

Country Heights Estate Water Reserve Drinking Water Source Protection Plan

Country Heights Estate
Water Supply

Gingin

April 2017

Rev I

The logo for Kcett features the word "kcett" in a bold, lowercase, sans-serif font. The letters are a dark red color. Above the letter "k", there are three short, parallel, slanted lines of the same color, stacked vertically. The logo is positioned in the lower half of the page, above a solid orange horizontal bar that spans the width of the page.

KCTT System Architecture: Drinking Water Source Protection Plan
 KC00217.006 Country Heights Estate, Gingin

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1. Summary

The Country Heights Estate is in Ginginup approximately 90km north of Perth and 5km north-west of the town of Gingin, in the Sire of Gingin. The proposed development is for a 314-lot rural residential subdivision with typical 1 hectare lots. The proponent is also committed to service the adjacent future development at Lot 83 Cheriton Road, Ginginup, of up to 72 lots with this potable water source. Therefore the water supply has been suitably sized to service both the requirements of the Country Heights Estate, as well as the aforementioned adjacent future development site. The establishment of the new potable water supply is in progress, and an application for a water service provider license has been submitted to the Economic Regulation Authority (ERA) by Aquasol Pty Ltd for the operation of the proposed plan to take water. Once established, the water supply will be managed and operated by a private water supplier.

Hydrogeological investigations have previously been undertaken by Rockwater Hydrogeological and Environmental Consultants (Appendix 3) to investigate the suitability of the Leederville aquifer as a supply source for the proposed plan. A production bore (CEPB1) was drilled and tested to satisfy the requirements of the H2 level hydrogeological investigation. The production bore is located approximately 1.6km west of Cheriton Road, and within the proposed Country Heights Estate.

Current land use for the property has mostly been cleared for pasture, except for the Boonanarring Nature Reserve which is located about 2km north of the proposed subdivision. Four centre-pivots adjoin the property though these are most likely drawing water from Gingin Brook, rather than groundwater. The surrounding land-uses pose minimal risk to the water supply due to the confined nature of the source aquifer system, provided the bore construction is in accordance with the Minimum Construction Requirements for Water Bores in Australia (3rd Edition) (National Water Commission 2012).

This Drinking Water Source Protection Plan (DWSPP), has been prepared by KCTT to assess the risks to water quality within the proposed Country Heights Estate Water Reserve and to recommend management strategies to avoid, minimise and manage those risks. The water quality protection measures to be implemented include: -

- The proclamation of the boundary of the proposed Country Heights Estate Water Reserve in accordance with the Country Areas Water Supply Act 1947. The private land in the compound (water reserve) will be managed for priority 1 (P1) water source protection.
- Approval and Recognition of the water reserve and P1 area within the Shire of Gingin's local planning scheme and other applicable strategies.
- Best Management Practices implementation, including construction of the bore in accordance with Minimum Construction Requirements for Water Bores in Australia (3rd Edition) (National Water Commission 2012). The full list of practices is in Section 4.5 of this DWSPP.

This DWSPP has been prepared to satisfy the requirements of the Department of Water in line with the departments commitment to continuous protection of this drinking water source to meet public health requirements and ensure the supply of a reliable, safe, good quality drinking water for all consumers in the subject and surrounding areas.

The Australian Drinking Water Guidelines recommend a “multiple barrier, catchment to consumer” approach to protect public drinking water sources which this DWSPP is consistent with. This approach is reflected in the Drinking Water Source Protection Plans developed by the Department of Water in Western Australia. Catchment protection is the first barrier against contamination, with subsequent barriers implemented at the water storage, treatment, and distribution stages of a water supply system.

Catchment protection requires an understanding of the catchment and the hazards and hazardous events that can compromise drinking water quality. This understanding enables the development of preventative strategies and operational controls to ensure the safest possible water supply to consumers.

This Plan details the location and boundary of the drinking water reserve which provides potable water to the Drinking Water Source within the Country Heights Estate in Gingin, and discusses existing and future use of the water source. This source is not considered under influence from surface land uses because the water is drawn from a confined aquifer at a depth of 276m. Therefore, the source is not considered susceptible to contamination. The proposed bore is to be constructed in accordance with the Minimum Construction Standards for Bores in Australia (edition 3).

