

INVESTIGATION OF WATER AND SEWER OPTIONS FOR PROPOSED EXPANSION OF GIDGEGANNUP TOWN SITE

1. INTRODUCTION

At the request of the City of Swan, David Wills and Associates have carried out an investigation into the provision of a new potable water supply and reticulated sewerage system to the Gidgegannup Townsite to facilitate the expansion of proposed townsite for commercial and residential uses. The Gidgegannup Townsite is located approximately 16 km east of Midland on Toodyay Road and an area of approximately 240 hectares has been set aside since the early 1990s for expansion of commercial and residential uses. The townsite currently accommodates a number of local businesses, houses, recreational areas and a primary school. The North Eastern Hills Settlement Pattern Plan (NEHSPP) (WAPC 2002) stated that population growth be directed to the Gidgegannup townsite and it should be developed to accommodate around 4000 people.

A development scenario for the townsite expansion in line with the NEHSPP recommendation would result in approximately 1,600 Urban Residential lots between 500 and 600 square metres and around 8.0 hectares (ha) of commercial and retail areas. Costs of providing reticulated water for two lower density scenarios of approximately 200 lots at 4,000m² each and 500 lots at 2,000m² each was also examined to see if the cost of providing the water service to the proposed townsite was feasible. In accordance with Western Australian Planning Commission (WAPC) subdivision policies, any subdivision of lots less than 4 hectares requires reticulated potable water supply and subdivision of lots less than 2000m² requires reticulated sewer systems.

In addition, the report examines alternatives to reticulated water and possible alternative sewer disposal methods.

This report will investigate the constraints of providing sewer and water services to facilitate development to accommodate 4000 people as recommended by the NEHSPP and will offer possible alternative development options to be further pursued to facilitate subdivision and expansion of the Gidgegannup townsite.

2. WATER SUPPLY

2.1 PROVISION OF SCHEME WATER FROM WATER CORPORATION SYSTEM

The Water Corporation had previously prepared a conceptual water scheme to supply water to Gidgegannup for the City of Swan which was used as a basis of this report. Due to the lack of technical information, the system may have to be further reviewed if the provision of a potable water supply system is considered to be a viable option for the development of Gidgegannup.

The closest source of water from a Water Corporation system is the Mundaring to Kalgoorlie pipeline which is located at the corner of Sawyers Avenue and Keane Street in Mt Helena. Between Mount Helena and Gidgegannup, there is a large hill in the vicinity of Brinkie Way which limits the maximum flow that can be extracted from the Goldfields water main. To resolve this restriction, a storage tank of 2,500 cubic meters (kilolitres) would need to be provided in this locality. There is currently a single undeveloped 2.0 ha Special Rural lot which would be able to house this facility. See the proposed route at Appendix A.

The system would function under the following principles; over a 24 hour period, water would be drawn from the Kalgoorlie main into the tank at varying rates but would have sufficient capacity to fill the tank within that period. Because the gradient between the Kalgoorlie water main and the tank is relatively flat, a 300 millimeter diameter water main would be required. The proposed 300 mm diameter uPVC water main would be laid from the Mundaring pipeline to Cameron Road along Alice and Joseph Roads, a distance of approximately 5.0 km.

The tank has been sized by the Water Corporation so it could also be used to serve existing developments in the area and proposed subdivisions to the west of the tank site. The benefit of providing the tank is two fold:

1. Provide security supply at all times. The Goldfields main supply can be interrupted, and there is usually sufficient reserve storage in the tank to last at least 24 hours.
2. The tank allows high discharge rates during peak demand periods where the water level in the tank is drawn down and then refilled overnight.

If a pipe less than 300mm diameter main was laid, insufficient water could be supplied over a 24 hour period unless pumps were used. The use of pumps is unacceptable to the Water Corporation if a gravity system can be built. This is due to the improved reliability of the operation of the system, and the removal of ongoing operational costs.

