ENGENY
WATER MANAGEMENT

CITY OF BALLARAT

Ballarat West Development Contributions Plan

Expert Witness Statement – Andrew Prout

Date 14 June 2013

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T-2-Engeny Report

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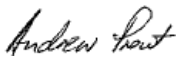
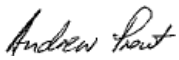
Signatures					

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1. INTRODUCTION

This report has been commissioned by Maddocks for the City of Ballarat. This report has been prepared in accordance with Planning Panels Victoria Expert Evidence Guidelines. Details of the report author are provided below.

1.1 Expert Witness Details

1.1.1 Name and Address

Andrew Glen Prout

Suite 15

333 Canterbury Road

Canterbury, Victoria, 3126

1.1.2 Qualifications

Andrew Glen Prout has the following qualifications and professional memberships:

Education

Bachelor of Engineering (Civil), Swinburne Institute of Technology, 1984

Postgraduate Diploma in Management Studies, Melbourne University, 1992

Registrations/Affiliations

Member, Institution of Engineers, Australia and Chartered Professional Engineer

Member, College of Civil Engineers, I.E. Aust.

1.1.3 Experience and Expertise of the Author / Reviewer

Andrew is the General Manager for the Melbourne branch of Engeny. Andrew has gained more than 30 years professional experience both in the consulting engineering field and with government and semi-government authorities. Andrew is a leader in the surface water management field, having prepared Melbourne Water's current Drainage Design Guide and having lectured at university level. Andrew's key skills are in stormwater, flood mapping, water sensitive design, waterways, flood management and other surface water fields of work. A CV with more details, particularly regarding Andrew's expert witness work, is provided in **Appendix A**.

Andrew has significant experience and expertise in relation to flooding, drainage and erosion. Andrew has been responsible for the assessment of flooding and drainage patterns, waterways and the design and construction of numerous drainage works for many clients.

Andrew is familiar with drainage patterns in the Ballarat area having undertaken a number of projects in the area. Andrew was project director for Engeny's report on the Ballarat West Growth Area PSP Drainage Report completed in February 2012, which included the modelling and concept design of the proposed drainage infrastructure and revisited the PSP area during the preparation of this report. He has also undertaken numerous drainage and flood studies throughout Victoria, including a number of projects in and around Ballarat. Andrew has very strong skills and experience in drainage master planning, having prepared and reviewed Melbourne Water Drainage Schemes and having prepared master plans for numerous growth areas. Andrew has undertaken expert witness work in relation to flooding for a number of clients, including Melbourne Water, Councils and landowners.

Andrew has been supported by Paul Clemson in the work undertaken for this project. Paul is a senior civil engineer with substantial experience in drainage schemes, catchment modelling, master planning and cost estimating. Paul has undertaken a detailed review of the cost of drainage infrastructure for Melbourne Water Development Services Schemes and has reviewed this report.

2. INSTRUCTIONS

Written instructions were provided by Maddocks and for this report the instructions sought my advice regarding the DCP submissions that were made. The instructions sought my comments in relation to my areas of expertise and whether or not in my opinion that there should be any changes to the DCP. My areas of expertise for this matter relate to the proposed drainage, flood control and stormwater treatment infrastructure for the Ballarat West DCP.

3. FACTS, MATTERS AND ASSUMPTIONS

This report is based on information provided to Engeny and additional reference documents noted in Section 4.

4. REFERENCE DOCUMENTS

Two folders of hard copy documents were provided with instructions for preparation of an Expert Witness Report. An index listing the contents of the folders is attached as **Appendix B**.

A total of 28 written submissions responding to the exhibited DCP were received and reviewed for this report.

Other documents that have been referenced during the preparation of this report include:

- Clause 56.07 of the Victorian Planning Provisions;
- Using the integrated water management provisions of Clause 56 – VPP Practice Note, October 2006;
- Melbourne Water cost estimating rates for Development Services Schemes (Drainage Schemes), including review of actual tendered cost rates by Engeny; and
- Infrastructure Design Manual (IDM), March 2013.

5. ASSESSMENT

I have considered the key issues in the submissions and have responded to each issue. The key issues raised in the submissions in relation to my areas of expertise in my opinion are:

1. The need for the proposed drainage infrastructure
2. The design standards to which the proposed drainage infrastructure have been designed;
3. The cost of the proposed drainage infrastructure;
4. Whether or not suitable drainage infrastructure could be provided at a lower cost;
5. Apportionment of the cost of the drainage infrastructure; and
6. Whether or not drainage infrastructure should be included in the DCP at all.