The Department of Water has advised that it agrees with the assessment of this source and supports the water quality protection measures described above. This is subject to approval of the proposed development and of a water service provider license for a potable water supply. The Department of Water has advised that it will proclaim the Country Heights Estate Water Reserve as proposed in this DWSPP once these conditions have been met (Appendix 1).

2. Glossary

Abstraction	The pumping of groundwater from an aquifer, or the removal of water from a waterway or water body.
Absorb	Adsorb means to accumulate on the surface of something.
Aesthetic guideline value	The systematic allocation for the depreciable amount of an asset over its useful life.
Allocation	Is the volume of water that a licensee is permitted to abstract, usually specified in kilolitres per annum (kL/a).
Aquifer	An aquifer is a geological formation or group of formations able to receive, store and transmit significant quantities of water.
Australian Drinking Water Guidelines	The National Water Quality Management Strategy: Australian Drinking Water Guidelines 6, 2011 (NHMRC & NRMCC 2011) (ADWG) outlines acceptable criteria for the quality of drinking water in Australia (see this plan's References).
Bore	A bore is a narrow, lined hole drilled into the ground to monitor or draw groundwater (also called a well).
Bore field	A group of bores to monitor or withdraw groundwater is referred to as a bore field (also see wellfield).
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Confined Aquifer	An aquifer that is confined between non-porous rock formations (such as shale and siltstone) and therefore contains water under pressure.
Contamination	A substance present at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment, water resources or any environmental value.
Drinking water source protection report	A report on water quality hazards and risk levels within a public drinking water source area; includes recommendations to avoid, minimise, or manage those risks for the protection of the water supply in the provision of safe drinking water supply.
Hydrogeology	The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
Public drinking water source area	The area from which water is captured to supply drinking water. It includes all underground water pollution control areas, catchment areas and water reserves constituted under the Metropolitan Water Supply, Sewerage, and Drainage Act 1909 or the Country Areas Water Supply Act 1947.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment.
Water quality	Water quality is the collective term for the physical, aesthetic, chemical and biological properties of water.
Water reserve	A water reserve is an area proclaimed under the Country Areas Water Supply Act 1947 or the Metropolitan Water Supply, Sewerage, and Drainage Act 1909 for the purposes of protecting a drinking water supply.
Well Head Protection Zone (WHPZ)	A designated area surrounding a bore / well for the purpose of water quality protection.

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Appendix 4 – Country Heights Estate Subdivision and Staging Plan

Appendix 5 – License to Take Water Approval Letter from Department of Water.

Appendix 6 - Water Treatment Plant Process Diagram and Layout

3. Drinking Water Reserve Overview

3.1 Proposed Water Supply System

A potable water supply is required for the development of the Country Heights Estate project at Lot 81 Cheriton Road, Gingin. A site location plan is shown in Appendix 3, Figure 1 – Country Heights Water Reserve Locality Map.

The proposed development covers an area of approximately 350 ha and includes the construction of 314 residential lots. The current plan for the developments residential density is of R1 coding, which is to be split in to 5 stages of construction over approximately a 10-year period. The proposed staging is shown in Appendix 4 – Country Heights Estate Subdivision and Staging Plan.

Aquasol Pty Ltd (Aquasol) has applied to the Economic Regulatory Authority (ERA) for a Water Service Provider’s (WSP) License to operate the required potable water supply from the confined Leederville aquifer. Abstraction will utilise a single production bore CEPB1, with abstraction under a 5C license granted by the Department of Water and supported by the H2 Hydrogeological Assessment Report, completed by Rockwater Pty Ltd 2015. A copy of this report is in Appendix 3.

The proposed Country Heights Estate license to take water details are summarised in Table 1 below, with the Department of Water approval letter in Appendix 5.

