

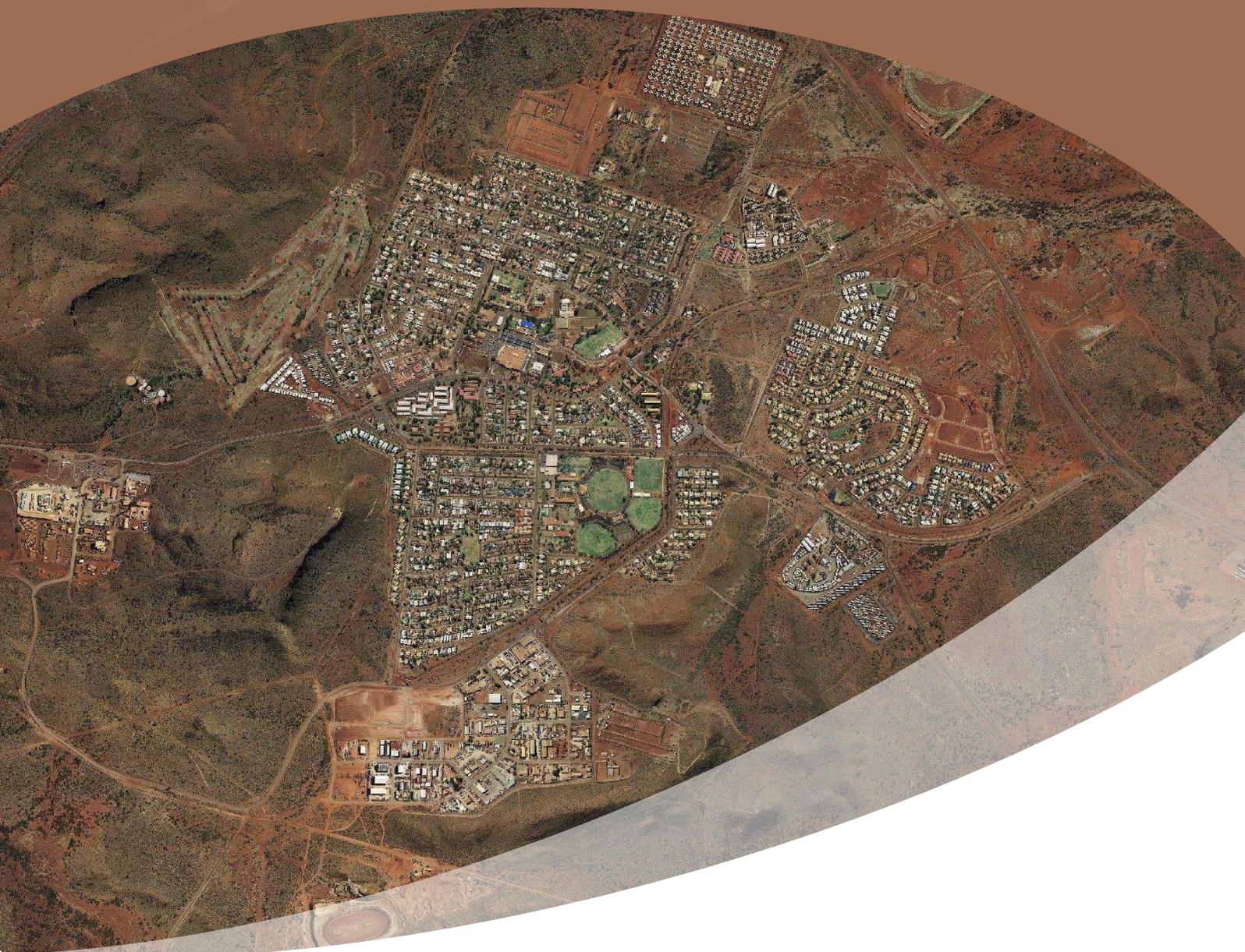


Government of Western Australia
Department of Water

Newman Water Reserve

Drinking water source protection review

Newman town water supply



Looking after all our water needs

Water resource protection series
Report WRP 146 June 2014



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Cover photograph: *Aerial photograph of Newman*

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Summary

This review updates the *Newman Water Reserve drinking water source protection plan* (2009). The 2009 plan and this review need to be considered jointly.