The required storage of 2,500 kl was stipulated by the Water Corporation and could theoretically be reduced as the number of lots within the Gidgegannup town site was reduced. For the proposed 200 lot subdivision, a 500 kl tank would be adequate which would reduce the tank construction cost by approximately \$120,000. The 500 lot subdivision would require a 1,000 kl tank which would reduce the cost by approximately \$100,000.

As the tanks become smaller and the volume of water to be transferred in a 24 hour period is less, the pipeline from the Mundaring pipeline to the tank can also reduce. The 200 lot and 500 lot development scenario would only require a 200mm diameter uPVC pipe.

However, the Water Corporation would require that the 2,500 kl tank with a 300mm diameter uPVC connection main must be installed for all scenarios to enable flexibility to serve future adjacent areas to be subdivided.

A new water main will then run from the tank into the southern boundary of the Gidgegannup Town Site, a distance of approximately 5 km. The size of the pipeline between the tank site and Gidgegannup will be dependent upon the ultimate development of the area. With the construction of all the water mains in this area, the major cost is the excavation costs, rather than the supply and lay of the different pipe diameters.

The water supply scheme has been notionally designed to provide an operating head of 320m AHD (Australian Height Datum) at the southern border of the proposed Town Site. This will be sufficient to serve a majority of the townsite, which is at approximately 300m AHD. A pressure booster pump system will be required to give sufficient operating head to the existing higher properties located on the north east corner of the designated Town Site. This solution is more economical than increasing the size of the main from the tank into the town

The hydraulic head in the Kalgoorlie pipeline at the connection point has yet to be determined. Based on the original design of the pipeline (dated 1902), the pressure head is approximately 375m AHD. It would be expected that this will have increased as the pipeline and pumps have been upgraded.

Consideration was given to using a smaller diameter pipeline in the initial stages of development to reduce the capital cost. This was not viable as the excavation for the entire length of the water main will be in hard rock conditions which are expensive. There is minimal cost savings in the initial supply of pipe and to excavate a future pipeline close to the existing water main has numerous potential problems, including rupturing of the existing water main. This alternative is therefore considered unrealistic.

The internal water supply network for the ultimate townsite development has been estimated only and the pipe diameter and lengths of main will depend upon the final number of lots to be serviced with a water connection. Once water has been brought to the southern boundary of the townsite, a reticulated network of smaller diameter pipes - 100 and 150 mm diameter pipes would be required through the area to serve future and existing residents.

There will also be a need to pay Water Corporation headworks charges with every connection made to the water supply network.

2.2 POSSIBLE ALTERNATE SOURCES OF SCHEME WATER

2.2.1 Provision of a Water Supply from Groundwater

There is an existing reticulation bore on the grounds of the Gidgegannup Primary School. Analysis of the groundwater from this bore undertaken in 1991 indicates that the water is satisfactory for drinking apart from its elevated acidity of pH = 4.7. Normal potable water should be in the range of pH = 6.7 to 7.5. The water could be made potable by dosing with caustic soda to reduce the pH.

The investigation study for the school bore showed that the bore could be pumped at 2.2 litres per second (l/sec) for sustained periods. The depth of the bore was 15.6m and the static water level remained between 8.5 – 9m for the duration of the test. Provided alternate reliable supplies could be found, a bore of this capacity would serve approximately 40 houses.

If the development scenario was any greater than the minimum of 200 lots, the availability of sufficient high quality, sustainable groundwater in close proximity to the townsite appears to be unlikely. The sourcing of alternate supplies more remote from the town would need to be further investigated.

If a bore field was established, the following infrastructure would be required:

1. A bore field located in a suitable area with the required protection of land uses to ensure the water quality could not be compromised. The possible land use would have to be agreed with the Department of Environmental Protection and Office of Water Regulation.

Grazing of the land would not be acceptable due to the possibility of fecal contamination, nor horticultural use due to possible chemical contamination. Land tenure would have to be resolved with a consideration being paid for the water right and constraint in the land use to ensure the water quality is not compromised.

