of treated water into the aquifer (clause 20, *Groundwater SEPP*).

In order to gain a determination from EPA on these matters, the responsible party should:

- 1) write to EPA providing relevant information, a scientifically reasoned opinion and seeking advice
- 2) await advice from EPA
- 3) complete cleanup/management in accordance with the EPA advice or direction.

EPA can also advise on other regulatory requirements related to the cleanup and management of polluted groundwater (see Section 8 of these guidelines).

Where polluted groundwater is identified and remains in place after cleanup to the extent practicable has occurred, it is EPA's role to inform relevant rural water authorities and make information available to the community in accordance with Section 9 of these guidelines.

3. Characterisation of groundwater and aquifers

Prior to any cleanup and/or management of polluted groundwater, groundwater and aquifer characterisation should be undertaken to assess the nature, extent and degree of pollution. It may also provide information about the groundwater and the aquifer that is useful in assessing the risk posed by the pollution and in the design of cleanup activities. Note that where an imminent hazard is identified, some immediate cleanup action is necessary prior to the completion of groundwater and aquifer characterisation.

Groundwater and aquifer characterisation involves collecting data to define:

- site geology and hydrogeology (for example, aquifer type and configuration, porosity type, identification of preferential pathways, and groundwater flow direction and velocity, including spatial and temporal variability of these parameters)
- the extent of the plume, and the nature and spatial and temporal distribution of contaminants within the plume and surrounding media (for example, type and concentration ranges of the contaminant(s), contaminant phase distribution including non-aqueous phase distribution and partitioning between groundwater, aquifer material and gas, contaminant transformation processes including transformation rate estimates and sorption capacity)
- the current and potential impact of contaminants on beneficial uses of the groundwater (for example, background groundwater TDS, other relevant groundwater quality indicators and aquifer yield data). This assists in determining the beneficial uses that apply to the groundwater and the potential for the plume configuration to change over time (for example, pumping from a nearby bore and tidal or seasonal influences).

When combined with a thorough investigation of available cleanup technologies (Section 6.1 in these guidelines), such characterisation assists in identifying practicable cleanup options.

For detailed guidance on groundwater sampling, refer to EPA Publication 669, *Groundwater Sampling Guidelines*.

4. Source removal and control

Possible sources of groundwater pollution include unsealed storage or production areas, leaking product pipelines, historical waste disposal activities (for example, pouring liquid waste into quarries/trenches), leaking underground petroleum storage systems, contaminated aquifer material (for example, soil or rock) and non-aqueous phase liquid (NAPL - for example, petroleum products).

4.1 Source removal

The removal or control of the source is a necessary first step in the cleanup or management of polluted groundwater. Early actions taken to locate and remove or

control the source may greatly reduce the extent of the pollution and the risk posed to existing beneficial uses (and the cost of cleanup). It may not be possible to meet cleanup or management objectives if there is a continuous supply of contaminants to the groundwater.

The presence of NAPL in contact with (for example, floating on top of) groundwater is in itself pollution of groundwater. NAPL is also a source of further groundwater pollution by the dissolution of water soluble components of the NAPL into the groundwater.

The *Groundwater SEPP* requires that:

'Where non-aqueous phase liquid is present in an aquifer, it must be removed unless the Authority [EPA Victoria] is satisfied that there is no unacceptable risk posed to any beneficial use by the non-aqueous phase liquid.'

In most cases, where NAPL is present in an aquifer, it must be removed.

Examples of current source removal techniques include removal or decommissioning of primary sources (for example, storage tanks/pipes), excavation and removal, pump and treat, flushing (in situ), soil vapour extraction and dual-phase extraction. References such as the USEPA publication *Treatment technologies for site clean up: Annual status report* provide a guide to available source removal/control technologies.

In some cases it may be impracticable to remove the source of groundwater pollution (for example, dense NAPL within complex subsurface geology). Section 6.2 of these discusses the factors considered by EPA in determining the practicability of groundwater cleanup. These apply equally to assessing 'practicability' of source removal. Any assessment that source removal is impracticable should be clearly documented to assist in discussion with EPA, referencing each of the factors set out in Section 6.2.

4.2 Source control

Where complete source removal is impracticable, the source must be removed to the extent that is practicable and treatment/control measures must be implemented as follows:

- The source must be contained and/or treated so that migration of polluted groundwater is minimised (onsite in most circumstances). Examples of containment technologies include the installation of a physical barrier system (such as capping or a slurry wall) or hydraulic containment.
- Source control must operate for the entire duration that the source is present. If the pollutant source degrades over time, the source control may cease only when the source no longer causes detriment to a protected beneficial use. If the pollutant source does not degrade, the source control must operate indefinitely, or until such time that technology is available to remove the source.
- Any source control measure must be supported by groundwater quality monitoring that demonstrates that it protects the beneficial uses of the groundwater remote from the source (for example, at the site boundary).

Any source control measures proposed to be implemented should be clearly documented to assist in discussion with EPA.

5. The role of risk assessment in cleanup and management of polluted groundwater

Whenever groundwater quality is changed such that it exceeds the relevant groundwater quality objectives, it is considered polluted and must be cleaned up. A site-specific risk assessment, using a method acceptable to EPA, may play an important role in the cleanup and management of polluted groundwater, as the nature and timing of the cleanup activities may be influenced by the risk posed by that pollution. Risk assessment is appropriate in the following circumstances:

- to determine the degree of existing exposure and therefore the influence on the practicability and the urgency of the cleanup activities (see Section 6.2 in these guidelines)
- where EPA advises that risk assessment derived groundwater quality objectives are appropriate (for example, where groundwater quality objectives for organic toxicants for the beneficial use 'stock watering' default to criteria derived for drinking water to protect human health)
- to derive cleanup objectives where cleanup to restore beneficial uses is demonstrated to be impracticable.

Where risk assessment derived objectives are intended to be used, the methodology and key assumptions should be clearly documented to assist in discussion with EPA.

6. Cleanup of polluted groundwater

The goal for any cleanup of polluted groundwater is to restore the protection of beneficial uses of the groundwater both onsite and offsite. Restoration of the beneficial uses of groundwater is achieved when the groundwater quality objectives of the *Groundwater SEPP* are met (see Section 5 of these guidelines if contaminants are present for which there are no groundwater quality objectives in the *Groundwater SEPP*).

Where cleanup to meet *Groundwater SEPP* objectives is not practicable (Section 6.2 in these guidelines), alternate cleanup objectives should be derived that reflect cleanup to the extent practicable; considering the extent and degree of pollution, likelihood of detriment to beneficial uses and the efficiency of the selected cleanup technology. Cleanup objectives for 'maintenance of ecosystems' should be derived for a site such that *Groundwater SEPP* objectives are met at the point of discharge to a surface water body (see Section 1.1 in these guidelines).

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6.1 Selection of groundwater cleanup technologies

Cleanup technologies should be assessed for their ability to meet cleanup objectives, resulting in the most effective and practicable technology(s) being selected.

Effective cleanup technologies are identified following:

- the collection and analysis of groundwater and aquifer characterisation data (see Section 2 in these guidelines)
- extensive review of groundwater cleanup technologies.