5.1 Need for the drainage infrastructure

There are a number of requirements that specify the need for drainage infrastructure in urban areas in Victoria. The objectives for drainage systems include:

- Provision of drainage outlets for properties to provide effective drainage. Typically drainage pipes are provided to a design standard adopted by the local Council as the drainage authority.
- Provision of overland flow paths and waterway corridors to safely convey 100 year ARI peak flows to provide flood protection to all properties and to provide a safe system as required by the Planning Scheme.
- Provision of wetlands (and / or other infrastructure) to achieve best practice stormwater treatment to meet State Environment Protection Policy (SEPP) and Planning Scheme requirements.
- Flood retarding to control peak 100 year ARI flood flows to receiving waterways as required by the Planning Scheme and the Corangamite CMA.

A number of the requirements for drainage are set out in the objectives in Clause 56.07-4 (refer to **Appendix C**) of the Planning Scheme and elaborated on in Standard C25 in Clause 56.07-4 and in the VPP Practice Note regarding Clause 56.

Specific design requirements for drainage infrastructure are described in detail in the Infrastructure Design Manual (IDM) that has been adopted by numerous Councils in Victoria, outside of Greater Melbourne. The IDM was developed in 2007 and version 4

was issued in March 2013. The City of Ballarat is one of the Councils that have adopted the IDM.

The drainage system objectives listed above are to meet environmental, drainage and flood protection standards. My view is that for most of these requirements it would be inappropriate to reduce the required standard to make the drainage works more affordable, as I don't believe that it would be appropriate to:

- Provide the future residents and business owners of Ballarat West with less flood protection than people moving into any other new urban area in Victoria;
- Provide the future residents and business owners of Ballarat West with a lower standard drainage system than in the rest of Ballarat; and
- The Ballarat West area should not be allowed to do less than required to protect the downstream environment in terms of stormwater quality or controlling downstream flooding to existing levels.

Overall the DCP proposes an efficient combination of works to achieve the required outcomes. The key issues in relation to drainage infrastructure are discussed below.

5.2 Design standards

The key items and standards adopted for the drainage infrastructure for the Ballarat West PSP were:

- 10 year ARI pipes to convey drainage flow in a minor storm.
- Overland flow paths, roads, floodways, retarding basins and creek corridors to safely cater for the 100 year ARI flows throughout the area in a major storm.
- Wetlands (and small biofilters) for stormwater treatment. Wetlands and biofilters have been sized to just meet Best Practice Environmental Management Guidelines (BPEMG) targets for sediment, nutrient and litter removal.
- Flood retarding basins have been located on the same sites as many of the wetlands to to reduce peak flow rates to protect downstream waterways and properties from any increase in flooding during major floods and to reduce the size of downstream pipes and floodways within the PSP area where cost effective. The proposed flood retarding basins have been designed to be excavated basins to ensure that they provide the required extra flood storage. By adopting excavated basins the design has avoided the potentially very high cost of spillways for retarding basins with embankments and has removed the risk of embankment failure during a flood event. The flood retarding basins have been designed to just achieve the design objective of not increasing downstream flood flows compared with existing conditions.

5.3 Cost of the drainage infrastructure

Table 5.1 summarises the estimated cost of the drainage infrastructure across the three precincts in the DCP as estimated by SMEC Urban.

Table 5.1: Drainage Cost Summary with 10 year ARI pipes

Item	Precinct 1 Cost ($M)	Precinct 2 Cost ($M)	Precinct 4 Cost ($M)	Total Cost ($M)	Percentage of total
10 year ARI capacity drainage pipelines	15.6	4.6	4.6**	24.8	28.9 %
Wetlands/ retarding basins construction	30.4	9.8	11.2	51.4	59.9 %
Bioretention	0.2	0.9	0.2	1.3	1.5 %
Land acquisition for wetlands / basins / biofilters	4.7	2.0	1.6	8.3	9.7 %
Totals	50.9	17.3	17.6	85.8	100 %
Developable land (ha)	499	218	230	947.51 !!	
Drainage cost per developable hectare	$102,000	$79,400	$76,500	$90,600	

** Note error in SMEC Urban spreadsheet for precinct 4, as discussed with SMEC Urban. Rate was calculated by SMEC Urban based on total pipe cost of $3.6M, but this did not include contingency, Council fees or design consultancy fees which had all been included for precincts 1 and 2. I note that the final total in the Schedules for the DCP appear to have been corrected for the error in the SMEC Urban spreadsheet.