Table 1 – License to Take Water Details

Local Government Authority	Shire of Gingin
Licensee	Claymont Development Pty Ltd
License No	GWL178900
Aquifer Type	Confined
Description of Water Source	Gingin – Perth – Leederville – Parmelia Aquifer
Location of Water Source	Lot 81 on Plan 38255 – Volume / Folio 2572/129 – Lot 81 Cheriton Road Ginginup
Licensed Abstraction	200,000kL per annum
Number of Bore(s)	1
Bore Name and GPS Coordinates	CEPB1 (3976680E,653871N)
Duration of License	27 th November 2015 to 4 th November 2025

3.2 Water Treatment

The water to be extracted from bore CEPB1 is to be disinfected by chlorination before supplying the Country Heights Estate water reticulation mains. Chlorination is the final barrier used to ensure good quality public drinking water. Although this is essential, source protection will be achieved through appropriate catchment and aquifer management, as endorsed by the Natural Resource Management Ministerial Council (NRMMC, 2011). Water quality analyses were conducted during the H2 Hydrogeological Assessment Report. The results indicated that the source water meets all Australian Drinking Water Guidelines requirements with the exception of pH and iron values, which Rockwater have recommend the injection of soda ash and aeration as part of the water treatment process. Implementation of this process of the water treatment process to ensure the water quality stays within the Australian Drinking Water Guidelines will be undertaken by the proposed water supply provider (Aquasol).

The drinking water quality will be managed in accordance with the Australian Drinking Water Guidelines (NHRMC and NRMMC 2004a) and in accordance with the proposed management plans.

3.3 Treatment and Processes of Potable Water Supply

The proposed treatment system will see raw water pumped to the surface via a 276-metre depth bore into the Leederville Aquifer. The raw water will be pumped via a small-bore feed piping to the Water Treatment Plant within the water reserve compound. This configuration is shown in Appendix 2, Figure 2 – Bore and Water Treatment Plant Compound. The raw water will first be pumped through a series of filtration tanks with filtration media, then through a second filtration system which includes UV sterilisation and reverse osmosis where liquid chlorination will be the final barrier of treatment. This treated water is then pumped into 2 x 300kL potable water storage tanks, and finally the water will be pumped into a pressurised water supply system which will reticulate each of the proposed lots in the Country Heights Estate development.

The filtration system will require regular backwashing, as represented by the red lines and arrows for the backwash water in Appendix 6 of this report. All backwash water will be sent to a separate collection tank for further treatment. At regular maintenance intervals the backwash water tank will be dosed with flocculent, which will enable any solids to be settled by gravitation at the bottom of the tank for later removal. The clear water from the top can then be recycled through the system and sent back to the treatment train. The purpose of the back-washing is to remove materials such as iron precipitate and other impurities which settle through the carbon filtration media. The layout of the proposed Water Treatment Plant system is shown in Appendix 6 – Water Treatment Plant Process Diagram and Layout.

The final stage in the water supply process is the water reticulation system, which connects the Water Treatment Plant to the future dwellings. The design for the water reticulation system will be based on the standard reticulation design requirements used by the Water Corporation of Western Australia Design Standard DS 63.

4. Catchment Details

4.1 Climate

The Gingin region has a Mediterranean type climate, characterised by warm dry summers and mild wet winters. The long-term average rainfall over the past 20 years is 620.2mm, with most of the rain being dissipated between May and September. Climate statistics for the town of Gingin have been provided below from the Bureau of Meteorology website (Ref: http://www.bom.gov.au/climate/averages/tables/cw_009178.shtml).

Table 2 – Average Temperature and Rainfall

Month	Mean Temperature	Maximum	Mean Temperature	Minimum	Mean Rainfall (mm)
January	33.2		16.6		15.1
February	33.3		17.1		9.5
March	30.8		15.3		20.6
April	26.6		12.2		29.9
May	22.7		9.1		76.7
June	19.6		7.3		112.6
July	18.3		6.2		125.8
August	19.1		6.5		107.3
September	20.6		7.4		83.2
October	24.4		9.2		35.0
November	28.0		12.0		20.3
December	30.6		14.4		9.8
Total (Average)	25.6		11.1		620.2

Source: Bureau of Meteorology

4.2 Physiography and Vegetation

The site is located to the north-west of the town of Gingin, which lies within the Dandaragan Trough. The site has undulating levels varying from RL 140 m AHD along the eastern side of the site (Cheriton Road) to approximately RL 240 m AHD at the south-west portion of the site. The Country Heights Estate covers an area of approximately 350 hectares. Through desktop studies conducted utilising available aerial imageries and confirmed in a report prepared by Golder Associates, (Geotechnical Investigation Access Roads Lots 81 and 83 Cheriton Road Cheriton Country Estate Gingin, WA) the site is well grassed throughout and has some dense natural vegetation in the northern portion of the site. Further detail from the Golder Associates report referenced above confirms the following: -