Recommendation 9 of the 2009 plan – ‘to investigate alternative locations for public drinking water supply bores remote from existing or future mining and upstream of the town’ – has recently been undertaken by BHP Billiton. These investigations have led to the company’s proposal for a new bore field in the Homestead Creek area, to become the main source of Newman’s drinking water. The new Homestead bore field will be in the undeveloped Homestead Creek surface water catchment area, approximately 5 to 10 kilometres north of Newman.

The risk of water quality contamination at the proposed Homestead bore field will be lower than at the existing bore field. This is due to the considerable distance between the proposed bore field and mining operations and urban activities.

The boundary proposed in the 2009 plan has been varied in this review to include the E-line bore field, the K-line bore field and Ophthalmia Dam and its nearby waterway catchment. This is necessary because the E-line and K-line bores are again being used to provide part of the town’s drinking water supply (Figure 2).

The following table outlines the stages involved in the protection of Newman’s drinking water sources:

Stages in development		Comment
1	Catchment survey, information gathering and stakeholder consultation. (August 2008 to March 2009)	Draft protection plan is prepared incorporating advice from key stakeholders.
2	Consultation on draft drinking water source protection plan for Newman Water Reserve. (April 2009)	Draft protection plan released for a public comment period.
3	Publish approved drinking water source protection plan. (June 2009)	<i>Newman Water Reserve drinking water source protection plan</i> published after considering submissions. Includes recommendations on how to protect water quality.
4	Prepare drinking water source protection review. (March to June 2013)	This review reports on the implementation status of the recommendations in the 2009 plan.

1 Review of Newman's drinking water source protection plan

1.1 Newman's water supply scheme

Newman's drinking water is currently drawn from a number of bores located to the east and north-east of the town, and one bore (Bore V18) to the west (Figure 2). BHP Billiton operates the bores and treats the water. The Water Corporation is the licensed water service provider and operates the reticulated supply scheme.

The abstraction of Newman's drinking water, as well as water used for mineral ore processing, dewatering and dust suppression, is governed by licences issued under the *Rights in Water and Irrigation Act 1914*. Population growth in Newman is leading to increased demand for drinking water. As such, consideration may need to be given to increasing the licensed water allocation.

The 2009 plan recommended 'to investigate alternative locations for public drinking water supply bores remote from existing or future mining and upstream of the town'. The rationale behind this was that it would be preferable for Newman's main source of drinking water to be located away from the potential contamination risks of mining operations and urban activities.

BHP Billiton has undertaken investigations in the Homestead Creek Catchment Area, north of Newman. As a result, the company is establishing the new Homestead bore field approximately 5 to 10 kilometres north of the town. The bore field will be within the Newman Water Reserve boundary proposed in the *Newman Water Reserve drinking water source protection plan* (Department of Water 2009).

The Homestead bore field will become the main source of Newman's drinking water (BHP Billiton 2012). These bores – whilst drawing from an unconfined aquifer – will be relatively deep, that is 100 metres to 200 metres below ground level. It is also intended that they will be connected to mains power.

The 2009 plan proposed that Ophthalmia Dam and its associated waterway catchments (upstream of the dam) would be removed from Newman Water Reserve. This was based on advice given during the plan's preparation that the E-line and K-line bores (downstream of the dam), within the Ophthalmia bore field, were no longer being used for drinking water supply.

However, use of the E-line and K-line bores has resumed, providing a significant portion of the town's drinking water. Therefore the existing proclaimed water reserve boundary around Ophthalmia Dam and its nearby waterway catchment needs be retained (Figure 2).

Much of the recharge for the E-line and K-line bore fields is by infiltration from Ophthalmia Dam. Recharge basins are in place downstream of the dam and near the E-line and K-line bores. Consideration is being given to using these basins to provide quicker recharge of the aquifer thus supplementing the water supply.

This review recommends that BHP Billiton undertake a study to assess the risks to raw water quality at the E-line and K-line bores from:

- aquifer recharge by infiltration from Ophthalmia Dam
- possible aquifer recharge using the existing recharge basins.

This will provide the basis for undertaking best practice management of this key component of Newman's drinking water supply.

It is intended that Bore V18, immediately to the west of Newman, will cease being used for drinking water supply when the Homestead bore field becomes the main source of supply.

1.2 Boundary and priority areas

It is proposed to amend the current proclaimed boundary of the Newman Water Reserve under the *Country Areas Water Supply Act 1947*. This is shown in Figure 2.