Examples of groundwater cleanup technologies include pump and treat systems, air sparging, air stripping with activated carbon adsorption and permeable reactive walls. Some suggested further reading on groundwater cleanup technologies is included in Section 10.

Some groundwater cleanup technologies will involve discharge to surface water, land and/or air. These must not pollute the receiving environment and the regulatory requirements related to such discharges are discussed in Section 8.

6.2 The practicability of cleanup of polluted groundwater

Polluted groundwater should be cleaned up such that the protection of beneficial uses is restored. Where acceptable to EPA, groundwater may be cleaned up to the extent practicable. EPA's role is to determine the practicability of a cleanup and if it is impracticable to clean up the groundwater, to determine any ongoing management measures necessary to restore beneficial uses. Where it is thought that it is impracticable to clean up polluted groundwater to restore beneficial uses, EPA should be consulted.

In determining the practicability of cleanup of polluted groundwater, EPA will take into account technical, logistical and financial considerations.

- **Technical** considerations include the physical ability to remove the pollution within a reasonable timeframe. For example, the chemical and physical properties of the pollutant(s), the groundwater and aquifer characteristics and the availability of technology(s) capable of effectively removing the pollution from the aquifer.
- **Logistical** considerations include access to the site, availability of materials and infrastructure, and the disposal of wastes.
- **Financial** considerations include the cost of cleanup, including equipment, installation, maintenance and waste treatment.

The cleanup measures adopted shall be cost-effective and commensurate with the significance of the environmental issues being addressed (including but not limited to consideration of the likelihood of beneficial uses being realised). These considerations will be made with due consideration of approaches adopted for other sites.

Cleanup of groundwater to restore the protection of beneficial uses should occur within a *reasonable timeframe*. The following considerations assist in defining a 'reasonable timeframe':

- the adequacy of interim measures to protect existing and likely beneficial uses of groundwater until the protection of beneficial uses is restored (for example, reliability of groundwater use controls during the cleanup process)
- whether cleanup will be achieved before pollution migrates offsite and/or affects existing beneficial uses
- community views on the timing and extent of cleanup (particularly if the plume is offsite).

Shorter timeframes to clean up pollution are warranted where there is greater likelihood of detriment to existing and likely beneficial uses of groundwater. A strong preference is afforded to options that result in cleanup in a shorter period of time. This reduces the risk of harm arising from the use of the groundwater. The most effective and timely groundwater cleanup may be provided by a combination of individual technologies.

If it is thought that cleanup to meet groundwater quality objectives (*Groundwater SEPP*) is impracticable:

- the evaluation of practicability should be clearly documented against each of the criteria set out in the previous text box and appendix 2 in these guidelines for consideration by EPA
- cleanup to the extent practicable is still necessary to minimise the impact on beneficial uses
- groundwater pollution and the use of groundwater should be managed (in accordance with Section 7 in these guidelines) so there are no detrimental effects on existing or potential beneficial uses of the groundwater
- the practicability of groundwater cleanup should be periodically reassessed.

The process for gaining a determination from EPA on 'clean up to the extent practicable' is provided in Section 2 of these guidelines. Additional guidance on the role of environmental auditors in these determinations is included in Section 13.6 of EPA Publication 759. A list of information to be included in such a submission to EPA is included in appendix 2.

7. Managing polluted groundwater

When cleanup to protect beneficial uses is not practicable (or where cleanup has not yet occurred or is currently occurring), polluted groundwater should be managed to ensure the protection of human health and the environment. Management of polluted groundwater includes the following key components:

- cleanup objectives (that reflect cleanup to the extent practicable) (see Section 6 in these guidelines)
- groundwater monitoring
- trigger levels

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- a contingency plan
- controls on the use of polluted groundwater, including the provision of information to ensure that affected landholders or subsequent landholders are aware of the polluted groundwater and the beneficial uses that are precluded
- periodic review of the practicability of the groundwater cleanup (to meet the *Groundwater SEPP* objectives) where this has previously been determined to be impracticable.

The preparation and implementation of any plan to manage polluted groundwater should incorporate these key components. EPA should be consulted in the preparation of such a plan.

7.1 Groundwater monitoring

Cleanup and/or management of polluted groundwater should, where appropriate, be accompanied by a groundwater monitoring program. This should specify such details as the location and frequency of sampling, as well as the measurements (that is, groundwater elevation and analyses) necessary to evaluate whether cleanup/management is performing as required. The groundwater monitoring program should provide for:

- monitoring of the groundwater elevation in each bore, enabling the determination of groundwater flow direction and rate that may indicate changes in any risks posed
- monitoring of the spatial and temporal variation in pollutant distribution, including detecting any unexpected expansion in the plume
- verification of the effectiveness of groundwater cleanup and management, and detecting changes in environmental conditions (for example, hydrogeological, geochemical and microbiological) that may reduce the effectiveness of the cleanup technology
- verification of the attainment of cleanup objectives (that is, protection of beneficial uses or objectives that reflect cleanup to the extent practicable)
- confirmation that beneficial uses of groundwater are protected outside the plume
- detection of new releases of contaminants to the environment that could impact on the effectiveness of the cleanup/management
- identification of any potentially toxic and/or mobile transformation products from the cleanup process.

The frequency of groundwater monitoring must be determined on a site-specific basis and include consideration of the:

- extent of the pollution
- contaminant type and properties
- local and regional hydrogeology (for example, flow direction and rate)
- presence of existing beneficial uses of groundwater in the vicinity of the plume

- quality of existing groundwater elevation and quality data.

The frequency of groundwater monitoring should be adequate to detect potential changes in the site conditions, while allowing sufficient time to implement contingency plans to protect receptors if an unexpected change occurs. For example, quarterly sampling of each bore may be considered sufficient to establish consistent trends in groundwater quality for a site where pollution remains onsite, groundwater flow velocity is low (less than 10 m a year) and there are no existing uses precluded by the pollution.

Refer to EPA Publication 669, *Groundwater Sampling Guidelines*, for guidance on sampling groundwater.

7.2 Trigger levels

A groundwater monitoring program should include 'trigger levels' that indicate if the current cleanup technology is not meeting, or will not meet, cleanup objectives. Trigger levels specify a concentration of contaminant(s) that is unacceptable at a critical location. These 'triggers' may signal unsatisfactory performance of the cleanup/management by indicating:

- an insufficient reduction in contaminant concentration
- an increase in contaminant concentration (possibly indicating a new release)
- migration and/or expansion of the plume.

Where trigger levels are exceeded, a contingency plan should be implemented that ensures cleanup objectives are attained (see Section 7.3 of these guidelines).

7.3 Contingency plan

A contingency plan is a description of the response in the event of 'trigger levels' being reached. It may involve the implementation of an alternative cleanup technology or simply a modification of the selected cleanup technology. Contingency plans should be prepared at the time of the initial technology selection and should be flexible, allowing for the incorporation of new information (for example, advances in cleanup technologies or toxicological data used to estimate the risk to groundwater receptors).

7.4 Controls on the use of polluted groundwater during cleanup/management

The use of polluted groundwater (both onsite and offsite) should be prevented (where appropriate) and/or information should be made available to potentially affected parties indicating the beneficial uses precluded by pollution.