- Geology under proposed road reservations (measured in twelve test pits)
 - SAND – fine to medium grained, very loose to loose extending to depths of between 50mm to 200mm, overlying
 - SAND – fine to medium grained, very loose to medium dense (Aeolian) extending to the depth investigated of 2.7 metres.
 - In three test pits, some LATERITED / CEMENTED sandy GRAVEL / Gravelly SAND was encountered at depths of between 1.4 metres and 2.0 metres.
 - In one test pit a surficial layer of clayey GRAVEL (possibly fill) to a depth of 0.20 metres.
- Geology under the proposed water tank site

- SAND – fine to medium grained, very loose to loose from surface to 1.4 metres depth
- Cemented Sandy GRAVEL / LATERITE, moderately to well cemented

The soil types are therefore well-suited to high levels of infiltration at the surface.

4.3 Hydrology / Hydrogeology

The Department of Water provides the following general description of the hydrology of groundwater in the Perth Basin region. “Stretching about 2200 square kilometres along the coastal plain north of the Swan River to Gingin and east to the Darling Scarp, the Gnangara groundwater system comprises four main aquifers: -

- The shallow, unconfined Superficial aquifer (the Gnangara Mound).
- The shallow, semi-confined Mirrabooka aquifer.
- The deep, mostly confined Leederville aquifer.
- The deepest, mostly confined Yarragadee aquifer.”

The site is located within the Northern Perth Basin, with the proponent planning to extract water via bore hole CEPB1 from the Leederville Aquifer.

The Leederville Aquifer is noted as a “mostly confined” aquifer. The aquifer is noted as being “much deeper and separated by confining layers made up of materials with low permeability, such as clay and shale, which minimise water movement between these layers”. KCTT undertook a search of hydrogeological data using the Department of Water’s mapping (www.water.wa.gov.au) and found the following information: -

- Aquifers - Level 1 Perth - Surficial
- Aquifers - Level 2 Perth - Leederville - Parmelia.
- Aquifers - Level 3 Perth - Yarragadee North.
- Groundwater Salinity
 - State (Generalised) 1000-3000 mg/L
 - Perth Basin - Yarragadee/Cockleshell/Lesueur/Sue 1500-3000 mg/L
 - Perth Basin - Leederville/Parmelia 500-1000 mg/L

The local hydrogeological cross section completed by Rockwater Pty Ltd in May 2015 for the Country Heights Estate at CEPB1 (Appendix 2 - H2 Hydrogeological Assessment Report, Rockwater Pty Ltd) shows the local hydrogeology at the well-head as: -

- Surficial deposits within the top 3 to 5 metres;
- overlaying Poison Hill Greensand / Molecap Greensand to a depth of around 30 metres
- overlaying Kardinya Shale to a depth of around 15 to 20 metres;
- overlaying Henley Sandstone to a depth of around 35 metres;
- intercepting the Leederville Formation around 130 metres beneath the surface;
- terminating the well head around the Parmelia Foundation at a depth of 276 metres, or at a level around - 50m AHD.

The depth of the well head is therefore intercepting the Leederville Formation.

4.4 Water Quality

There is a wide range of chemical, physical, and microbiological properties that can affect the health and aesthetic quality of drinking water. For the Country Heights Estate development, independent water quality testing was conducted by Rockwater Pty Ltd and submitted to ALS, which is a NATA registered laboratory. Water samples were taken from bore CEPB1. At the end of the 48-hour pumping test, the results indicated that: -

- The water is of potable quality, with a salinity of about 240 mg/L TDS and a total hardness of 35 mg/L.
- Concentrations of major ions and nutrients are well below Australian drinking water guidelines (ADWG) set by the NHMRC & NRMCC, 2011.
- pH was 5.9, which is slightly lower than the ADWG aesthetic range of 6.5 to 8.5
- Dissolved iron was 0.37 mg/L which is higher than the ADWG aesthetic value of 0.3 mg/L

Further details on the testing are contained in the full report by Rockwater Pty Ltd, provided in Appendix 3 of this report.

