WATER PLAN

2013 to 2018

Supporting Document F

Demand Forecast

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1.0 DEMAND

1.1 Water Supply - Demand Strategy

Goulburn Valley Water recently updated its Water Supply Demand Strategy, GVW2060 – A Sustainable Urban Water Future, March 2012. The Strategy considers a 50 year planning horizon from 2012 to 2060 to balance available water resources with demand having regard to issues such as population and commercial growth and impacts of climate change.

Demand forecasts have been developed for GVW2060 which have formed the basis of the demand forecast for the draft Water Plan.

A Water Conservation Strategy has been updated in the preparation of GVW2060 and the demand forecasts reflect water conservation strategy reductions in water usage.

1.2 Overview of Demand Forecasts

Essential inputs to the development of the draft Water Plan are the water and wastewater demand forecasts. These data enable estimation of many of the Corporation's cost drivers such as raw water, chemicals, power and consumables in addition to capacity augmentation works for budget preparation. At the other end of the scale, the demand forecasts are used to establish revenue streams and set the proposed price path for the draft Water Plan.

The water demand forecast developed for GVW2060 is consistent with the requirements of "Guidelines for the Development of a Water Supply Demand Strategy, DSE August 2011" and has been the basis for preparation of the draft Water Plan.

In addition, a forecast for wastewater receival at wastewater management facilities, comprising volume, trade waste parameter loads and resultant reclaimed water volumes to 2060 has been prepared, consistent with the discussion paper "Economic Regulation of the Victorian Water Sector Demand Forecasting, ESC 2004".

1.2.1 Water Demand Forecast

A building block approach was taken to aggregate forecasts for each demand category in predicting future total demand for each system. Contributors to water demand have been categorised into:

- Residential consumers;
- Commercial and minor industrial consumers;
- Major consumers including food industries;
- Distribution system non-revenue water; and
- Headworks non-revenue water.

1.2.2 Residential Demand Forecast

Two multi-variate regression models have been developed to forecast residential water demand per connection. The models are based on the aggregated residential demand for all water supply systems managed by Goulburn Valley Water and include climatic variables and restriction on use variables. Model output enables estimation of future demands taking into account forecast development, predicted climate change and also the impact of demand management initiatives with relative confidence.

Two models were developed to improve forecast accuracy and recognise differing demand patterns/usage between the northern and southern areas of Goulburn Valley Water's region. The models were calibrated to a monthly time step using data collected over the period 1998 to 2011, achieving adjusted R^2 values of 0.93 for both models. In addition, a significant relationship between the key climatic variables, temperature and rainfall, and the model as a whole with residential demand was verified for both models implying a high confidence in the output.

Residential water consumption across the Corporation can be categorised as discretionary and non-discretionary. Non-discretionary water consumption essentially consists of in-house use. Discretionary consumption is all other water usage, dominated by outside house use, and is the major contributor to variability of demand. The major demand modifiers are temperature, rainfall, usage restrictions and conservation initiatives. Apart from major industrial demand, discretionary water usage has the greatest effect in the variability of the Corporation's annual demand.

Projections for population growth for each town were derived from Victoria in Future data provided by the Department of Planning and Community Development.

1.2.3 Commercial Demand Forecast

Commercial and minor industrial water demand per assessment is relatively consistent from year to year. This lack of variability does not warrant the development of separate complex forecasting models.

The regional regression model excludes commercial and minor industrial demand. This component is relatively easily disaggregated from the forecast as it is relatively static and the nature and number of commercial customers changes relatively slowly.

Consequently the existing average demand per assessment has been adopted for forecasting taking into account the predicted increase in assessments. On the whole, industrial and commercial demand is not expected to be directly influenced by changes in temperature and rainfall.

1.2.4 Major Customer Demand Forecast

The demand by major customers is not suited to development of complex regression models. Variations in demand result from a multitude of influences such as changes in technology, production and water conservation efforts. Seasonal climatic variations have little or no impact on industry demand, although one off events, such as the very low irrigation allocation of 2006/07, may impact on primary production to the extent that industry productivity is also affected. These events are generally not predictable.

In order to prepare forecasts for major industry demand, each industry has been considered in isolation and consulted in relation to their expected production growth and any other proposed changes over the forecast period. Without exception, industry contacts have indicated a high uncertainty in forecasting future demands.

Based on the limited future demand information received from major customers, demand forecasts have been prepared which generally assume that major customer demand will remain consistent with recent historical levels.

1.2.5 Distribution System Non-Revenue Water Forecast

Distribution system non-revenue water comprises flushing, fire fighting, meter error (bulk and customer), fraud and leakage. It has varied over the historic period.