The Homestead bore field is located within the proposed new water reserve boundary, allowing it to be protected under the act.

As per Newman's 2009 plan, the bulk of the new water reserve will have a priority 1 (P1) classification.

The gazetted town site area and Bore V18 will have a priority 3 (P3) classification. Additionally, Rivergums Village, located to the south of Ophthalmia Dam, will also be P3.

1.3 Protection zones

Wellhead protection zones (WHPZs) are used to protect drinking water production bores from immediate water quality threats. The following protection zones are applicable in the Newman Water Reserve:

- 500 m radius WHPZs for the production bores within the P1 area
- 300 m radius WHPZs for the production bores within the P3 area.

1.4 Water quality

The Water Corporation has provided updated water quality information for the Newman Water Reserve. This data is shown in Appendix B.

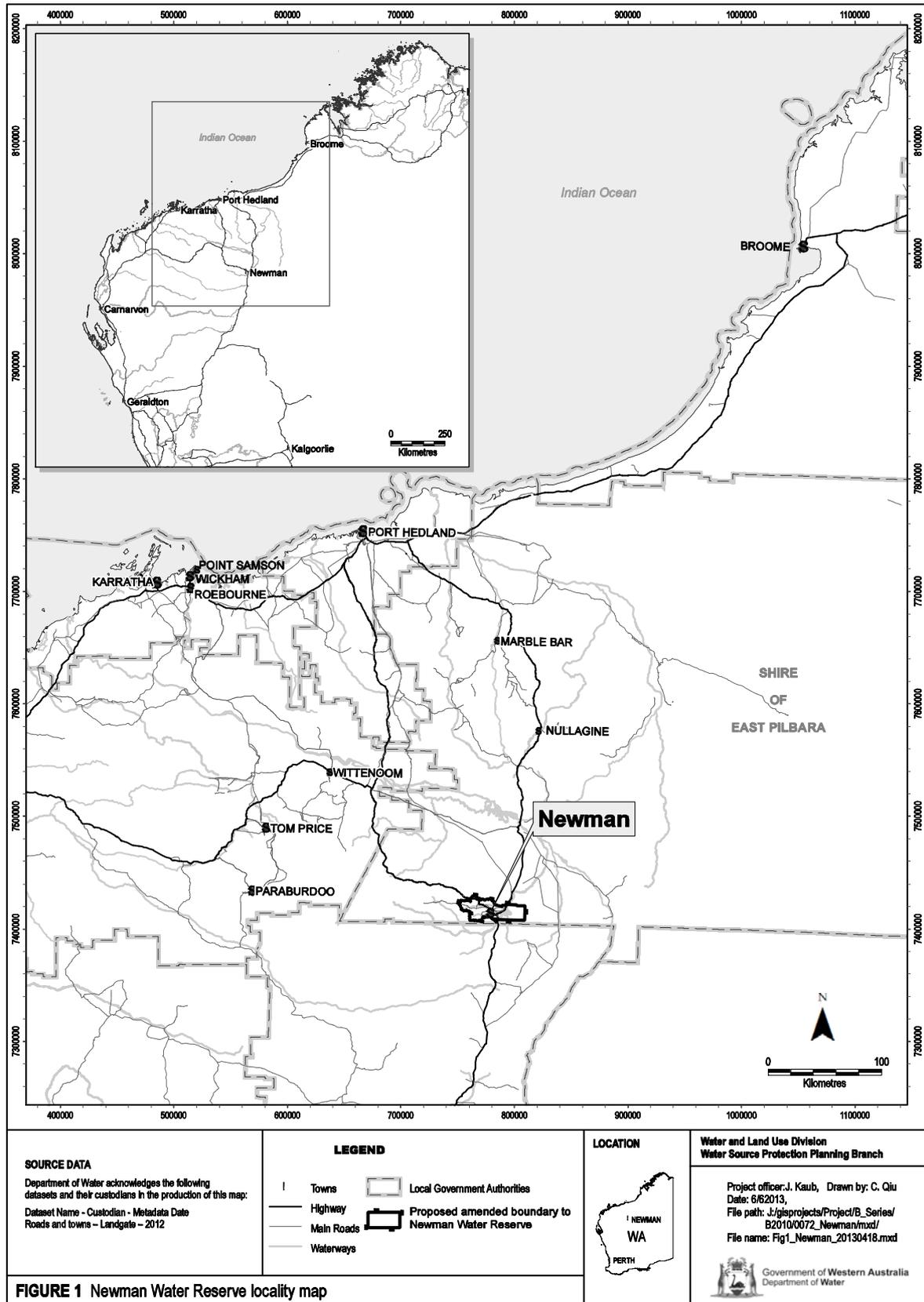


Figure 1 Newman Water Reserve locality map

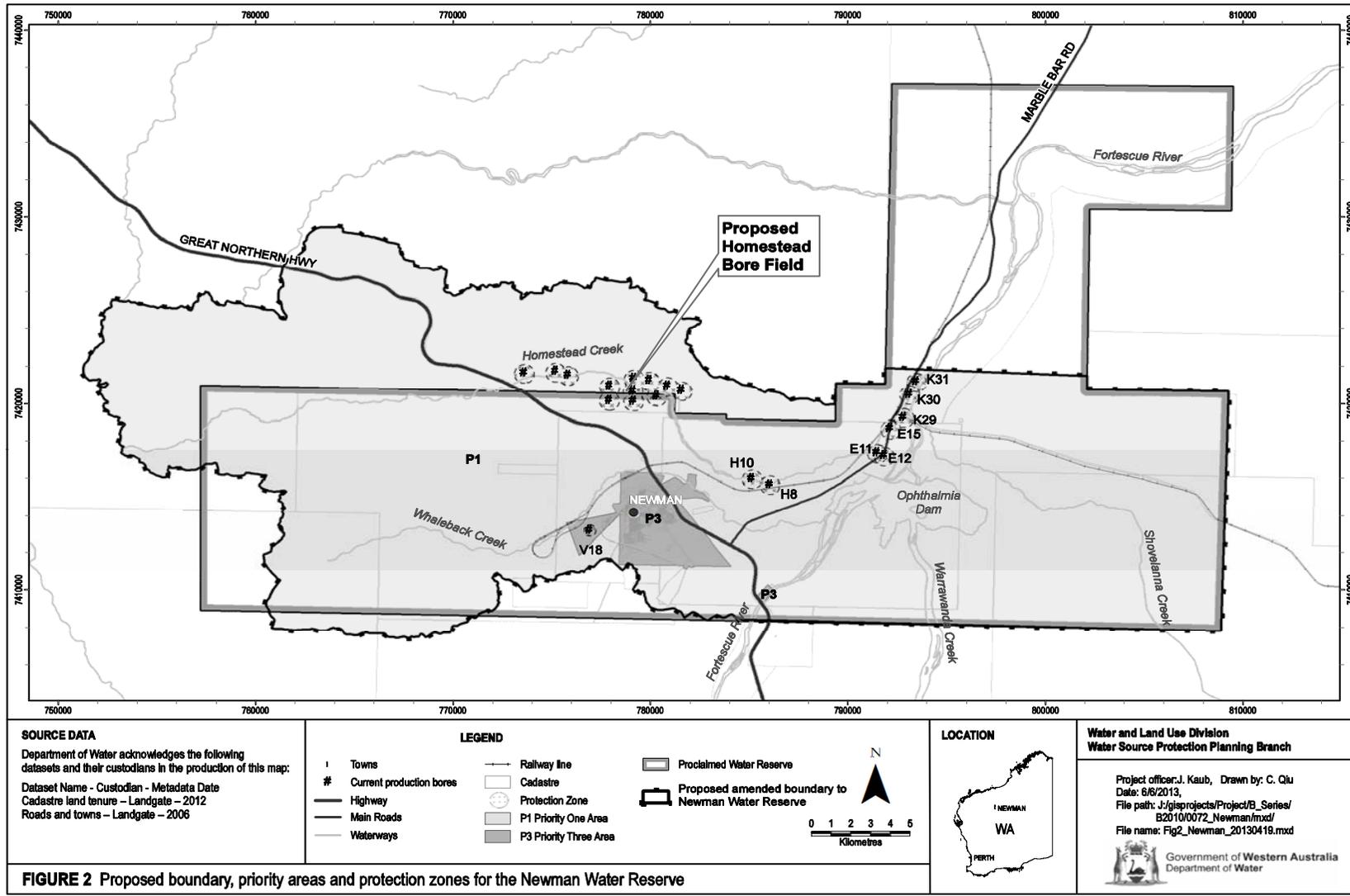


Figure 2 Proposed boundary, priority areas and protection zones for Newman Water Reserve

2 Implementation of Newman's drinking water source protection plan

2.1 Status of previous recommendations

Table 1 outlines the recommendations from the 2009 plan and discusses their current status.