The water samples were taken at the end of the constant-rate test, when the pH and electrical conductivity of the water had been stabilised. All health and aesthetic related chemical components of the raw water, with exceptions of iron and manganese on occasions, are within Australian Drinking Water Guidelines (ADWG) (NHMRC & NRMCC 2001). The high iron concentrations are most likely a result of the steel casing of the bores. The monitoring program should be maintained to established the long-term trends in water quality as per the recommendations in Rockwater Pty Ltd report as nominated in Section 10 – Groundwater Monitoring and Well Head Protection. Specific consideration should be given to the potential risk of microbial contamination of raw water (Bore CEPB1). Further information on potential management of microbial management is shown in Appendix IV of the Rockwater Pty Ltd report.

Rockwater Pty Ltd stated that “soda ash injection and aeration will be required as a part of the water treatment process, with implementation of this process being the responsibility of the water supply provider”. Aquasol have subsequently confirmed their system will be using a suitable media filtration design with pH correction to maintain water quality.

4.5 Contamination Risks

Contamination risks to drinking water quality can occur through a range of chemical, physical and microbiological factors which affect the provision of a reliable, safe good quality, aesthetically-acceptable drinking water to consumers. A description of each of these factors is provided below: -

- Chemical contaminants are substances including chemical compounds or elements which could potentially contaminate a water source. The phrase “chemical contamination” is used to indicate situations where chemicals are either present where they shouldn’t be, or are at higher concentrations than they would naturally have occurred.
- Physical contaminants refer to solid materials that enter the water treatment system and may impact the aesthetic qualities of the water. Aesthetic qualities of water can be affected via these impurities in the drinking water, which can include impacts to the appearance, taste, smell and / or feel of the water.
- Microbiological Contaminants are pathogens of the micro-organism type that can cause disease including bacteria, protozoa and viruses.

Protection from contamination is one of the key components in any Drinking Water Source Protection Plan. The first step in developing appropriate protection measures is to confirm the aquifer is confined, semi-confined, or unconfined. Rockwater Pty Ltd's H2 Hydrogeological Assessment Report confirms the Leederville Aquifer is typically fully saturated and bounded above and below by impermeable layers, therefore forming a Confined Aquifer. This finding has also subsequently been confirmed by the Department of Water.

The confined aquifer therefore means that the aquifer will not be impacted by local surficial groundwater's which have been absorbed from the surface. This eliminates opportunities for localised contamination of the water source from localised surficial activities in the Country Heights Estate. The construction of the bore however is of importance. Bore CEPB1 is to be constructed to the National Bore Standards - Minimum Construction Standards for Bores in Australia (edition 3), thus further reducing contamination risks.

Since the bore is within a confined aquifer, the need and use of a Well Head Protection Zone (WHPZ) is not required. The effective protective boundary will be the extents of the bore compound which also includes the Water Treatment Plant. The Water Treatment Plant compound will be locked and gated with a suitable 1.8 metre height chain link security fence. Also, to minimise the risk of pollution as required by the Health Act (Underground Water Supply) Regulations 1959 administered by the Department of Health, no soak-wells or any other probable sources of pollution are to be within 30 metres of the compound boundary. Where this impacts proposed private allotments, a caveat will be placed on these lots preventing any such structures to be built on this zone. Aquasol, as the proposed service provider will undertake regular inspections to monitor the orderly working of the system and to check on nuisance issues such as vandalism. The maintenance and surveillance of the Water Treatment Plant compound shall be in accordance with the approved Management Plan.

Due the confinement of the aquifer, there is a minimal risk of contamination to the water source through application of agricultural nutrients and chemicals in the area. In addition to the significant depth and construction of the bores, the interbedded nature of the Leederville Formation in the area also reduces the risk of contamination to the bores by inhibiting leaching. In terms of the mitigation of risks at the Country Heights Estate site, these points are important. Earth works levels at the Country Heights Estate will be set such that there is no surface-lying water around the Water Treatment Plant and Bore/ Well Head, with all surface waters to be diverted away from the Water Treatment Plant compound.