The prevention of the use of polluted groundwater may include:

- controls on groundwater use and bore construction
- placing covenants on land titles of affected premises for information.

Note that the following legal requirements apply to the provision of information to subsequent owner/occupiers, including information about polluted groundwater:

- The occupier of any premises on whom a notice has been served (by EPA) under Sections 31 A/B (pollution abatement) and 62A (cleanup) of the *Environment Protection Act 1970* which is still in force, must notify any person who proposes to become an occupier of that premises as to the requirements contained in the notice and the steps, if any, that have been taken to comply with that notice (Section 60A, *Environment Protection Act 1970*).
- Where a statement of environmental audit has been issued (by an environmental auditor appointed by EPA) with respect to any premises and a certificate of environmental audit has not been issued subsequent to the statement, the occupier of the premises must provide a copy of the statement to any person who proposes to become the occupier of the premises (Section 53ZE, *Environment Protection Act 1970*).
- A vendor should provide information in relation to polluted groundwater at the time of sale of land. Legal obligations for information provision arising from a contract for the sale of land are set out in Section 32 of the *Sale of Land Act 1962*.

In all cases, any person who becomes aware of groundwater pollution at and from a premises should inform EPA and any other parties who may be affected (for example, the owner/occupier of any premises under which polluted groundwater occurs or is expected to occur).

EPA may assist in the dissemination of information by identifying a 'groundwater quality restricted use zone' (see Section 9 of these guidelines).

7.5 Periodic review of the practicability of cleanup of polluted groundwater

Where cleanup to restore the protection of beneficial uses is determined to be impracticable, periodic review of the practicability of groundwater cleanup (to meet *Groundwater SEPP* objectives) should be undertaken. This involves an assessment of information including:

- research of new/updated (and available) cleanup technologies
- data from the groundwater monitoring program (for example, geochemical data, plume/contaminant migration, contaminant concentrations and transformations)
- updated assessments of the risk posed to existing and potential beneficial uses of the groundwater, both onsite and offsite (for example, toxicological data).

7.6 When can management of polluted groundwater cease?

Management of polluted groundwater (including quality monitoring) should continue until the beneficial uses of groundwater onsite and offsite have been restored.

Evidence of the contraction or stabilisation of a plume of polluted water may not be an acceptable basis to cease monitoring and management of the plume, as this may not guarantee that the beneficial uses of the groundwater are, and will continue to be, protected. EPA should be

consulted on decisions to cease groundwater monitoring and management.

A groundwater quality management plan (GQMP) cessation submission to EPA should be auditor verified (see Section 7.1 of Appendix 2), and prepared using the information listed in the GQMP cessation checklist (see Attachment B).

8. Regulatory requirements related to cleanup and management of polluted groundwater

Some groundwater cleanup technologies will involve discharge to aquifers, surface water, land and/or air. Discharges during groundwater cleanup must not pollute the receiving environment.

The discharge activity may require a licence or works approval from EPA. Information on these requirements can be found in the *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996*.

Where a pilot study is proposed to be conducted to test a new cleanup technology that will ultimately produce a discharge that requires a licence or works approval, EPA may consider a research, development and demonstration project (RDD) application pursuant to Section 19D of the *Environment Protection Act 1970*.

8.1 Cleanup involving discharges to an aquifer

Cleanup technologies such as 'pump and treat' may involve the continual treatment and return of polluted groundwater to the aquifer, with the level of pollution being reduced at each treatment cycle. Other cleanup technologies involve the discharge of water to the aquifer containing substances with contaminant reducing properties (for example, nutrients to assist the growth of bacteria that degrade some contaminants).

Cleanup technologies that involve discharge to an aquifer must comply with clause 20 of the *Groundwater SEPP*. This clause allows the re-injection of treated groundwater to an aquifer, as part of a groundwater cleanup project. Under these circumstances EPA must be satisfied that there will be no detriment to any beneficial use beyond the premises boundaries and that groundwater quality objectives will be met upon completion of cleanup. Section 2 in these guidelines provides information on how to seek this determination from EPA prior to commencing cleanup.

9. Groundwater quality restricted use Zones

Groundwater quality restricted use zones (GQRUZs) are referred to in clause 19 of the *Groundwater SEPP* (as amended in March 2002). GQRUZs (previously known as polluted groundwater zones) are areas of aquifers that have been identified by EPA where one or more beneficial use(s) of the groundwater are precluded by pollution. GQRUZs may be of local or regional scale and may relate to a specific or diffuse source. EPA may identify an area

as a GQRUZ where it has determined that cleanup to the extent practicable has occurred.

EPA will provide information (for example, location, approximate degree and extent of pollution within the GQRUZ) to the groundwater resource manager and relevant rural water authority. EPA may also provide relevant information to other affected parties, catchment management authorities (CMAs) and local government.

In accordance with clause 19 of the *Groundwater SEPP*, EPA will require polluted groundwater within GQRUZs to be cleaned up to the extent practicable and the periodic reassessment of the practicability of cleanup. EPA will maintain a list of GQRUZs.

Irrespective of whether a GQRUZ has been identified by EPA, polluted groundwater, where cleanup to protect those beneficial uses is not practicable, should be managed in accordance with these guidelines.

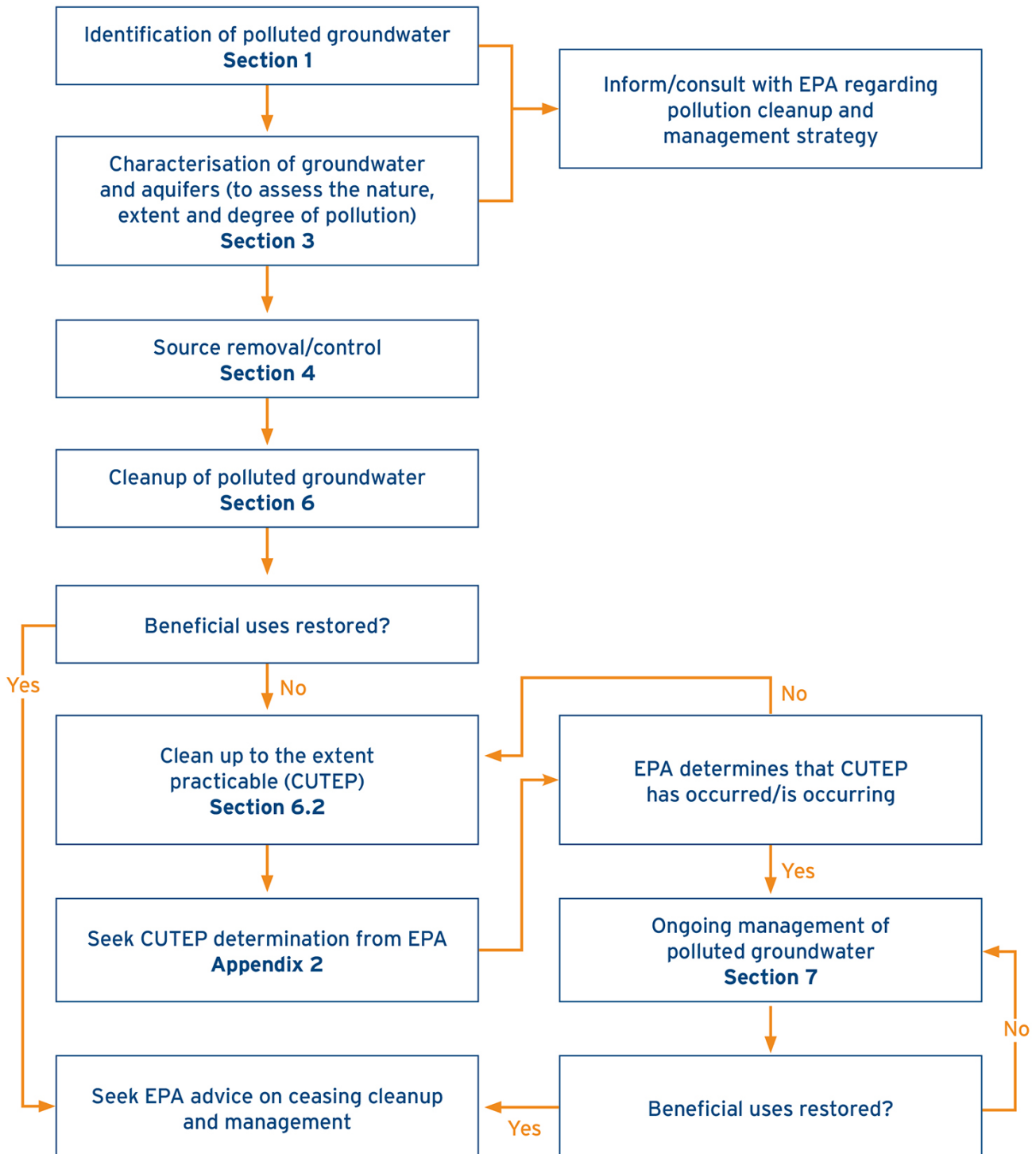
Other publicly available information that may relate to polluted groundwater is available on the EPA internet site (www.epa.vic.gov.au) and includes:

- information about groundwater quality in Victoria including the identified groundwater quality restricted use zones (GQRUZ). (For further information on identified GQRUZs, refer to EPA Publication 862)
- the priority sites register, a register of all sites for which EPA requires action relating to site contamination. This action may include cleanup and/or management of polluted groundwater. (For further information on the priority sites register, refer to EPA Publication 735)
- a list of sites for which statements of environmental audit have been issued by environmental auditors appointed by EPA. Statements of environmental audit may indicate that the quality of groundwater at or from a site may preclude one or more beneficial uses and include the auditor's opinion concerning any cleanup and/or management necessary.

10. Suggested further reading

- EPA 2000, *Groundwater sampling guidelines*, publication 669, EPA Victoria.
- Victorian Government 1997, *State Environment Protection Policy (Groundwaters of Victoria)*, *Victoria Government Gazette No. S 160*, Government Printer, Melbourne, December 1997.
- USEPA 1999, *Treatment technologies for site clean up: Annual status report (Ninth Edition)*, United States Environmental Protection Agency, EPA-542-R99-001, April 1999.
- USEPA 1998, *Abstracts of remediation case studies, volume 3*, United States Environmental Protection Agency, EPA-542-R98-010, September 1998.

Appendix 1: Recommended procedure for cleanup and management of polluted groundwater



Appendix 2: CUTEP Information guide

This guide relates to the documentation required to provide sufficient detail for decisions relating to 'clean up to the extent practicable' (CUTEP) as part of environmental audits. The purpose of this document is to provide a guide for:

- the preparation of a CUTEP submission provided to EPA by an auditor stating an opinion regarding a CUTEP determination to be made by EPA (in accordance with EPA Publication 759)
- or
- the information that is required to be included in an auditor-determined CUTEP and the audit report (in accordance with EPA Publication 759).

Details regarding the criteria for whether EPA or an auditor determines CUTEP for each site are provided in EPA Publication 759. EPA has drafted this document based on the experience gained in reviewing CUTEP submissions and making CUTEP determinations between 2002 and 2013.

Please note that the following information is to be provided as part of the CUTEP submission or audit report in addition to the requirements discussed in EPA Publication 840. For both auditor determined, and EPA-determined CUTEPs, submissions should be provided to EPA with a CUTEP checklist (see attachment A).

1.0 Background

Provide the following:

- a site description (include the current site plan and details of the current certificates of title)
- a summary of the site history and use, including:
 - a brief summary of the reason for CUTEP (for example, statutory notice, proposed change in site use, etc.)
 - a brief summary of the general site history and contamination
 - a brief summary of the current and proposed beneficial use(s) and/or development
 - summary information on the key pollution issue that is the reason for the CUTEP determination being sought
 - review and refer to relevant surrounding land uses and nearby audit reports (where applicable and relevant to the CUTEP determination) being made or sought.

2.0 Site conditions prior to cleanup and conceptual site model

The intention of this information is to summarise the site setting and document the condition of the site prior to cleanup activities. This is often referred to as the 'conceptual site model' and given that groundwater is the key concern, this must be supported by relevant information (outlined below).

The conceptual site model should be developed in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended 2013) (the NEPM) and EPA Publication 668 *Guidelines for Hydrogeological (Groundwater Quality) Assessments*.

2.1 Geology and hydrogeology

Provide an overview of the hydrogeology of the site in its sub-regional setting. This should be prepared using the guidance provided in EPA Publication 668 *Guidelines for Hydrogeological (Groundwater Quality) Assessments*. This should include (but not be limited to) a description of the following on a regional and local scale where relevant (with accompanying illustrations, cross-sections and tabulated data as appropriate for the site):

- Geology and aquifers - that is, a brief description of each lithological unit, for example, thickness, type and the identification of each aquifer, aquitard and hydraulic properties of aquifer(s).
- Groundwater occurrence and flow - including the depth to groundwater, presence of any potentiometric surface, flow direction, estimated seepage velocity, hydraulic conductivity, transmissivity and yield). Also describe any groundwater mounding, multiple aquifer interactions, preferential pathways, spatial and temporal variations in groundwater quality or contaminant concentrations (where present).
- Groundwater chemistry - identify the natural salinity/total dissolved solids (TDS) of the groundwater in each aquifer so as to identify the segment protected by the State Environment Protection Policy (*Groundwaters of Victoria*) (Groundwater SEPP). Additional information on the geochemistry of the aquifer may be relevant.
- Groundwater resource utilisation - a summary of current known bores and their use in the vicinity of the site (for example, within 2 km of the site or as appropriate).

It is also recommended the overview refers to at least one hydrogeological cross-section and/or a conceptual site model.

2.2 Source(s) of pollution

The conclusion that a site is (or is likely to be) a source of groundwater pollution is typically supported by one or more of the following key factors:

- Site history information indicates/confirms that the contaminant of concern was once used at the site or activities at the site have altered natural conditions leading to the mobilisation of naturally occurring or anthropogenically introduced contaminants.
- The contaminant of concern was detected in soil or vapour samples during the soil sampling program, noting that some contaminants may be difficult to identify in soil samples (for example, chlorinated hydrocarbons in shallow soils).
- Groundwater is polluted by the contaminant of concern.
- Upgradient or onsite sampling (current or data from surrounding sites) demonstrates the contaminant is not from a regional or alternate source.