2. Pipe system to convey the water to the town,
3. Chemical dosing system and construction of storage tanks located on a high area to ensure the whole town site could be served,
4. The network distribution system which would be similar to the scheme network required for the supply from the Goldfields main.

A costing of this option has not been carried out as further studies into the possible location of a suitable groundwater source(s) and the availability quantities of potable water in the vicinity of the town site must be first determined by a Hydrogeologist.

If a suitable groundwater source could be identified, environmental and engineering issues could then be addressed and the viability of this option could be determined. There are too many unknown concerns to estimate an order of costs at this stage.

2.2.2 Provision of water supply to town via direct pipe from pipeline and small holding tank at north of town

If the pipeline and tank were not provided, a 500 mm diameter steel main would be required to service Gidgegannup to meet the peak demand for the 1,600 lot scenario. The steel main would be more than double the cost of the proposed system and would not allow the Water Corporation to service other adjacent areas. The steel main could be laid above ground in some sections of the route to reduce excavation costs.

Due to structural requirements and fire rating, only steel pipes can be laid above ground. An above ground 300mm diameter steel main with suitable support and surface protection would still cost more than a 300 mm diameter uPVC pipe with rock excavation.

For a minimum development scenario of 200 lots, the Kalgoorlie pipeline has sufficient head to supply the Gidgegannup townsite with water for all but the highest peak times. A new, 10 km long, 200mm diameter main would be required to alleviate head losses.

To maintain adequate pressure during high peak times, a 500 kl tank is required on the hill immediately west of the showgrounds. During times of peak demand, the town could be fed from both directions to supplement the supply. The cost of this proposal is Option 4 in Section 2.3.

The support of the Water Corporation for this option would not be forthcoming as it does not have any redundancy in the design to allow adjoining areas to also be serviced. The construction costs will still be high, but this option does remove the need to purchase the Special Rural lot for a tank site.

2.2.3 Local Water Supply Dam

The construction of a dedicated dam near Gidgegannup to supply water is not an option as all streams in the hills area have been reserved for future water supply to the Perth Metropolitan Area. There would also be problems of acquiring enough land to site a dam of sufficient storage.

2.2.4 On-site Roof Collection

Current WAPC policy allows for on-site roof collection for lots 4 ha and larger, but the majority of the older 2 ha Special Rural lots in the metropolitan and south west areas are supplied by roof catchment in accordance with previous WAPC policy.

The City's Town Planning Scheme requires rural dwellings to have a minimum of 120 cubic metres (kilolitres) of water available for potable water and fire fighting purposes.

The long term average rainfall for Gidgegannup is in the order of 800mm per annum. Assume a drought condition with a 15% reduction in rainfall, the roof area to meet the "in-house" use of a family of 6 would be approximately 270 to 300 square meters. It is assumed that with water sensitive devices and the

public awareness for the need to conserve water, the roof area could be less to provide an adequate water supply.

Most modern houses, with a shed or garage, would have a roof area in the vicinity of the required size, even if the blocks were reduced to a 2,000 square metres residential lots.

2.3 COST TO PROVIDE SCHEME WATER FROM WATER CORPORATION SYSTEM

The cost are based on February 2004 construction figures, and includes all pipework, purchase of a land to accommodate a suitable tank site and construction of a concrete water storage tank, and a Water Corporation water supply headworks charge of \$2,800.00 per lot.

Tables 1 to 3 at Appendix B gives the approximate cost to provide a water supply to Gidgegannup for the various development scenarios of 200 lots, 500 lots and 1,600 lots with a storage tank constructed at Brinkie Way. Option 4 costing is to supply Gidgegannup town only and is described in Section 2.2.2 and the costs are detailed at Table 4 at appendix B.