5. Land Use Assessment

5.1 Water Quality Risks

The existing water quality risks at the proposed Country Heights Estate Water Reserve are considered low. The bore will be constructed in a confined aquifer at a depth of 276 metres and in accordance with the requirements of the Minimum Construction Requirements for Water Bores in Australia 3rd Edition, by the National Water Commission, 2012.

Any bores proposed to be installed to use the confined aquifer, close to the proposed Country Heights Estate Water Reserve, should be assessed to determine their contamination risk to the drinking water source, through the Department of Water's groundwater license application process. A copy of the License to Take Water approval letter by the Department of Water is provided in Appendix 5 of this report.

Water quality testing has been undertaken by Rockwater Pty Ltd, as documented in earlier Sections of this report. The water quality tests showed that the water quality was within appropriate guidelines for most potential contaminants. Where two readings were outside of the guidelines, solutions were suggested and these have been designed into the Water Treatment Plant's management plans by Aquasol. The key issues in managing future Water Quality Risks are therefore adherence to the Management Plans by Aquasol and protection of the Water Treatment Plant compound.

5.2 Existing Land Uses and Activities

Water resource use and conservation in Western Australia is administered by the Department of Water in accordance with the Rights in Water and Irrigation Act 1914. Under the Act, the right to use and control surface and groundwater is vested with the Crown. The Act also sets out the license requirements for drilling bores and abstracting groundwater within proclaimed groundwater areas throughout the estate.

Bore CEPB1 is located within a rural zoned area under the Shire of Gingin's Town Planning Scheme, with surrounding sparse bushland located in the south-west portion of the proposed development. Being on a local high point, this location will minimise potential risks associated with rural-residential land use.

The land on which the water abstraction bore (CEPB1) and Water Treatment Plant will be located, is owned by the Country Heights Estate land development proponent (Claymont Development Pty), in which the Water Treatment Plant compound will be leased to Aquasol upon construction completion. All costs and responsibility associated with the management of the Water Treatment Plant compound and the water reticulation system will be with the operator (Aquasol).

A Drinking Water Source Protection Assessment (DWSPA) was conducted during the compilation of this plan (DWSPP) (KCTT 2017). The DWSPA concluded that the bore CEPB1 did not require implementation of a Wellhead Protection Zone (WPZ), as the drinking water is sourced from a confined aquifer where there is minimal risk of contamination from the proposed land-uses and / or other contamination sources. The risk to the water quality to the source is therefore considered low and no risk assessment is required. The following statements provide further support to the low risk of contamination in the key areas of geological and hydrogeological condition assessments, storage coefficients and bore construction: -

- Geological conditions – the significant depth at which the Leederville aquifer lies and separation of the aquifer from Yarragadee Aquifer by impermeable strata of the Carnac and Otoriwiri Members of the Parmelia Formation (Rockwater, 2015).
- Hydrogeological conditions – the Leederville aquifer is typically fully saturated and bounded above and below by impermeable layers. The clay and silt interbeds serve to confine water held in permeable sand layers targeted for water supply (Rockwater, 2015).
- Constant-Rate Test. The Doughery-Babu analysis suggest that the storage coefficient is about 0.000016, which is indicative of confined conditions (Rockwater, 2015).
- The bore is to be constructed in accordance with the National Water Commission’s Minimum Construction Requirements for Water Bores in Australia (2012).

6. Management of Water Quality and Protection

6.1 Proposed Proclamation of Country Heights Estate Water Reserve

This Drinking Water Source Protection Plan recommends proclaiming the proposed compound area of bore CEPB1 (approximately 46 x 16 m) for the Country Heights Estate, see Appendix 2, Figure 2 – Bore and Water Treatment Plant Compound. This water reserve is proposed to be proclaimed under the Country Water Supply Act 1947 as the “Country Heights Estate Water Reserve”. The proclamation process is to be initiated by the Department of Water, in consultation with the water service provider Aquasol.

The landholding for this production bore compound will be leased from Claymont Developments (the proponent) to Aquasol (the water service provider) on an ongoing basis. The Country Heights Estate Water Reserve should be recognised as a special control area in the Shire of Gingin's local planning scheme and all associated planning documentation.

6.2 Protection Objectives

The objective of this plan is to protect drinking water quality for public health. This plan aims to also balance water quality protection, social needs and the expectations of current and future land owners as much as possible. The measures and management practices recommended in this plan are aimed at avoiding, minimising and or managing the risk of groundwater contamination.