The amount of distribution system non-revenue water is forecast to either remain at current levels or be reduced where a reduction forms part of the preferred supply-demand balance strategy for a particular town.

1.2.6 Headworks Non-revenue Water Forecast

Headworks non-revenue water comprises water treatment plant production water usage, evaporation from off-stream storages, meter error and leakage on bulk water supply mains. Water treatment plant production water usage is the dominant contributor to this component of demand.

The water treatment plant production water usage is proportional to the volume of water produced and delivered into the distribution system. Production water usage varies for the type of facility and technology adopted generally in the range 3% to 8% of total facility inflow.

The amount of headworks non-revenue water is forecast to either remain at current levels or be reduced where a reduction forms part of the preferred supply-demand balance strategy for a particular town.

1.3 Wastewater Demand Forecast

The demand forecast for wastewater received at the Corporation's 26 wastewater management facilities and, in the case of Wandong/Heathcote Junction, delivered to Yarra Valley Water has been formulated through the aggregation of five categories of demand comprising residential, non-residential, industrial trade waste, water treatment plant waste and infiltration volumes. Only non-residential and industrial demand involves a volumetric charge component under Goulburn Valley Water's existing tariff structure. In addition, the major trade waste customers are also charged based on quality parameters.

Only the major trade waste customer and water treatment plant waste discharges to sewer are metered. As a consequence the actual volume received from residential and non-residential customers is unknown. The non-residential customers are charged on an equivalent volume basis related to a percentage of water consumed. Residential customers are charged a fixed service fee unrelated to volume discharged.

For the purposes of estimating residential, non-residential and infiltration volumes, the known major industrial discharge and water treatment plant waste volumes are subtracted from the bulk metered inflow to the wastewater management facility.

Bulk non-residential discharge is an estimated quantum based on a proportion of metered potable water demand. This proportion varies for different customer categories, necessitating individual calculation of property volumes and aggregation of the results on a township or region basis.

The residual volume is attributed to residential sewage and infiltration/meter error, neither of which impacts on Corporation revenue. The residential volume component has been estimated having regard to the number of residential connections and average occupancy rate on a township basis, with a typical allowance of 175 litres per capita per day.

Trade waste forecasts have been developed having regard to the discussions held with major customers. The forecasts have taken into account issues such as historic growth trends and waste characteristics, development outlook and waste minimisation initiatives such as water conservation and sodium reduction programs.

1.4 Summary of Demand Forecasts

1.4.1 Water Demand Forecast

Table 1 summarises historic demand and the Water Plan 3 forecast.