Option	Lot Yield	Lot Size	Water Supply cost - \$/lot: 2,500 kl tank
1	1,600 lots	500-600 m ²	\$9,381
2	500 lots	2,000 m ²	\$17,768
3	200 lots	4,000 m ²	\$28,695
500 kl tank for Gidgegannup Town ONLY			
See Section 2.2.2			
4	200 lots	4,000 m ²	\$24,015

The cost to supply water in a typical urban 500 to 600 m² subdivision in the Perth coastal strip, with existing water mains in close proximity to the development, is in the order of \$4,000 to \$6,000 per lot, including the Water Corporation water headwork charge of \$2,800 per lot.

Because of the fixed cost of laying a pipeline from Mundaring to the tank site and the construction the tank is fixed for all development scenarios, the minimum development scenario of only 200 lots in the Gidgegannup townsite (Option 3) is significantly greater than the 1,600 lot scenario.

The pipeline from the Brinkie Way tank to Gidgegannup is of a different size for each scenario. Due to the high cost of rock excavation required for each option, the savings in the smaller pipe is insignificant when compared to the other costs.

If scheme water was supplied to Gidgegannup, the existing properties could not be forced to connect to the system. If they were connected, the method to recover the proportion of the construction cost would have to be developed.

It is unlikely they could avoid paying a proportion of the water main construction cost if a connection was requested.

2.4 WATER SUPPLY FUNDING OPTIONS

Gidgegannup is outside the Water Corporation water and wastewater Operating Licence Area issued by the Office of Water Regulation, and approval would be required for the Water Corporation to extend the services to serve the proposed Gidgegannup town site expansion.

In accordance with current Water Corporation Policy, the full cost of supplying water to the townsite of Gidgegannup and distributing it would be at the entire cost of the Developer, with little prospect of the Water Corporation contributing funds to the project.

The existing land owners in Gidgegannup would not be forced to connect to the water supply system if it was constructed, but would have to pay an agreed proportion of the construction cost if the a water supply connection was made.

The method to recover the costs of bringing the water to Gidgegannup from the existing landowners will not be easy and there are currently no mechanisms available to the Water Corporation, although this may change in the medium term. The Water Corporation has been working on a procedure to address this matter for over 10 years.

The Water Corporations concept design for the water supply system is to construct a 2,500 cubic meter tank at the summit point of the system. This is to allow the proposed future subdivisional developments to the west of Brinkie Way at Parkerville, as well as serving surrounding existing subdivisions.

The expectation for the Gidgegannup development to pay for the entire infrastructure from the Mundaring to Goldfields water main up to, and including the storage tank, is unrealistic, but has been the basis of the costings.

The inability of the Water Corporation to facilitate the cost sharing will mean the first subdivision that requires the water supply scheme will have to pay the full cost, unless there is support from Government to approach the project funding in a different way.

Resolution of the funding arrangement will require a whole of government approach if the proposed expansion of Gidgegannup town site, or the adjacent areas that have been identified for future development by Department of Planning and Infrastructure is to succeed. The process to manage this will require the City of Swan to undertake extensive, high level consultation.

2.4.1 Private Water Supply Company to provide water to Gidgegannup

If government, or an equitable cost sharing funding of the water main construction cannot be achieved, one possible alternative to the supply coming from the Water Corporation system would be to create a privately operated water supply system in accordance with the Office of Water Regulations mandate.

A suitable source would have to be located and a private company commissioned to construct and operate the system. It is unlikely that the Local

Authority would consider this to be part of their core business and the company would have to be profitable which could result in substantially more expensive water than the rates charged by the Water Corporation to its Perth Metropolitan customers.

The source of water would have to be proved, and it could be a groundwater supply, or a method to purchase water from the Water Corporation Kalgoorlie main and supply Gidgegannup via a private distribution system.