!! Areas published on the web site were approximate from SMEC Urban calculations and included a total developable area of 1004 ha. Urban Enterprises has done a more detailed land budget with a total developable area of 947.51 ha and this area has been used in the calculation of rates in the DCP.

With the land acquisition added and the error corrected for precinct 4 and the developable areas from the Urban Enterprise report used, my estimate of the drainage costs per hectare would be as per the bottom line in **Table 5.1** above. Note that rounding of totals and cost rates have been done in the table above and areas for each precinct were only to the nearest hectare.

The overall average cost per hectare calculated above of $90,600 agrees (except for rounding errors) with the adopted rate in the Schedule to the DCP of $90,831.64.

Key aspects of the cost of the infrastructure are:

- Location of combined wetlands and retarding basins in otherwise encumbered and / or undevelopable areas wherever possible to:
  - Maximise land available for development;
  - Minimise land acquisition costs; and
  - Locate wetlands / basins in logical places, such as valleys, existing dams and predominantly flood plains where drainage can be cost effectively directed and where the topography results in the lowest cost for excavation and minimises the area required.
- Adoption of excavated retarding basins to avoid the high cost of spillways for retarding basins with embankments and to remove the risk of embankment failure during a flood event.
- Adoption of 10 year ARI pipes has been included in the DCP.

5.4 Could the drainage infrastructure be provided at a lower cost

To consider whether or not the drainage infrastructure could be provided at a lower cost I have reconsidered the required design standards, confirmed that the proposed drainage infrastructure just meets the standard and reviewed the cost estimates.

Some submissions have suggested that various parts of the proposed drainage system could be reduced in size and that this would reduce costs. These suggestions include:

- Smaller drainage pipes.
- Introduction of mandatory rainwater tanks for all dwellings, which would reduce the size of wetlands / biofilters.
- Changes to retarding basins and potentially smaller pipe sizes as a result.
- Provision of “at source” stormwater treatment as an alternative to the proposed wetlands.

In relation to the submissions seeking a lower cost drainage system the adoption of smaller drainage pipes would lead to a lower standard of drainage pipe capacity and more frequent flow in streets and public areas. My opinion is that the adoption of a 10 year ARI standard for Council pipes as proposed in the DCP is reasonable, because:

- The City of Ballarat has provided 10 year ARI pipes throughout the rest of Ballarat and to reduce the standard for Ballarat West would be inconsistent with this existing standard.

- The recent IDM has a mix of recommended standards as detailed on page 82 of the IDM, with a 5 year ARI standard for residential, 10 year ARI for small commercial areas (less than 10 shops) and some industrial areas and 20 year ARI for larger commercial areas and industrial areas. The Ballarat West PSP has a mix of land uses and Council has chosen an overall design standard of a 10 year ARI minor drainage system, which is the best fit to the overall range of standards in the IDM.

- If residential areas in Ballarat West adopted a 5 year ARI minor drainage system standard there is the risk that this level of service could deteriorate over time due to a number of factors, including impervious area "creep" and/or increasing rainfall intensities. Impervious creep occurs when the original estimates of the impervious area in a catchment are not adequate over the long term, due to construction of extra impervious areas, such as extra dwellings (due to more lots per hectare, dual occupancies or apartments), sheds, and paving, some of which don't require a permit, or cannot be controlled. Climate change predictions indicate that there is likely to be some increase in rainfall intensities (this issue is subject to ongoing study, including review for updates to design rainfall data and Australian Rainfall and Runoff). The combined effect of impervious creep and climate change could be to reduce a 5 year ARI pipe system to a 2 or 3 year system, leading to more frequent overland flow than intended. With the adopted 10 year ARI standard then even if there is impervious area creep and/or rainfall intensity changes then at least the standard will be between a 5 and 10 year ARI capacity and the capacity will be the same as the drainage built in recent decades in the rest of Ballarat.

If the suggestion made by some respondents that smaller drainage pipes would be reasonable was adopted then the City of Ballarat could consider a 5 year ARI standard instead of 10 year ARI to reduce costs. As mentioned above the IDM recommends 5 year ARI pipes for residential areas and some Councils in Greater Melbourne also adopt a 5 year ARI pipe standard. While my view is that the 10 year ARI standard is the most appropriate for Ballarat West I have considered the likely impact on costs should the standard be reduced from 10 year to 5 year ARI.

Table 5.2 provides the approximate impact on the cost of the drainage system if Council adopted a 5 year ARI standard across the three precincts in the DCP. The adoption of 5 year ARI pipes instead of 10 year ARI pipes would save approximately $5M over the DCP area. The approximate cost saving for 5 year ARI pipes and the potential impact on the contribution rate is provided for information for the Panel and its inclusion is not intended to advocate that this lesser standard should be adopted.