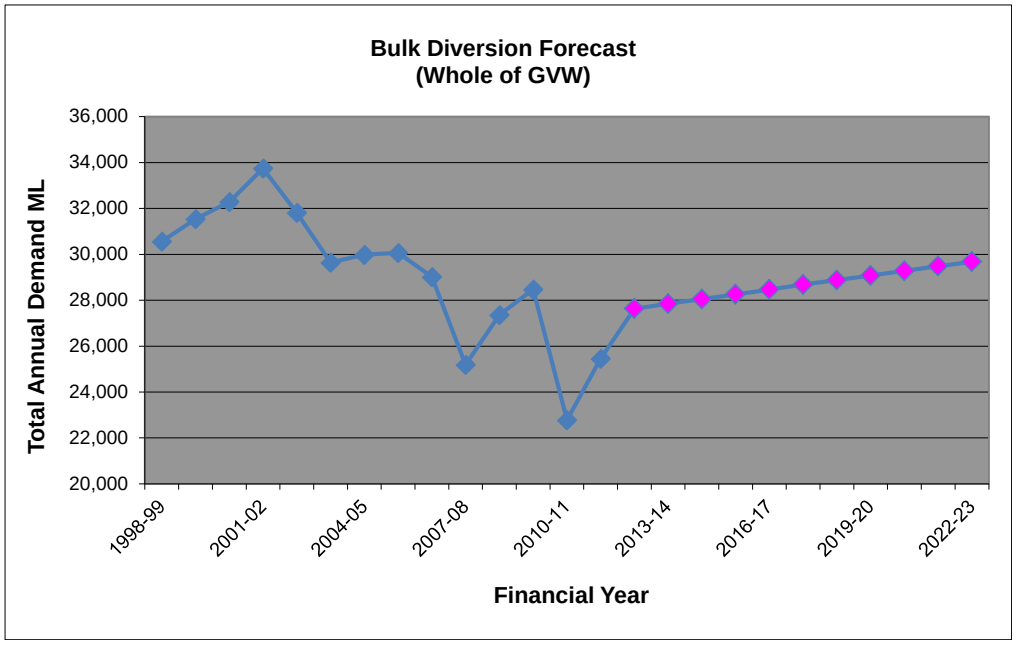
TABLE 1 – WATER DEMAND FORECAST

FINANCIAL YEAR	RESID (ML)	NON-RESID (ML)	MAJOR CUSTOMER (ML)	DISTRIBUTION SYSTEM NON-REVENUE WATER (ML)	TOTAL PRODUCED (ML)	HEADWORKS NON-REVENUE WATER (ML)	BULK DIVERSION (ML)
1998/99	12812	4526	6099	3005	26442	4118	30560
1999/00	13480	4335	6517	3464	27797	3743	31540
2000/01	13621	4202	7451	3985	29259	3028	32287
2001/02	14273	3903	7648	3766	29591	4154	33745
2002/03	14643	4214	7175	2849	28881	2932	31813
2003/04	13198	4270	6677	2474	26619	3526	30145
2004/05	13480	4092	7041	3139	27752	2290	30042
2005/06	14595	4625	6585	1862	27667	2796	30463
2006/07	14015	5828	4413	1596	25852	3163	29015
2007/08	11499	3667	5547	2267	22980	2210	25190
2008/09	12786	4175	5816	2210	24987	2370	27357
2009/10	12226	3706	6362	2045	24339	4130	28469
2010/11	9461	2771	5944	1920	20096	2680	22776
2011/12	11316	3676	6078	1840	22910	2543	25453
2012/13	12831	3733	6056	2267	24886	2742	27628
2013/14	12978	3766	6056	2285	25085	2764	27848
2014/15	13115	3793	6056	2302	25266	2783	28049
2015/16	13256	3821	6056	2319	25452	2802	28254
2016/17	13400	3849	6056	2337	25642	2823	28465
2017/18	13548	3878	6056	2356	25838	2844	28681

Data in black are actuals and data in magenta are forecasts

Figure 1 details the historic and forecast demand trend for water bulk diversions.

FIGURE 1 – BULK WATER DIVERSION FORECAST



Bulk diversions have varied greatly over the past 12 years and have been impacted by varying climate, periods of water restrictions, the introduction of permanent water savings measures and behavioural changes in water use by customers.

Bulk diversions experienced in 2008/2009 and 2009/2010 are considered the most representative of recent years for unrestricted demand under average climatic conditions.

Bulk diversions for 2010/2011 and 2011/2012 have been heavily impacted by high rainfall experienced during summer.

For the future forecast period average climatic conditions are forecast.

1.4.2 Wastewater Demand Forecast

Table 2 summarises the historical demand and forecast demand for the Water Plan period.

TABLE 2 –WASTEWATER DEMAND FORECAST

Financial Year	Residential (ML)	Non - Residential (ML)	Industrial (ML)	Infiltration (ML)	WTP Process Water (ML)	Total WMF Inflow (ML)
2001/02	6,081	1,889	4,828	1,466	1,231	15,495
2002/03	6,206	1,901	4,559	1,308	926	14,900
2003/04	6,129	1,927	4,382	1,490	1,283	15,211
2004/05	5,929	1,963	4,333	1,451	1,467	15,143
2005/06	5,810	2,294	4,210	1,318	1,403	15,035
2006/07	5,786	1,630	3,946	917	1,272	13,550
2007/08	6,005	1,697	3,321	965	899	12,886
2008/09	6,163	1,672	3,274	960	803	12,872
2009/10	6,381	1,670	3,581	1099	782	13,513
2010/11	6,198	1,560	3,216	2,187	1,278	14,439
2011/12	5,784	1,677	3,459	1,708	1,341	13,969
2012/13	6,119	1,715	3,216	1,451	1,674	14,174
2013/14	6,232	1,734	3,051	1,451	1,687	14,154
2014/15	6,338	1,750	3,051	1,451	1,698	14,288
2015/16	6,447	1,766	3,051	1,451	1,710	14,425
2016/17	6,558	1,782	3,051	1,451	1,722	14,565
2017/18	6,672	1,798	3,051	1,451	1,735	14,707

Figure 2 details the historic and forecast aggregated wastewater demand.