A clear and logical description of the above factors should be provided for each contaminant that is subject to the CUTEP determination.

Where a site is not considered to be the source of groundwater pollution, the suspected source of pollution should be identified, along with evidence to support any such conclusion. In order to do this, in addition to evidence from the site, it may be necessary to review and discuss the following:

- soil and groundwater data for adjacent sites (for example, where audit reports have previously been completed)
- soil and/or groundwater data collected offsite and beyond the influence of any contaminant from the site
- any other information deemed relevant to support the conclusion that a source of groundwater pollution is located offsite or represents background concentrations exceeding relevant groundwater quality objectives.

2.3 Contaminant transport pathways and mechanisms

Discuss the mechanisms/pathways by which the contaminant(s):

- has, or is likely to have, moved through the soil profile and polluted the groundwater
- are dispersed within/by the aquifer. This should be linked to and explain the extent of groundwater contamination prior to, and after, cleanup.

2.4 Potential receptors/beneficial uses

Discuss the potential receptors/beneficial uses which may be impacted by the contaminant(s):

- Provide information with respect to potential receptors including groundwater extraction and groundwater discharge to surface waters.
- Provide information on soil vapour related to groundwater pollution.
- In relation to surrounding groundwater extraction, note the type of use, the bore screening depth interval/aquifer, direction and distance from the site.

- This discussion should include existing and potential future receptors/beneficial uses and include consideration of foreseeable changes to the site and surrounding site(s) that may create a new and/or altered exposure pathway(s).

3.0 Summary of cleanup works undertaken

A summary of all relevant soil and groundwater cleanup works undertaken must be provided.

For **soil** this should be a brief overview, and include the following:

- a brief summary of *relevant* soil remediation works - this summary should focus on the characterisation of the contamination status of the site and *source* removal (that is, soil remediation relevant to the identified groundwater pollution). For example:
 - For a site where groundwater is polluted with petroleum hydrocarbons, this would include removal of underground fuel storage tanks and associated petroleum hydrocarbon contaminated soil, but not other soil remediation activities unrelated to the groundwater pollution issue for which the CUTEP determination is being made
- an estimate of the initial contaminant source mass
- an estimate of the contaminant source mass removed
- an estimate of the residual contaminant source mass (if any)
- where complete source removal is/was impracticable, provide information with respect to any source control measures employed (if any). Information/data to support the performance of any source control measure should also be provided.

For **groundwater** this should be an overview, and include (but not be limited to) the following:

- justification/discussion of the type of cleanup/management technology employed (including a review of potential cleanup technologies considered)
- any cleanup benchmark or field trials and their results
- period of cleanup
- number of cleanup events and type
- effect of the cleanup undertaken, including discussion of any contaminant rebound/s or reduced concentrations of contaminants/reduction of contaminant source mass, that is, what evidence is there that the cleanup has been effective.

4.0 Extent and nature of groundwater pollution after cleanup

Provide a clear description of the extent and nature of groundwater pollution that is subject to the CUTEP determination (that is, the status of groundwater post any soil and/or groundwater cleanup works (if any) that have occurred). As a minimum:

- Discuss the adequacy of the groundwater monitoring well network to assess the lateral and vertical extent of groundwater pollution identified.

This discussion should refer to the guidelines for 'Delineating groundwater contamination' provided in Section 8.3 of the NEPM 1999 (as amended 2013).

- Discuss the frequency and total number of groundwater monitoring events used to define the extent of groundwater pollution.

With respect to the frequency of groundwater monitoring, consideration should also be given to seasonal and tidal factors, and the potential for these factors to affect the groundwater monitoring results.

This discussion should also comment on the trends in the groundwater data.

- In order to collect sufficient and reliable data to establish representative groundwater concentrations and trends, the following is recommended:
 - a number of monitoring events at each monitoring location that allows the current condition of groundwater to be reproducibly assessed (that is, representative data), generally considered to be greater than three monitoring events
 - an interval should be allowed between each monitoring event suitable for the hydrogeological environment, contaminants of concern and the return (or near return) of equilibrium in the aquifer following cleanup events.

Note that deviation from the above requirements may be justified in some cases. Where this occurs, justification for the deviation must be clearly documented.

- Provide a summary table for each beneficial use that is precluded by the groundwater pollution, including the corresponding contaminant(s) causing the pollution (see attachment B for an example). The summary table should also include naturally elevated or background elevated analytes in groundwater, as well as regional pollution (see attachment C for an example).
- Provide commentary on the likelihood of the beneficial use(s) being realised, now or in the future, including those precluded by pollution.
- Provide a figure(s) showing the extent of groundwater pollution for each relevant contaminant of concern.

- For sites where an assessment of the risk to human health of the groundwater pollution is completed, provide information and conclusions of the risk assessment, including the estimated excess lifetime cancer risk and hazard quotient (where relevant to the type of risk assessment undertaken).

Note that EPA Publication 668 provides further details regarding hydrogeological assessments.

5.0 Plume stability and future behaviour

Provide an assessment of plume stability and estimated/projected future plume behaviour. This should include an estimate of the time it will take for each beneficial use to be restored **without** any further cleanup/management in the context of climatic and seasonal variability.

A number of approaches are available for assessing plume stability and modelling/estimating the future behaviour of groundwater pollution. These range from simple data assessments through to complex mathematical modelling. The applicability of these approaches is site specific and dependant on several factors, including site conceptualisation, data availability, purpose of the modelling and risk posed by the pollution.

Examples of predictive plume behaviour are noted below:

- extrapolation and/or assessment of existing groundwater concentration data trends
- use of natural attenuation parameter data to estimate future trends
- analytical modelling of groundwater flow and contaminant transport
- numerical modelling of groundwater flow and contaminant transport.

6.0 Assessment of the feasibility of (further) groundwater cleanup/management

In cases where no active groundwater cleanup/management has occurred, the feasibility of any potential groundwater cleanup needs to be assessed and discussed for the purpose of the CUTEP submission. In cases where groundwater cleanup has already occurred, then the feasibility of further groundwater cleanup to restore the protected beneficial uses must be provided.

- Provide an assessment of the potential cleanup technologies that could be implemented. This assessment should include technical, logistical, financial and reasonable timeframe considerations (as required by EPA Publication 840). However, other criteria may also be considered based on relevant site-specific factors.
- Application of a 'staged' screening process may also be appropriate in some cases. For example, 'step 1' may first screen out potential cleanup technologies that are not technically feasible without the need to

provide a detailed discussion of logistical, cost and timeframe considerations.

Documents used to support the screening process should be referenced; for example, the USEPA *Superfund Remedy Report* (<http://www.epa.gov/superfund/remedytech/srr/>).

'Step 2' may then further assess the technically feasible cleanup technologies against the other criteria.

- Where the cost of a cleanup technology is included, the itemised costs for components that make up the total cost should also be provided. (It can also be relevant to disclose the costs of site cleanup to date as a guide to the levels of effort expended). Note the costs provided should be directly related to the potential cleanup works. For example:
 - capital cost
 - operation and maintenance cost per year
 - environmental monitoring and reporting costs (for example, groundwater monitoring).
- Provide the expected timeframe for the restoration of beneficial use(s) based on the implementation of each cleanup option considered.
- Provide an argument that further cleanup of groundwater pollution is not commensurate with the significance of the environmental issues being addressed and the benefit that would be achieved.