The protection of bore CEPB1 is in accordance with government legislation and policy which involves the following elements: -

- Propose proclamation of the water reserve under the Country Areas Water Supply Act 1947.
- Priority areas are assigned to the land within the water reserve to guide land-use planning and development to protect water quality.
- Wellhead protection zones are not assigned as the source is defined as “confined”, and only the Water Treatment Plant compound, as shown in Appendix 2, Figure 2 – Water Treatment Plant Compound is proposed to be proclaimed.

6.3 Priority Area

The protection of Public Drinking Water Source Area's (or PDWSA's as they are commonly referred to) relies on legislation and policy available for water resource management and land-use planning. The Department of Water's policy for the protection of PDWSA's includes three risk-based priority areas: -

- Priority 1 (P1) areas have the fundamental water quality objective of risk avoidance.
- Priority 2 (P2) areas have the fundamental water quality of risk minimisation.
- Priority 3 (P3) areas have the fundamental water quality objective of risk management.

The determination of priority areas is based on the strategic importance of the land and water source, the local planning-scheme zoning, the form of land tenure and the existing and / or approved land uses or activities. For further information and detail, please refer to the Department of Water's Water Quality Protection Note (WQPN) No.25: Land use compatibility in public drinking water source areas.

In accordance with SPP 2.7 Public Drinking Water Source Policy and the Department of Water's Water Quality Protection Note (WQPN) No.25: Land use compatibility in public drinking water source areas, due to the confinement of the aquifer and minimal contamination risks associated with the water source, a protection area of the water source compound has been assigned with all land within this proclaimed compound area assigned Priority 1 (P1) protection. This protection area is shown in Appendix 2, Figure 2 – Water Treatment Plant Compound. The P1 protection area will be reflected as such in the Department of Water's Geographic Information System, upon proclamation of the proposed compound area.

In addition, and as nominated previously in this Drinking Water Source Protection Plan, as recommended by the Health Act (Underground Water Supply) Regulations 1959 administered by the Department of Health, no soak well's or other potential pollutants are to be within 30m of the proclaimed boundary compound.

6.4 Land Use Planning

State Planning Policy 2.7 – Public Drinking Water Source Policy (WAPC 1997) recognises the need for the establishment of appropriate mechanisms within the statutory land use planning process to secure the long-term protection of public drinking water sources. In accordance with this policy, it is appropriate that the Country Heights Estate Water Reserve (P1 protection area) is recognised as a Special Control area in the Shire of Gingin Local Planning Scheme No 9 (2012).

6.5 Best Management Procedure

The protection of water quality can be achieved through a combination of good design and various management practices. The many guidelines, quality protection notes, and codes of practice exist for a wide range of land uses. The guidance tools mentioned have been mostly developed through consultation between government agencies, practitioners, and various industry groups.

The following best management procedures will be employed through the Country Heights Estate Water Reserve to provide guidance to residents and visitors of the importance of the area as a public drinking water source: -

- Fencing, inclusive of secure gating to the bore compound and WTP;
- Signage of the compound, showing the Water Reserve name, the Water Service Provider and their emergency contact details;
- Bore construction to National Water Commission's Minimum Construction requirements for Water Bores in Australia (February 2012).
- No water source contaminants within 30m of the bore compound, such as soak-wells, pesticides, and or other potential pollution to the water source which is a legislation requirement by the Department of Health (Health Act Underground Water Supply Regulations, 1959, Department of Health).

6.6 Surveillance and By-Law Enforcement

The proclamation of the Country Heights Estate Water Reserve will provide the necessary basis to allow future and existing by-laws to protect water quality in the Country Heights Estate. The proclamation will be in accordance with the Country Areas Water Supply Act, 1947.

By-law enforcement and surveillance (water service provider) throughout the operation of the Country Heights Estate Water Reserve is a critical component in the maintenance and protection of water quality. As nominated above in Section 6.5, the provision and maintenance of appropriate signage and fencing at the entrance to the Water

Treatment Plant compound is one of the keys to the protection of the Water Treatment Plant, the bore and the other important infrastructure items contained within the compound.