FIGURE 2 – WASTEWATER DEMAND FORECAST

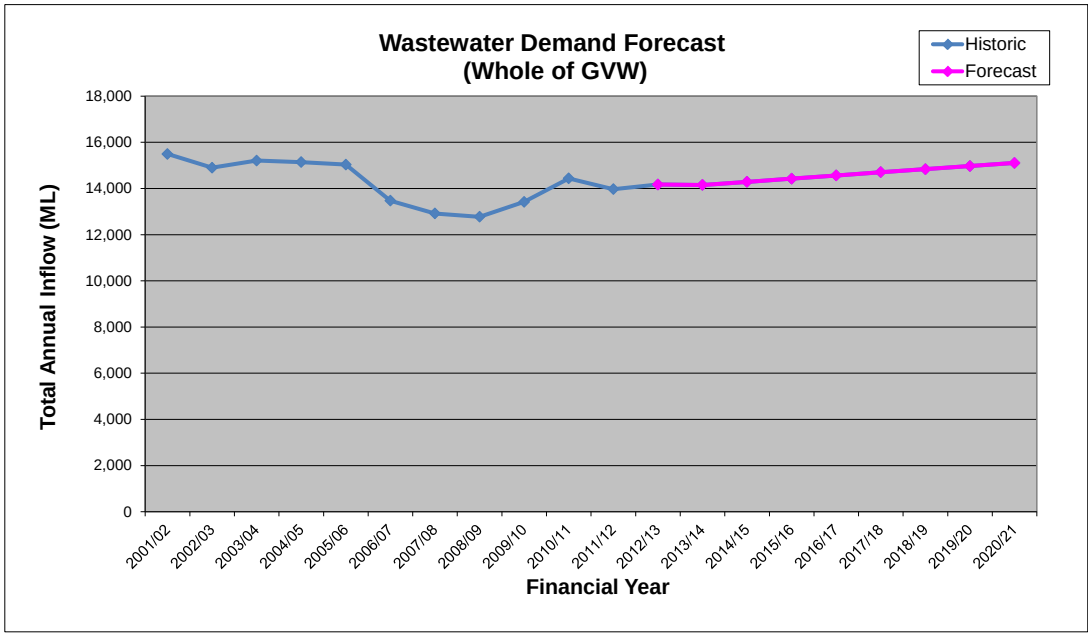


Table 3 summarises the forecast aggregated wastewater discharge from Wandong Heathcote Junction to the Yarra Valley Water system at Wallan for the Water Plan 3 period.

TABLE 3 – WANDONG/HEATHCOTE JUNCTION WASTEWATER FORECAST

Year	Outflow to YVW (ML pa)
2008/2009	97
2009/2010	93
2010/2011	124
2011/2012	103
2012/2013	98
2013/2014	99
2014/2015	100
2015/2016	101
2016/2017	102
2017/2018	103

- The 2010/2011 outflow reflects the impact of above average rainfall on wastewater flows. The 2011/2012 outflow is also impacted by rainfall but to a lesser extent.

The forecast outflow reflects average climatic conditions and increasing flows primarily due to residential growth.

Table 4 summarises the reclaimed water forecast.

TABLE 4 –RECLAIMED WATER FORECAST

Financial Year	Inflow (ML)	Nett Evap (ML)	Total Recycled Water (ML)	Corporation Irrigated (ML)	3rd Party Irrigated (ML)	Returned to Stream (ML)	Percentage Recycled for Irrigation
2001/02	15,495	4,406	11,089	5,920	1,616	3,553	68%
2002/03	14,900	4,557	10,342	6,034	2,461	1,847	82%
2003/04	15,211	4,304	10,906	5,808	2,128	2,970	73%
2004/05	15,143	4,941	10,202	5,498	2,247	2,457	76%
2005/06	15,035	4,981	10,054	5,472	1,855	2,727	73%
2006/07	13,550	5,799	7,751	4,800	1,884	1,118	86%
2007/08	12,886	5,074	7,811	4,366	1,947	480	81%
2008/09	12,871	5,684	7,187	4,790	2,203	194	97%
2009/10	13,513	6,282	7,231	3,705	2,944	582	92%

Financial Year	Inflow (ML)	Nett Evap (ML)	Total Recycled Water (ML)	Corporation Irrigated (ML)	3rd Party Irrigated (ML)	Returned to Stream (ML)	Percentage Recycled for Irrigation
2010/11	14,439	3,256	11,183	2,112	2,515	6,557	41%
2011/12	13,969	5,317	8,652	4,089	2,734	1,828	79%
2012/13	14,174	5,354	8,820	4,298	2,989	1,436	83%
2013/14	14,154	5,355	8,800	4,599	2,665	1,436	83%
2014/15	14,288	5,355	8,933	4,692	2,704	1,437	83%
2015/16	14,425	5,355	9,070	4,787	2,743	1,438	83%
2016/17	14,565	5,356	9,209	4,884	2,784	1,438	83%
2017/18	14,707	5,356	9,351	4,983	2,825	1,439	84%

Note: Third party recycling agreements have been established on a voluntary commercial basis.