Table 1 Implementation status of Newman's 2009 plan

No.	Recommendation	Status	Comments
1	The boundary of the Newman Water Reserve should be amended under the <i>Country Areas Water Supply Act 1947</i> .	Incomplete	Now that the boundary has changes, the Department of Water proposes to proclaim this amended boundary during the 2013/14 financial year.
2	Prepare an implementation plan for the recommended protection strategies.	Complete	In December 2012 BHP Billiton prepared <i>Western Australia Iron Ore (WAIO) Newman potable source protection plan</i> .
3	The <i>Shire of East Pilbara Town Planning Scheme</i> should incorporate this plan and reflect the identified Newman Water Reserve boundary, P1 and P3 areas and WHPZs in accordance with State planning policy no. 2.7: <i>Public drinking water source policy</i> .	Ongoing	The Shire of East Pilbara's <i>Town planning scheme no. 4</i> currently includes provisions for public drinking water source areas as special control areas in its scheme text. Scheme maps will need to be updated to show the new boundary (Figure 2).
4	All development proposals that are inconsistent with our Water quality protection note no. 25: <i>Land use compatibility in public drinking water source areas</i> or recommendations in this plan should be referred to the Department of Water for advice and recommendations.	Ongoing	This has been occurring on an ongoing basis since the publication of the 2009 plan and is being carried forward as an ongoing recommendation.

No.	Recommendation	Status	Comments
5	Incidents covered by the State Emergency Management Plan for Hazardous Materials Emergencies (Westplan-HAZMAT) in the Newman Water Reserve should be addressed.	Ongoing	This has been occurring on an ongoing basis since the publication of the 2009 plan and is being carried forward as an ongoing recommendation.
6	Signs should be erected along the boundary of the water reserve to define the location and promote awareness of the need to protect drinking water quality. Signs should include an emergency contact telephone number.	Incomplete	Some signs are in place. Additional signs should be placed in strategic positions along the new boundary.
7	The Department of Water should consider delegating responsibility for enforcement measures and monitoring of the Newman Water Reserve to the Water Corporation.	Complete	Delegation to Water Corporation occurred in January 2013.
8	A review of this plan should be undertaken after five years.	Complete	This review has been undertaken after four years – slightly ahead of schedule – because BHP Billiton developed an implementation plan and completed investigations for a new, lower-risk bore field to supply most of Newman's drinking water.
9	Investigate alternative locations for dedicated public drinking water supply bores that are remote from existing or future mining operations and are upstream of the town site.	Complete	The company is currently commissioning the new Homestead bore field.

No.	Recommendation	Status	Comments
10	Ensure BHP Billiton's standard operating procedures recognise the water reserve, including on-site induction that educates people about their presence in a water reserve and informs them of the need to protect water quality.	Complete	The recently prepared <i>WAIO Newman potable source protection plan</i> (BHP Billiton 2012) provides a framework for BHP Billiton standard operating procedures. On-site inductions are completed on an ongoing basis and will need to continue.
11	Discontinue the use of production bore H7 for potable water supply.	Complete	Bore H7 has been disconnected from the potable water supply and is now used for mining operations.
12	Conduct quality testing on water being discharged from the wastewater treatment plant into the managed wetland and investigate alternative options to dispose of this water.	Complete	Brine from the reverse osmosis process at the water treatment plant is discharged to the acid and metalliferous drainage facility, and as such, is managed appropriately. Water is no longer discharged to the managed wetland.
13	Continue to remove cattle from the water reserve, particularly in the vicinity of the production bores.	Ongoing	BHP Billiton has acquired pastoral leases in the area to assist with this process and has management protocols in place designed to achieve this outcome.
14	BHP Billiton should prepare a catchment management strategy for the Newman Water Reserve, in consultation with the Department of Water.	Complete	The <i>WAIO Newman potable source protection plan</i> was published in December 2012. The department reviewed this document.

2.2 Consolidated recommendations

Based on the findings of this review, the following recommendations will now be applied to the Newman Water Reserve. The bracketed stakeholders are those expected to have a responsibility for, or an interest in, the implementation of that recommendation.