3. SEWERAGE

3.1 CONSTRAINTS IN PROVIDING A TRADITIONAL SEWERAGE SYSTEM

The provision of a traditional self contained reticulated sewerage scheme to serve the Gidgegannup town site only has been investigated and it has been concluded that proposed system is highly unlikely due to a variety of factors including:

i. Location of a suitable treatment plant site:

This requires the purchase of the land to accommodate the treatment plant which would be in the order of only 5 ha. However, the site selection must also allow for the creation of a 500 metre buffer around the site to meet environmental requirements and would cover approximately 150 ha.

This buffer constrains the use of the land and would prevent any residential development from occurring in the area. Due to the current development of the Gidgegannup area, the cost of acquisition for the land and the location of such suitable sites are highly unlikely.

ii. Disposal system:

Traditionally, sewerage effluent has been treated to a secondary or tertiary stage and discharged into the ocean or a creek. As the Gidgegannup townsite is within the Susannah Brook Declared Water Supply Catchment Area, this method of disposal would not be supported. The alternate method would be to spray irrigate or trickle irrigate large plantations of suitable softwoods or hardwoods to take up the nutrients and meet environmental requirements. This has been done at Albany with success.

The location of a suitable site within the State Forest will be a major constraint which could be very difficult to resolve. Jarrah and Marri trees are not suited to take up large quantities of water, and it is felt that the support of various Government Departments to clear fell sections of State Forest to provide a suitable soft wood plantation area is highly improbable.

iii. Sewer Network:

An extensive sewer network system to collect the wastewater from each individual lot and conveying the sewage to the treatment plant would be required. Due to the terrain and soil types including lateritic gravel and granite, construction costs would be extremely high.

To provide sewerage to the Town Centre of Kalamunda, property owners pay in excess of \$9,000 per lot as their contribution proportion to the Water Corporation funded system. With the Gidgegannup system, it is highly unlikely that the Water Corporation would contribute any funds to the construction of the works and the connection cost per lot would be significantly higher.

3.2 POSSIBLE ALTERNATE DISPOSAL METHODS

3.2.1 Urban Residential

In keeping with current planning policy, the most cost effective scenario for development of the Gidgegannup townsite would be to create lots in excess of 2,000 square metres to enable on-site effluent disposal systems to be installed.

Due to the clay nature of the town site, the soils have a natural propensity to bond to phosphorus which is a major detrimental source of nutrient to a fresh water environment. Therefore, the impact upon the Declared Water Catchment Area due to increased sewage discharges would be minimal.

This is supported by previously report commissioned by the City of Swan for the Gidgegannup town site, "The Nature of Land and its Capability of On-site Effluent Disposal - 1995" prepared by Environmental Capability. They also recommend that development be constrained in some of the lower, environmentally sensitive areas which is also supported.

If the development of the town site was to be progressed, a more detailed study to accurately identify the areas of constraint to gain environmental clearances may be required.

3.2.2 Commercial / Retail Area Sewer System

Depending on the density of the `Commercial / Residential development area, and the soil in the vicinity, on-site disposal systems may be practical. If this is impractical or opposed on environmental or health concerns, the proposed strategy for the disposal of sewage effluent from the proposed 8.0 ha Commercial / Retail Area would be as follow:

- i. The Commercial / Retail Area would be created as a single strata titled Super Lot so the Body Corporate could effectively control the proposed sewer system.
- ii. The Lot would be served by an internal reticulated sewer system discharging into a sophisticated package treatment plant which would treat sewage effluent to a tertiary level. Depending upon the final location of the lot, land use and density of occupation, it is envisaged that the treatment plant would occupy an area in the order of 10 metres by 10 metres. It should be located in a landscaped area to provide a visual and odour buffer. At an additional cost, the system could be housed completely below ground. Several proprietary systems are available which could meet this objective.
- iii. The treated effluent would be chlorinated and used on site to irrigate landscaping within the Strata Title Lot. It is envisaged that the effluent would be in excess of the landscaping requirements and this water could be used for public purposes such as irrigating the Gidgegannup show grounds or football oval, or supplement the irrigation water for the Primary School oval.