7.0 Management of polluted groundwater

7.1 Ongoing monitoring

Where ongoing groundwater monitoring is proposed, provide a plan (for example, a groundwater quality management plan (GQMP)) or information detailing the following:

- background information relevant to provide an understanding of the purpose and scope of the GQMP
- a description of the proposed monitoring schedule, including:
 - the identification of each well to be sampled and/or maintained
 - the frequency of sampling proposed
 - the analytical schedule
 - the period of monitoring proposed.
- triggers for further action based on the results of the monitoring program (for example, occurrence of NAPL, concentrations of contaminants of concern, changes in flow direction, existence of new nearby groundwater users, etc.)
- reporting requirements for the monitoring program, including identification of the responsibility for doing so (for example, site owner)
- the criteria for cessation of the monitoring program (for example, verification provided by the auditor to EPA seeking consent to cease monitoring or 53V environmental audit).

EPA may require a s53V environmental audit to cease

monitoring, the circumstances include:

- where NAPL exists and extends off-site
- where a groundwater plume impacts a large area
- where sensitive receptors exist, such as existing extractive bores, nearby receiving water bodies and potential vapour risk derived from groundwater, etc.

Where ongoing groundwater monitoring is **not** proposed, provide a statement justifying this approach supported by multiple lines of evidence.

7.2 Recommendation of the identification of a groundwater quality restricted use zone (GQRUZ)

EPA identifies GQRUZs where groundwater pollution precludes a protected beneficial use of groundwater. EPA requires auditors to recommend a GQRUZ boundary in the CUTEP submission. EPA currently identifies sites:

- as a GQRUZ (where pollution remains onsite)
- or
- **within** a GQRUZ (where pollution extends offsite).

The following information needs to be provided to EPA prior to a CUTEP determination being finalised (regardless of whether it is EPA or auditor-determined):

- the recommended location and size of the GQRUZ based on title boundaries (or the inferred extent offsite where the title boundary is not appropriate)
- the precluded beneficial uses of groundwater based on the remaining groundwater pollution
- documented evidence that property owners affected by GQRUZs that extend offsite have been consulted. In addition, evidence that any queries by the affected owners have been answered by the site owner/polluter, auditor or EPA (as required)
- a recommendation regarding the criteria for removal or amendment of the GQRUZ.

Additional guidance regarding the style of communication with offsite affected property owners is included in this document as attachment D.

7.3 Management of polluted groundwater

Provide information with respect to how the groundwater pollution should be managed following the determination of CUTEP. This may include:

- a map in the audit report showing the proposed extent of the groundwater quality restricted use zone (GQRUZ)
- where the groundwater pollution extends offsite, provide evidence of communication with offsite property owners affected by the proposed GQRUZ
- the proposed condition(s) to be included in the Statement of Environmental Audit related to the extraction of polluted groundwater onsite
- a summary of the ongoing management plan or requirements.

The cleanup and management of polluted groundwater

Attachment A - CUTEP checklist

To be attached to CUTEP submission made to EPA Victoria, or audit report where the auditor has determined CUTEP.

Site address: _____

IBIS No: _____ CARMS No: _____

Information included		Section/page discussed	Please tick off
Title details			
Land area			
Past use			
Surrounding land use (North, South, East and West)			
Proposed future use			
Geology			
Groundwater depth (m)			
Groundwater flow direction			
Nearest surface water receptor (distance and direction)			
Bore search (2 km radius)			
Groundwater segment (note - most conservative segment should be used)			
Beneficial uses of groundwater identified			
Summary table of precluded beneficial uses, with associated contaminants, as per attachment C			
Remediation options table	Discussion of specific options		
	Cost		
	Technical feasibility		
	Logistical feasibility		
Vapour risk considered			
GQMP	Responsible party identified		
	Cost - establishment and annual		
	Duration		
Water quality summary table showing results from all rounds of monitoring (ug/L)			
Separate table showing latest water quality results that are above guidelines (ug/L) as per attachment D (as a hard- and soft-copy Word document)			
An opinion on the source of all contaminants over criteria in the groundwater (e.g. onsite source, offsite source, co-source)			
Groundwater and soil contamination maps			
Hydrogeological cross-section(s) of the site showing (as a minimum) geology, groundwater levels, groundwater bores and any relevant features (e.g. USTs, excavations, utility services, building structures, etc.)			
Discussion of proposed GQRUZ (if applicable). This should include sufficient information to identify it and an associated figure. Note - a meeting should be held with EPA to discuss the GQRUZ. The GQRUZ itself should cover the known/modelled extent of all known precluded extractive beneficial uses.			
Details and records of communications with offsite property owners associated with the GQRUZ (if applicable)			
Any other issues of significance (e.g. Enforcement Notice, significant public interest)			
A clear and concise executive summary providing all of the above information			

Note that this is the base level of information required for a CUTEP submission. More complex issues will require additional information.

The clean up and management of polluted groundwater

We recognise that some aspects of the CUTEP checklist may not be relevant in certain site scenarios. In this case the requirement does not need to be met, but a clear reason needs to be provided. This may be achieved through a comment in the checklist, or a reference to where this argument is provided in the audit report.

Attachment B - GQMP cessation checklist

To be attached to GQMP cessation submission made to EPA Victoria.

Site Address: _____

IBIS No: _____ CARMS No: _____

Information included	Section/Page discussed	Please tick off
Site address and land area		
Title details		
Background information <ul style="list-style-type: none"> - Date of CUTEP/GQRUZ determined/identified (if applicable) - Statement of Environmental Audit condition regarding GQMP (if applicable) - Precluded beneficial uses of groundwater (prior to GQMP implementation) - A discussion on mechanism to cease monitoring (i.e. 53V audit to cease GQMP is not warranted where a 53V audit was previously recommended¹) 		
GQMP requirements <ul style="list-style-type: none"> - Monitoring frequency and period, bore networks and analytes - Trigger conditions/contingency - End points or mechanism for monitoring cessation 		
Summary of implementation of groundwater monitoring program <ul style="list-style-type: none"> - A total of groundwater monitoring events (GMEs) undertaken since GQMP - Level of compliance with GQMP 		
Summary of groundwater monitoring results reviewed since GQMP implementation <ul style="list-style-type: none"> - Groundwater flow direction - Historical concentrations, trends of contaminant concentrations - Plume stabilisation - Groundwater quality summary table showing results (↔g/L) 		
Current groundwater conditions <ul style="list-style-type: none"> - Separate table showing latest water quality results that are above relevant guidelines (↔g/L) - Maps of groundwater contamination, plume extent etc. 		
Assessment of risks to beneficial uses and the environment <ul style="list-style-type: none"> - Changes of groundwater uses in the vicinity of the site since GQMP implementation - Updated bore research information - Potential impacts to human health and the environment - Risks to beneficial uses 		
Opinions on whether triggers (or end points) of GQMP have been met and GQMP can be ceased		
Opinion on whether the GQRUZ identified should be retained, amended or revoked (if applicable)		
Any other issues of significance (e.g. remedial notice, significant public interest)		
A clear and concise executive summary providing all of the above information		

*Note that this is the base level of information required for a GQMP cessation submission. More complex sites will require additional information.