1. Amend the boundary of the Newman Water Reserve under the *Country Areas Water Supply Act 1947* as shown in Figure 2 of this review. (Department of Water)

2. Fully incorporate the findings of this review and location of the Newman Water Reserve (including its priority areas and protection zones) in the Shire of East Pilbara's *Town planning scheme no. 4*, in accordance with the Western Australian Planning Commission's State planning policy no. 2.7: *Public drinking water source policy*. (Shire of East Pilbara)
3. Refer development proposals within the Newman Water Reserve that are inconsistent with the Department of Water's Water quality protection note no. 25: *Land use compatibility in public drinking water source areas* or recommendations in this plan to the Department of Water's regional office for advice. (Department of Planning, Shire of East Pilbara, proponents of proposals)
4. Ensure incidents covered by Westplan–HAZMAT in the Newman Water Reserve are addressed by ensuring that:
 - the Newman local emergency management committee is aware of the location and purpose of the Newman Water Reserve
 - the locality plan for the Newman Water Reserve is provided to the Department of Fire and Emergency Services headquarters for the HAZMAT emergency advisory team
 - the Water Corporation acts in an advisory role during incidents in the Newman Water Reserve
 - personnel dealing with Westplan–HAZMAT incidents in the area have ready access to a locality map of the Newman Water Reserve and information to help them recognise the potential impacts of spills on drinking water quality.(Department of Water, Water Corporation)
5. To safeguard the quality of water recharging the aquifer drawn on by the E-line and K-line bore fields, the following should be undertaken:
 - a water quality risk assessment for Ophthalmia Dam
 - a water quality risk assessment for use of the recharge basins adjacent to the bore field
 - recommendations to be made for best practice management based on these assessments.(BHP Billiton)
6. Continue to remove cattle from the water reserve, particularly in the vicinity of Ophthalmia Dam and production bores. (BHP Billiton)
7. Update this review after six years, or earlier if there are changes in the risks to water quality. (Department of Water, BHP Billiton)

Appendices

Appendix A – Water quality data

The Water Corporation has monitored the raw (source) water quality from Newman in accordance with the requirements of the *Australian Drinking Water Guidelines* (ADWG) and interpretations agreed to with the Department of Health. This data shows the quality of water in the catchment. The raw water is regularly monitored for:

- aesthetic characteristics (non-health-related)
- health-related characteristics, including:
 - health-related chemicals
 - microbiological contaminants.

The following data represents the quality of raw water from Newman bore field. In the absence of specific guidelines for raw-water quality, the results have been compared with the ADWG values set for drinking water, which defines the quality requirements at the customer's tap. Any water quality parameters that have been detected are reported; those that on occasion have exceeded the ADWG are in ***bold and italics*** to give an indication of potential raw-water quality issues associated with this source.

The values are taken from ongoing monitoring for the period January 2008 to January 2013.

It is important to appreciate that the raw-water data presented does not represent the quality of drinking water distributed to the public. Barriers such as storage and water treatment exist downstream of the raw water to ensure it meets the requirements of the ADWG.

For more information on the quality of drinking water supplied to the North West Region refer to the most recent Water Corporation drinking water quality annual report at <www.watercorporation.com.au> What we do > Water quality > Water quality publications > Most recent drinking water quality annual report.

Aesthetic characteristics

The aesthetic quality analyses for raw water from Newman Water Reserve are summarised in the following table.

Aesthetic detections for Newman bore field

Parameter	Units	ADWG aesthetic guideline value*	Newman raw water	
			Range	Median
Chloride	mg/L	250	110–250	130
Hardness as CaCO ₃	mg/L	200	460–500	480
Iron	mg/L	0.3	<0.003–0.015	<0.003
pH	No unit	8.5	7.3–7.48	7.43
Sodium	mg/L	180	64–160	71
Total filterable solids	mg/L	600	861–1194	912
Turbidity	NTU	5	<0.1–0.1	<0.1

* An aesthetic guideline value is the concentration or measure of a water quality characteristic that is associated with good quality water.