- iv. The excess treated effluent would be pumped to a storage pond located close to the area to be watered. The storage is needed as the demand for irrigation is low during winter. The effluent in excess of demand is stored for use over the summer months when the disposal of effluent by irrigation would be viable. The stored effluent is pumped into an irrigation system to water the area, usually at night.
- v. At the Gidgegannup Football Club, there is a suitable area to the north of the football field that could contain the storage area. There may be other locations in the Gidgegannup town site that could be used and further investigation would be required during the detailed design phase if this option was to be pursued.
- vi. As the treatment plant is under the control of the Strata Lot Body Corporate, all land owners would contribute to the operation of the system and would be beyond the control of the Water Corporation and associated rates.

The feasibility of these options would be dependent upon further investigations and the disposal methods would be considered. However, the re-use of the higher quality sewerage effluent, which will be chlorinated before discharge, would be for the environmental and public good.

3.2.3 Commercial / Retail Sewer System: Preliminary Design

The Water Corporation's Wastewater Manual specifies an approximate design flow of 12,000 litres of sewage per net hectare per day for commercial areas. The Department of Agriculture for Western Australia suggests an irrigation demand for pastures of approximately 10,000 cubic metres of water per hectare per year, but could be reduced if a larger area was to be watered, or there was potential for water logging of the area if very heavy clays were present.

The size of the storage pond is based on a flow balance solution. Inflow into the pond is from rainfall and treated sewage, while outflow includes evaporation and irrigation output. The attached spreadsheet at Appendix C indicates a required storage volume of approximately 9,100 cubic metres to service a commercial area of 8 hectares.

The pond would be in the order of 6.0 to 6.5 metres deep with a surface area of 1,500 square metres. By making the pond deep, the surface area is reduced which reduces the losses due to evaporation. The final configuration would be developed during the design stage and would be associated with the available area to situate the storage pond.

Due to high irrigation demands during summer, coupled with high evaporation rates, it is expected that the pond may run empty during February and March. It is therefore anticipated that irrigation output shall be monitored in the months leading up to February, ensuring adequate volume in the pond to satisfy annual irrigation demands for the football field.

Due to the nature of the soil on the site, phosphorus would be bound with the natural in situ soils and pollution of the Declared Water Catchment Areas would not occur due to the proposed development of the Gidgegannup townsite.

The expansion of this form of sewer system to cater over the entire townsite is not practical due to problems of;

- i. Construction of the collection system in difficult ground,
- ii. The volume of effluent generated by the ultimate town population would be a vast increase from the Commercial / Retail area and the storage and disposal areas may prove to be a major problem
- iii. Method to collect rate from a non Water Corporation sewer system. The Local Authority may have to be involved so their rating system could be used. As this is not part of the core business, problems may arise,

4. CONCLUSION

To develop 1,600 lots in the Gidgegannup Town Site would currently require the provision of a Water Corporation water supply service from Mt Helena and a formal sewerage collection and treatment system. However, the costs of extending the Water Corporation water supply from Mundaring and the constraints associated with developing a local sewerage treatment plant demonstrate that the cost of providing these services are prohibitive and likely to prevent development.

It is recommended that the Town Site be developed with residential lots of a minimum of 2,000 square metres each to remove the need for the construction of a reticulated sewer system and centralised treatment plant and enable individual lots to be serviced by on-site disposal systems e.g. septic tanks or ATUs.

If the proposed 8.0 ha Commercial / Retail area could not support the use of multiple on-site disposal systems for the sewage system, the alternative would be to create the area as a single Strata Title lot. This would be served by a package treatment plant which produced effluent of sufficient quality that could be used to irrigate public purpose areas as well as the landscaped area of the Strata lot.

Although current WAPC subdivision policies require the provision of a reticulated water system for lots less than 4 hectares, sufficient potable water can be collected from roof catchments to service smaller lots.