¹ Auditors can make a recommendation to EPA that a s53V environmental audit is not required for sites where a historical CUTEP determination has been made.

Attachment C - Example of precluded beneficial use summary table

Precluded beneficial use	Contaminant(s)
Maintenance of ecosystems	TPH (C ₆ -C ₃₆), arsenic, zinc (n), nitrate (b)
Potable water	NA
Mineral water	NA
Agriculture, parks and gardens	TPH (C ₆ -C ₃₆), arsenic, zinc (n)
Stock watering	NA
Primary contact recreation	nitrate (b)
Industrial water use	TDS
Buildings and structures	NE

Notes:

(n) - naturally occurring

(b) - background/regional pollution

NA - Not applicable

NE - No exceedance

Attachment D - Example of current groundwater analytical results summary table

The following template should be reproduced for the following:

- analytes considered by the auditor to be natural and hence not pollution
- analytes considered by the auditor to be sourced from the site
- analytes considered by the auditor to be from an upgradient source
- analytes considered by the auditor to be representative of regional pollution

Contaminant	Concentration range (µg)/L			Guideline values (µg/L) (Reference guideline)							
	Regional aquifer (Site aquifer formation, approximate depth to groundwater in mbgl)			Maintenance of ecosystems - Fresh water	Maintenance of ecosystems - Marine water	Potable water	Stock watering	Primary contact recreation	Agriculture parks and gardens	Industrial	Buildings and structures
	Upgradient	Onsite	Downgradient								

Notes:

Attachment E - Supplementary requirements for stakeholder communication for offsite Groundwater Quality Restricted Use Zones (GQRUZ)

Summary

Where an offsite GQRUZ is proposed, the auditee (the site owner/occupier) is required to communicate with affected stakeholders. These guidelines explain communication requirements, including:

- submission of a stakeholder communication plan for EPA review, via their auditor
- informing stakeholders of the application for GQRUZ identification
- notifying stakeholders of the outcome once EPA makes its determination.

1. Aims, scope and overview

Aim

The aim of this attachment is to guide auditees (site owner/occupiers), their consultants and auditors in conducting effective communication with stakeholders affected by an offsite GQRUZ. The purpose of GQRUZ communication is to enable stakeholder input in to EPA's GQRUZ identification, and to notify stakeholders of restrictions if an offsite GQRUZ is identified.

Scope

This attachment specifies stakeholder consultation requirements only in relation to GQRUZ - i.e. EPA's decision to manage residual contamination through restricting groundwater use. Stakeholder engagement will be required at many prior stages of the contaminated site assessment process, as set out earlier in this publication (see section 7.4 - Controls on the use of polluted groundwater during clean up/management) and in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) Schedule 8 - Community Engagement and Risk Communication² (the NEPM). Communication regarding GQRUZ should not be the first time stakeholders are engaged about a site.

The intent of a GQRUZ (refer to Section 9) is to inform stakeholders of risks relating to extraction of groundwater via a bore or direct access of shallow groundwater. A GQRUZ is not intended to manage groundwater pollution that poses a hazard offsite in other ways, e.g. a direct contact risk to construction workers, soil contamination offsite, a vapour risk, or a risk to surface waters. In these circumstances further communication measures may be required by EPA.

Overview

Stakeholders affected by an offsite GQRUZ proposal must be communicated with at two stages.

Stage 1 communications: provide stakeholders an opportunity to input into EPA's CUTEF decision

Stage 2 communication: notify stakeholders of restrictions once a decision is made.

To ensure this communication is effective, EPA requires development and execution of a site-specific communication plan demonstrating how affected stakeholders will be identified, and what communication methods and key messages will be used to reach them at each stage.

For most sites, the communication plan will be simple and limited to completion of the attached 2-page "communication plan" template. However, any communication plan should be scaled to the complexity of the site, including considerations such as the risk, the number of properties affected, and the level of community interest.

Further detail and supporting resources are provided in the sections to follow. Section 2 shows the timing of GQRUZ communications activities in relation to the CUTEF application process, and the respective roles of the site owner/occupier and their consultant, the auditor, and EPA. Section 3 provides guidance on communication plans. Section 4 includes tools to support owner/occupiers/consultants, including an example communication plan template and letters.

² National Environment Protection Measure (Assessment of Site Contamination) Measure 1999 (as amended 2013), Schedule 8, Guideline on Community Engagement and Risk Communication

2. GQRUZ communication process, timing and roles and responsibilities

Figure 1 and the text below set out the main stages of GQRUZ communication, timing in relation to the CUTEP application process, and responsibilities of the owner/occupier, assessor, auditor and EPA at each stage.

Summary of process and timing

1. A GQRUZ communication plan must be developed covering stage 1 and 2 communications. EPA can assist with communication plan development on request.
2. The communication plan is included with the CUTEP submission. EPA reviews the plan against guidance in this publication within 3 weeks, comments on its adequacy, and provides a draft GQRUZ map.
3. Stage 1 of the communication plan is implemented, allowing 2 weeks for stakeholders to respond to communication. Documentation and evidence of implementation are gathered as specified in the communications (comms) plan.
4. The auditor notifies EPA when stage 1 is complete. EPA makes its decision on whether CUTEP can be determined and a GQRUZ will be identified.
5. Stage 2 of the communication plan is implemented with evidence documented in the audit report.

Table 1: the CUTEP application process and associated GQRUZ communications actions

	CUTEP application process step	GQRUZ communications action
1	Auditor submits CUTEP notification and arranges optional CUTEP briefing with EPA (6 weeks prior to CUTEP submission).	Owner/occupier/consultant prepare communication plan, and auditor reviews. EPA assistance with communication plan can be requested at CUTEP briefing
2	Auditor submits CUTEP.	Communications plan is included with CUTEP submission.
3	EPA conducts initial review of CUTEP submission, GQRUZ, and comms. plan (Within 3 weeks of CUTEP submission) against this publication. EPA comments on adequacy of these to the auditor. The draft GQRUZ map is produced.	Auditor advises site owner/occupier of any required changes to comms plan based on EPA advice. Site owner/occupier and consultant update comms plan. Once the comms plan is agreed by all parties, the site owner/occupier and consultant start stage 1 communication.
4	Auditor responds to any initial review queries. EPA continues detailed review of CUTEP submission while awaiting GQRUZ comms responses.	Allow two weeks for stakeholder feedback. Owner/occupier/consultant collate stage 1 communications evidence and responses. Auditor reviews and notifies EPA when complete.
5	EPA determines CUTEP (Within 8 weeks of CUTEP submission, not including time with auditor). EPA considers any feedback from stakeholders as part of its CUTEP assessment.	Owner/occupier/consultant start stage 2 communications. Evidence of stage 2 comms. provided to auditor and documented in audit report.
6	Auditor finalises s53X environmental audit report.	