6.7 Emergency Response

The contamination of water may occur because of unforeseen incidents and the use of chemicals during emergency response scenarios.

The Shire of Gingin's Local Emergency Management Committee should be informed and familiar with the location and purpose of the Country Heights Estate Water Reserve. A locality plan should be provided to the fire and rescue services headquarters and Hazardous Materials Emergency Advisory Team (or equivalent). Aquasol should have an advisory role as any Hazardous Materials incidents in, or near to, the Country Heights Estate Water Reserve.

A map of the Country Heights Estate Water Reserve, as shown in Appendix 2, Figure 2 should be made available to all personnel who deal with any hazardous materials within the water reserve. All personnel working within the water reserve should be made aware of the importance of protection of the water quality in this area.

7. Recommendations

The following recommendations are made with regards to the Country Heights Water Reserve. The relevant stakeholder in terms of implementation is indicated in brackets at the end of each recommendation.

1. The boundary of the compound for bore CEPB1 should be proclaimed as the Country Heights Estate Water Reserve under the Country Areas Water Supply Act 1947. (Department of Water, Proponent, and Aquasol).
2. The Country Heights Estate Water Reserve should be recognised in the Shire of Gingin Local Planning Scheme No 9 in accordance with the WAPC's State Planning Policy No 2.7 Public Drinking Water Source Policy 2003. (Shire of Gingin and Aquasol)
3. Implement the water source protection strategies that have been identified in this DWSP in conjunction with the management objectives, operating rules, monitoring provisions and contingency plans nominated in the Groundwater Licence Operating Strategy (GLOS), by Rockwater Pty Ltd from August 2015. (Aquasol)
4. Maintain surveillance over the Country Heights Estate Water Reserve, with any non-conforming land-uses to be identified and referred to the Department of Water for assessment. (Aquasol)
5. Bore CEPB1 to be constructed in accordance with National Bore Standards including National Water Commissions Minimum Construction Requirements for Water Bores in Australia, Edition 3, or any such document that supersedes the guidelines in this document in the future. (Claymont Developments, Aquasol)
6. All emergency incidents that occur in the Country Heights Estate Water Reserve shall be addressed by ensuring that: -
 - a. The Shire of Gingin Emergency Management Committee is aware of the location and purpose of the water reserve.
 - b. The area of the water reserve is provided in plan format to the Department of Fire and Emergency Services.
 - c. Aquasol play an advisory role during any reported incidents in the Country Heights Estate Water Reserve. (Claymont Developments, Aquasol)
7. All fencing, secured gating and appropriate signage is placed on the reserve boundary of the proposed Country Heights Estate Water Reserve compound. All fencing, security gates and signage shall be maintained in an appropriate standard such that the fencing is continuous, has a consistent integrity to limit unintended access and the signage is legible with up-to-date contact details for emergency purposes. (Aquasol)
8. Provision of all appropriate information for future residents / landowners in the Country Heights Estate relating to the importance of the Country Heights Estate Water Reserve. This should be included in all information provided to prospective purchasers, with a copy of the developer's water customer agreement for the provision of water services in the Country Heights Estate. (Claymont Developments, Aquasol)
9. A final version of the Country Heights Estate Water Reserve Drinking Water Protection Plan (once Figure 2 depicting the proposed water reserve has been endorsed by the Department of Water) is to be released on the Licensed water service provider's website. An electronic copy of this plan should be made available to the Department of Water for its record. (Aquasol, Claymont Development, KCTT)
10. The Country Heights Estate Water Reserve Drinking Water Source Protection Plan should be revisited and updated within 5 years, or earlier if required. (Aquasol, Claymont Developments)

8. References

- Department of Water, 2004. Water Quality Protection Note: Land use compatibility in public drinking water source areas, Department of Water, Perth, available at www.water.wa.gov.au
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- Western Australian Planning Commission, 2006. State Planning Policy no. 2.9: Water Resources, Government Gazette Western Australia, 19th December 2006, pp. 5707-22, Government of Western Australia, Perth.
- Western Australian Planning Commission Rural Planning Guidelines Version 2 February 2014. Department of Water, Water Quality Protection Note 25 – Land Use Compatibility Tables for Public Drinking Water Source Areas, April 2016.