The volume of reclaimed water returned to stream has been high during 2010/2011 and 2011/2012 due to above average rainfall, particularly during summer which has limited opportunities for irrigation.

The forecast assumes average climatic conditions which will result in increased irrigation in comparison to the past two years.

Table 5 summarises the trade waste forecast.

TABLE 5 – TRADE WASTE FORECAST

Year	Volume (ML)	BOD (tonne)	Sodium (tonne)	Nitrogen (tonne)	Phosphorus (tonne)
2006/2007	3,407	7,354	1,330	212	59
2007/2008	3,324	6,854	1,131	214	52
2008/2009	3,250	6,024	905	169	49
2009/2010	3,357	7,199	1,123	196	47
2010/2011	3,216	6,024	976	178	43
2011/2012	3,459	6,853	1,044	192	53
2012/2013	3,216	6,006	971	179	43
2013/2014	3,051	5,925	747	168	43
2014/2015	3,051	5,925	747	168	43
2015/2016	3,051	5,925	747	168	43
2016/2017	3,051	5,925	747	168	43
2017/2018	3,051	5,925	747	168	43

Minimising trade waste discharge to sewer is a key focus for Goulburn Valley Water. Over the past five years the Corporation has been working closely with major industry customers to encourage water conservation and trade waste minimisation.

Table 6 summarises the forecast residential and non-residential waste volumes and chargeable volume for the regulatory period and beyond.

TABLE 6 –
FORECAST RESIDENTIAL AND NON-RESIDENTIAL WASTE VOLUMES AND CHARGEABLE VOLUME

Regional Forecast Residential & Non-Residential Wastewater Volume		
Financial Year	Non- Residential	
	Total ML p.a.	Chargeable[1] ML p.a.
2003/2004	1,927	1,442
2004/2005	1,963	1,469
2005/2006	2,294	1,461
2006/2007	1,630	1,404
2007/2008	1,697	1,096
2008/2009	1,672	1,274
2009/2010	1,670	1,217
2010/2011	1,560	1,051
2011/2012	1,696	1,081
2012/2013	1,715	1,093
2013/2014	1,734	1,093
2014/2015	1,750	1,115
2015/2016	1,766	1,125
2016/2017	1,782	1,136
2017/2018	1,798	1,146

1 Excess volume taking into account 180kL allowance per connection. For more detail refer to Section 7.4

1.5 Issues for Specific Forecasting Parameters

1.5.1 Water Demand Forecast

The demand forecast assumes:

- Future residential demand per connection for existing properties will be similar to the average of the past 5 years;
- Future residential demand per new connection for new properties will be less than the average for existing properties. This is due to a number of factors such as smaller lot sizes, smaller areas of garden/lawns and higher uptake of water efficient appliances. Analysis was undertaken as part of the development of GVW2060 to establish future residential demand for new properties for Goulburn Valley Water's different regions; and
- Negligible price impacts on demand beyond existing influence.

Importantly, the residential forecast assumes average climatic conditions will prevail for the regulatory period assuming unrestricted supply. Consequently, no provision has been made for the imposition of water restrictions during the period.

1.5.2 Wastewater Demand Forecast

The wastewater demand forecast assumes:

- No change in per connection contribution to domestic sewage;
- The nature and proportions of non-residential new customers is similar to the existing demographic, resulting in no change to average per connection wastewater volumes;
- The forecast takes into account predicted growth in customers served detailed in GVW2060;
- Goulburn Valley Water's water conservation initiatives will not have a material impact on residential and non-residential sewage discharge over the regulatory period. While in-house water demand is expected to decline marginally over the period, the change will not be material. In the longer term, water efficient appliances in all new housing and substitution of existing low efficiency appliances in existing dwellings is expected to influence total domestic sewage volumes. This will be addressed in demand forecasts for subsequent regulatory periods;

- Future major industry trade waste forecast has been based on individual consultation with each customer to establish their development plans and waste minimisation potential to forecast industrial demand for the period; and

- Future concentration of charging parameters for major trade waste customers, such as BOD, sodium and nitrogen are assumed to reflect historic concentrations except where individual customers have forecast reductions through waste minimisation strategies.

Non-residential customers are allocated a 180 kL allowance at the beginning of the financial year that does not attract a volumetric charge. Any calculated volume in excess of the 180 kL allowance attracts a usage fee. Consequently, non-residential customers will not incur usage fees if their calculated discharge is below 180 kL.