The water for the Commercial / Retail area could possibly also be sourced from the roof runoff. Due to potential public liability problems, the water may have to be treated before being used within the buildings. The adequacy of supply from the ultimate roof areas would have to be confirmed, and additional strategies be developed if there was insufficient water available. Although it is thought that there should be adequate water available, the demand by restaurants, Laundromats and similar high usage consumers may present a problem.

Storage tanks for fire supply would also be required. This could be sourced from the roof of the buildings, or a small groundwater bore used to fill the tank.

Fire water requirements for the residential lots would be met in accordance with WAPC Special Rural Area policy with fire water tanks filled from the roofs or small bores.

Treated, chlorinated sewage effluent stored in the tank for fire purposes could also be considered. This novel approach may require additional discussions with the Local Authority Health Department and FESA as concerns about the possible contamination of the fire water would be an issue.

There appear to be no major technical constraints to the development of the Gidgegannup Town Site without a potable water supply from a Water Corporation system. However, this would require significant policy shifts in WAPC policy.

**GIDGEGANNUP WATER AND SEWER
OPTIONS**

**POSSIBLE WATER SUPPLY
PIPELINE ROUTE**

David Wills and Associates

Drawing No: 04007 –C01

**GIDGEGANNUP WATER AND SEWER
OPTIONS**

**WATER SUPPLY
CONSTRUCTION COST**

Gidgegannup Water Supply Study for City of Swan Construction Cost for Water Supply

Table 1: 200 lot development: 2,500 kl tank at Brinkie Way

	Unit	Rate	Quantity	Total
Construction of pipe to tank				
Ø300mm PVC main in residential road reserve	lin m	\$ 330	2,400	\$ 792,000
Ø300mm PVC main in rural road reserve	lin m	\$ 310	2,700	\$ 837,000
Cut-in to Goldfields WS pipeline	Item	\$ 20,000		\$ 20,000
Construction of Tank				
Purchase Lot	Item	\$ 250,000		\$ 250,000
Earthworks	Item	\$ 40,000		\$ 40,000
Provide 2,500 kL concrete tank	Item	\$ 200,000		\$ 200,000
Supply and install control valves, etc	Item	\$ 30,000		\$ 30,000
Construction of water main to town site				
Ø250mm PVC main in rural road reserve	lin m	\$ 240	5,000	\$ 1,200,000
Booster pump system at town site	Item	\$ 100,000		\$ 100,000
Supply network in townsite				
Ø100mm PVC water main	lin m	\$ 150	7,000	\$ 1,050,000
Ø150mm PVC water main	lin m	\$ 180	3,000	\$ 540,000
Domestic connections	Lot	\$ 600	200	\$ 120,000
Water Corporation Headworks	Lot	\$ 2,800	200	\$ 560,000
Total cost \$				5,739,000.00
Cost/lot				\$ 28,695

- Note: 1. All pipe rates include an allowance for excavation in heavy clays and rock removal.
2. Construction Costs are based on February 2004 values

Gidgegannup Water Supply Study for City of Swan Construction Cost for Water Supply

Table 2: 500 lot development: 2,500 kl tank at Brinkie Way

	Unit	Rate	Quantity	Total
Construction of pipe to tank				
Ø300mm PVC main in residential road reserve	lin m	\$ 330	2,400	\$ 792,000
Ø300mm PVC main in rural road reserve	lin m	\$ 310	2,700	\$ 837,000
Cut-in to Goldfields WS pipeline	Item	\$ 20,000		\$ 20,000
Construction of Tank				
Purchase Lot	Item	\$ 250,000		\$ 250,000
Earthworks	Item	\$ 45,000		\$ 45,000
Provide 2,500 kL concrete tank	Item	\$ 200,000		\$ 200,000
Supply and install control valves, etc	Item	\$ 30,000		\$ 30,000
Construction of water main to town site				
Ø300mm PVC main in rural road reserve	lin m	\$ 310	5,000	\$ 1,550,000
Booster pump system at town site	Item	\$ 100,000		\$ 100,000
Supply network in townsite				
Ø100mm PVC water main	lin m	\$ 150	11,000	\$ 1,650,000
Ø150mm PVC water main	lin m	\$ 180	6,000	\$ 1,080,000
Ø200mm PVC water main	lin m	\$ 210	3,000	\$ 630,000
Domestic connections	Lot	\$ 600	500	\$ 300,000
Water Corporation Headworks	Lot	\$ 2,800	500	\$ 1,400,000
Total cost \$				8,884,000.00
Cost/lot				\$ 17,768