Health-related chemicals

Parameter	Units	ADWG health guideline value*	Newman raw water	
			Range	Median
Barium	mg/L	0.7	0.02–0.02	0.02 [^]
Boron	mg/L	4	0.22–0.24	0.23 [^]
Chromium	mg/L	0.05	0.0006–0.0006	0.0006 [^]
Copper	mg/L	2	0.01–0.01	0.01 [^]
Fluoride	mg/L	1.5	0.4–0.7	0.55
Nitrate	mg/L	11.29*	0.46–1.1	0.9
Radon – 222	Bq/L	100	0.94–0.94	0.94 [^]
Selenium	mg/L	0.01	<0.003–0.004	<0.003 [^]
Sulfate	mg/L	500	81–175	87
Uranium	mg/L	0.02	<0.001–0.001	0.001 [^]

* A health guideline value is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHRMC & ARMCANZ, 2011).

[^]Less than three samples taken in reporting period.

Microbiological contaminants

Microbiological testing of raw water samples from Newman bore field is currently conducted on a monthly basis. *Escherichia coli* counts are used as an indicator of the degree of recent faecal contamination of the raw water from warm-blooded animals.

A detection of *E. coli* in raw water abstracted from any bore may indicate contamination of faecal material through ingress into the bore, or recharge through to the aquifer (depending on aquifer type).

During the review period, positive *E. coli* counts were recorded in 11 per cent of samples. The average value for positive counts is 2 MPN/100mL.

Appendix B – Photographs



Figure B1 The compound for Production Bore E13 in the Ophthalmia Bore field, photograph by N. Mantle



Figure B2 Ophthalmia Dam within close proximity (and upstream) of the E and K line bores in the Ophthalmia Bore field, photograph by N. Mantle



Figure B3 Pump testing of a bore drilled in the new Homestead Bore field, photograph by J. Kaub

List of shortened forms

ADWG	<i>Australian drinking water guidelines</i>
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
HAZMAT	hazardous materials
kL	kilolitre
km	kilometre
km²	square kilometre
LEMC	local emergency management committee
m	metres
mg/L	milligram per litre
mL	millilitre
MPN	most probable number
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
WAHMEMS	Western Australian hazardous materials emergency management scheme
WAPC	Western Australian Planning Commission
Westplan–HAZMAT	Western Australian plan for hazardous materials
WHPZ	wellhead protection zone
WQPN	water quality protection note

Glossary

Abstraction	The pumping of groundwater from an aquifer, or the removal of water from a waterway or water body.
Aesthetic guideline value	The concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer, e.g. appearance, taste and odour (NHMRC & NRMMC 2011).
Allocation	The quantity of water that a licensee is permitted to abstract is their allocation, 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 <i>National water quality management strategy: Australian drinking water guidelines 6</i> , 2011 (NHMRC & NRMMC 2011) (ADWG) outlines acceptable criteria for the quality of drinking water in Australia (see this plan's Bibliography).
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 <i>well field</i>).
Catchment	The physical area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Drinking water source protection report	This is a report on water quality hazards and risk levels within a public drinking water source area that includes recommendations to avoid, minimise, or manage those risks for the protection of the water supply in the provision of safe drinking water supply.
Health guideline value	The concentration or measure of a water quality characteristic that, based on current knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC & NRMMC 2011).
mg/L	A milligram per litre (0.001 grams per litre) is a measurement of a total dissolved solid in a solution.
Pathogen	A disease-producing organism that can cause sickness and sometimes death through the consumption of water, including bacteria (such as <i>Escherichia coli</i>), protozoa (such as <i>Cryptosporidium</i> and <i>Giardia</i>) and viruses.

pH	A logarithmic scale for expressing the acidity or alkalinity of a solution. A pH below seven indicates an acidic solution and above seven indicates an alkaline solution.
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 <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> and the <i>Country Areas Water Supply Act 1947</i> .
Recharge	Recharge is the action of water infiltrating through the soil/ground to replenish an aquifer.
Recharge area	An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment.
Turbidity	The cloudiness or haziness of water caused by the presence of fine suspended matter.
Wastewater	Water that has been used for some purpose and would normally be treated and discarded. Wastewater usually contains significant quantities of pollutant.
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 <i>Country Areas Water Supply Act 1947</i> or the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> for the purposes of protecting a drinking water supply.
Well field	A well field is a group of bores located in the same area used to monitor or withdraw groundwater (also see <i>bore field</i>).
Well head	The top of a well (or bore) used to draw groundwater is referred to as a well head.

Well head protection zone A wellhead protection zone is usually declared around wellheads in public drinking water source areas to protect the groundwater from immediate contamination threats in the nearby area.

Western Australian hazardous materials emergency management scheme This is now known as Westplan–HAZMAT.

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