Table 2: Summary of GQRUZ communication roles and responsibilities

Role	Responsibility
Site owner/occupier	<ul style="list-style-type: none"> • Development and implementation of communication plan • Respond to stakeholder queries
Auditor	<ul style="list-style-type: none"> • Review of communication plan to confirm it complies with this guidance and NEPM Sch 8 • Review and document evidence that plan has been implemented. • Respond to stakeholder queries
EPA	<ul style="list-style-type: none"> • Provide guidance and resources as set out in this attachment • Assistance on request with developing/implementing a communication plan • Confirmation of communication plan • Respond to stakeholder queries

3. Step by step guide to developing a communication plan

A communications plan must be submitted to EPA with the CUTEP submission. This plan may either be completed according to the template on the following pages, or follow another format, provided the below steps are conducted.

1. Identify the communications purpose

In the context of GQRUZ communications, this is to:

- Inform stakeholders about the quality of groundwater and the proposed restrictions.
- Give stakeholders the opportunity to respond and ask questions prior to GQRUZ identification.
- Inform stakeholders if EPA approves identification of a GQRUZ.

2. Identifying and understanding stakeholders

Refer to the NEPM s4.1.2-3 for details on identifying stakeholders and understanding their communication needs. For GQRUZ, stakeholders are individuals/organisations with a potential to extract groundwater within the GQRUZ, including:

- Both owners and occupiers of any private properties within the proposed GQRUZ. For apartment complexes, the owner's corporation rather than individuals may be contacted.
- Owners or occupiers of other land - e.g. Council or VicRoads for roadways.

Utility owners with underground infrastructure would not normally need to be contacted unless they are a land owner/occupier, but should be considered on a site by site basis depending on their likelihood of accessing groundwater.

Once stakeholders are known, undertaken a simple stakeholder analysis to understand the communication needs of these individuals/groups. For example:

- Communication challenges - such as English proficiency, or internet literacy.
- Level of familiarity with the concept of groundwater
- Level of prior knowledge concerning the contamination at the audit site.

3. Developing key messages

The NEPM Schedule 8 s4.1.5 provides guidance on developing site specific key messages. In summary, these should explain (1) the nature of the risk (2) the potential impacts to the stakeholder (3) the basis for statements about the site (e.g. outcomes of site investigations) (4) efforts to address the contamination issue, and (3) how the stakeholder can get involved in the process. They should also consider how the risk may be perceived by the stakeholder.

Messages for stage 1 communications should include:

- i. The purpose of communications - to advise site owners/ occupiers that a GQRUZ is proposed at their property
- ii. A warning that groundwater may pose a health risk if extracted (but does not otherwise pose a risk).
- iii. A reference to any prior communications with the stakeholder regarding the contamination.
- iv. References to introductory background information on groundwater and GQRUZ (e.g. GQRUZ website).
- v. Reference to information on contamination at the site and investigations to date (e.g. attachment/contact person)
- vi. Advice that the site owner will be required to advise future prospective purchasers of the GQRUZ.
- vii. Instructions on how the stakeholder can obtain further information and provide feedback. This should include timeframes, contact details for the site owner/occupier/the auditor/EPA and if required, arrangements for language translation organised by the owner/occupier.
- viii. A summary of next steps, including GQRUZ identification, stage 2 communications, finalisation of the s53X environmental audit report, and any ongoing groundwater monitoring plan.
- ix. A copy of the draft GQRUZ map

Messages for stage 2 communications should include:

- i. That a GQRUZ has been identified that affects the stakeholder's site.
- ii. A reference to communications with the stakeholder to date.
- iii. Advice that the site owner will be required to advise future prospective purchasers of the GQRUZ.
- iv. A list of contact details for the site owner, the auditor and EPA.
- v. A list of next steps - for example, the s53X audit report will be finalised, any ongoing monitoring arrangements.
- vi. A copy of the finalised GQRUZ map.

4. Deciding on communication methods

The NEPM s5 explains how to choose a communication method that has the best chance of reaching stakeholders at the site. The communication method would usually include a formal letter for both Stage 1 and Stage 2, delivered by a method that generates evidence of receipt. To increase chances that letters are opened and read, efforts should be made to personally address or deliver letters. The communication plan should explain how contact details of stakeholders will be sought (e.g. a Council or Utility record search). Other communication methods, such as public meetings, should be considered as supplementary measures, and should be used where suited to the site.

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GQRUZ Communication Plan Template

The template on the following two pages can be used by an audit site owner/occupier and their consultants in preparing a communication plan for an offsite GQRUZ, to be submitted to EPA Victoria. Using this template is not compulsory but plans must meet Attachment D requirements.

GQRUZ communication stages

Stage	Timing	Purpose	Activities
1	Between CUTEP submission and CUTEP determination	Seek stakeholders' input prior to CUTEP determination and GQRUZ identification (EPA requirement)	<ul style="list-style-type: none"> Owner/occupier/their consultant must draft a communication plan and provide it to the auditor. The auditor will review the plan and submit to EPA with CUTEP submission. EPA will provide feedback to the auditor on the plan and GQRUZ extent within 3 weeks. The owner/occupier/their consultant then execute the plan. Communications recipients must be given at least 2 weeks to respond. The owner/occupier/consultant will provide evidence of communications and a summary of any feedback to the auditor. The auditor will confirm with EPA that the communication plan has been executed and share any feedback relevant to CUTEP determination.
2	After CUTEP determination	Inform stakeholders of the CUTEP determination and GQRUZ identification (EPA requirement)	<ul style="list-style-type: none"> If EPA identifies a GQRUZ, the auditor will be informed. The owner/occupier/consultant should then undertake stage 2 communications. Evidence of these will need to be submitted to the auditor before the audit report can be finalised.

Stakeholders Audit site owner/occupier - please fill out for the appropriate stakeholders (add more rows if necessary)

Stakeholder	Contact details (name, address, phone, email)	Communication needs and interests	Most effective communication methods
Private property owners	May be individuals or body corporate	(e.g. English proficiency, age, internet access, understanding of groundwater)	(e.g. one-to-one talks, small group meetings, community meetings, open days at the polluting site, mailed letters, other)
Private property occupiers			
Public land owners			
Public land occupiers			
Other			

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Communication plan details - stage 1 and stage 2

Please complete the following tables for stage 1 and stage 2 communications

Stage 1 communications

Stakeholder	Relationship to site	Method(s) of communication	Proposed date of communications	Communications materials and key messages	Provisions for stakeholder to respond	Documentation and evidence
<i>E.g. Mrs Smith</i>	<i>E.g. owner of affected property</i>	<i>E.g. letter sent via registered post</i>	<i>E.g. immediately after plan and GQRUZ reviewed by auditor and EPA</i>	<i>What do you want the stakeholder to understand? What will be the content of communications? Please either attach example communications materials (e.g. a draft letter) or detail key messages.)</i>	<i>How can the stakeholder respond to the GQRUZ proposal? E.g. phone contact details for the site owner/owner/occupier, the auditor and EPA will be provided on the letter.</i>	<i>How will evidence of communications be obtained? For example, express post tracking information to show delivery, or a contact register for hand-delivered letters</i>

Stage 2 communications

Stakeholder	Relationship to site	Method of communication	Proposed date of communications	Communications materials and key messages	Provisions for stakeholder to obtain further information	Documentation and evidence