- Note: 1. All pipe rates include an allowance for excavation in heavy clays and rock removal.
2. Construction Costs are based on February 2004 values

Gidgegannup Water Supply Study for City of Swan Construction Cost for Water Supply

Table 3: 1,600 lot development: 2,500 kl tank at Brinkie Way

	Unit	Rate	Quantity	Total
Construction of pipe to tank				
Ø300mm PVC main in residential road reserve	lin m	\$ 330	2,400	\$ 792,000
Ø300mm PVC main in rural road reserve	lin m	\$ 310	2,700	\$ 837,000
Cut-in to Goldfields WS pipeline	Item	\$ 20,000		\$ 20,000
Construction of Tank				
Purchase Lot	Item	\$ 250,000		\$ 250,000
Earthworks	Item	\$ 50,000		\$ 50,000
Provide 2,500 kL concrete tank	Item	\$ 200,000		\$ 200,000
Supply and install control valves, etc	Item	\$ 30,000		\$ 30,000
Construction of water main to town site				
Ø375 PVC main in rural road reserve	lin m	\$ 450	5,000	\$ 2,250,000
Booster pump system at town site	Item	\$ 100,000		\$ 100,000
Supply network in townsite				
Ø100mm PVC water main	lin m	\$ 150	16,000	\$ 2,400,000
Ø150mm PVC water main	lin m	\$ 180	10,000	\$ 1,800,000
Ø200mm PVC water main	lin m	\$ 210	4,000	\$ 840,000
Domestic connections	Lot	\$ 600	1,600	\$ 960,000
Water Corporation Headworks	Lot	\$ 2,800	1,600	\$ 4,480,000
Total cost \$				15,009,000.00
Cost/lot				\$ 9,381

- Note: 1. All pipe rates include an allowance for excavation in heavy clays and rock removal.
2. Construction Costs are based on February 2004 values

Gidgegannup Water Supply Study for City of Swan Construction Cost for Water Supply

Table 4: 200 lot development: 500 kl tank west of Show Grounds

(NOTE: This Option will only serve Gidgegannup)

	Unit	Rate	Quantity	Total
Construction of pipe to rear of town				
Ø200mm PVC main in residential road reserve	lin m	\$ 230	2,400	\$ 552,000
Ø200mm PVC main in rural road reserve	lin m	\$ 210	10,100	\$ 2,121,000
Cut-in to Goldfields WS pipeline	Item	\$ 20,000		\$ 20,000
Construction of Tank				
Purchase Lot	Item	\$ 50,000		\$ 50,000
Earthworks	Item	\$ 40,000		\$ 40,000
Provide 500 kL concrete tank	Item	\$ 80,000		\$ 80,000
Supply and install control valves, etc	Item	\$ 30,000		\$ 30,000
Supply network in townsite				
Ø100mm PVC water main	lin m	\$ 150	7,000	\$ 1,050,000
Ø150mm PVC water main	lin m	\$ 180	1,000	\$ 180,000
Domestic connections	Lot	\$ 600	200	\$ 120,000
Water Corporation Headworks	Lot	\$ 2,800	200	\$ 560,000
Total cost \$				4,803,000.00
Cost/lot				\$ 24,015

- Note: 1. All pipe rates include an allowance for excavation in heavy clays and rock removal.
2. Construction Costs are based on February 2004 values

**GIDGEGANNUP WATER AND SEWER
OPTIONS**

**SEWERAGE STORAGE
POND CALCULATIONS**