Table 5.2: Drainage Cost Summary with 5 year ARI pipes

Item	Precinct 1 Cost ($M)	Precinct 2 Cost ($M)	Precinct 4 Cost ($M)	Total Cost ($M)	Percentage of total
Approximate 5 year ARI capacity drainage pipelines	**12.4**	**3.7**	**3.7**	**19.8**	**24.5 %**
Wetlands/ retarding basins construction	30.4	9.8	11.2	51.4	63.6 %
Bioretention	0.2	0.9	0.2	1.3	1.6 %
Land acquisition for wetlands / basins / biofilters	4.7	2.0	1.6	8.3	10.3 %
Totals	**47.7**	**16.4**	**16.7**	**80.8**	100 %
Developable land (ha)	499	218	230	947.51	
Drainage rate per developable hectare	**$95,600**	**$75,200**	**$72,600**	**$85,300**	

It is important to note that the Ballarat West PSP drainage design requires overland flow paths and floodways for major storms up to and including the 100 year ARI storm. These will be built into the layout for the proposed drainage works and subdivisions and will require roads, retarding basins, floodways and creek corridors to safely convey floodwaters in a 100 year ARI storm, without flooding private properties. This provision of a major drainage system is vital to protecting people and buildings from flooding within the PSP area and is required by the Planning Scheme and the IDM.

Rainwater tanks have been suggested in some submissions to help reduce the cost of drainage infrastructure. When rainwater tanks are mandated and the water from the tanks is mandated for regular use in each property (e.g. rainwater tanks plumbed for toilet flushing and/or laundry use) then this could reduce the size (and therefore cost) of stormwater treatment wetlands required. This is achieved by reducing the total flow and therefore total pollutant load being discharged to the drainage system. Rainwater tanks used in this way can have a number of benefits, including:

- Reducing total flow discharged to waterways to closer to the rural flow.
- Reducing pollutant loads discharged from roofs into the drainage and waterway system.
- Reducing demand for potable water.

- Possibly making more water available for garden irrigation and/or open space irrigation.

In considering the potential benefits of rainwater tanks it should be noted that rainwater tanks that are designed to fill for rainwater reuse have no significant impact on peak flows and therefore no effect on drainage pipe sizes or retarding basin sizes.

Mandating rainwater tanks may not significantly reduce the areas required for combined wetlands / retarding basins as in many cases the size of the wetland / basin is controlled by the volume needed for peak flow control, which is not reduced by mandating rainwater tanks. I have done a number of studies that have sized basins / wetlands both with and without allowing for rainwater tanks and there would be some reduction in cost for the wetlands, but there would be an increase in costs associated with the supply and operation of the rainwater tanks. For Ballarat West the sizing of wetlands for stormwater treatment and the sizing of the same sites for flood retardation is finely balanced. Therefore if rainwater tanks were adopted the sizes of these sites and their total costs would not be able to be changed to make a substantial overall saving as the same size sites with almost the same volume would be required.

Mandating rainwater tanks is only likely to be of any value if there is no “third pipe”, recycled water proposed to be supplied to the area. If there is sufficient recycled water to meet the demand for open space irrigation as well as providing treated wastewater to each household for garden irrigation and/or toilet flushing, then there would be little or no demand for water from rainwater tanks. If “third pipe” recycled water is adopted for this area then rainwater tanks are unlikely to have sufficient benefits to justify their costs.

There are a number of issues that would need to be resolved to determine if mandating rainwater tanks in the Ballarat West area was viable and cost effective, including:

- If “third pipe”, recycled water is proposed (I understand that this has not yet been decided), then there would be limited if any need for rainwater tank water for outdoor irrigation.

- If “third pipe”, recycled water is provided in sufficient quantity to provide for toilet flushing then it would be of little benefit to also mandate rainwater tanks.

- If there was no “third pipe” recycled water then the scenario of rainwater tanks would still need to be analysed in detail and may not improve the affordability in the area as the size of the basins / wetlands may not be able to be reduced very much and there would be extra costs to each household for the capital and operating costs of the tanks.

Provision of rainwater tanks would be likely to reduce the cost of stormwater treatment works by probably enabling the biofilters to be removed from the PSP design and a slight decrease in wetland area, with a saving of perhaps $1.3M to $3M in total. Provision of rainwater tanks to each house would be likely to cost significantly more than the amount saved on stormwater treatment works.

In relation to the suggestions that retarding basins could be made more efficient my view is that the combination of wetlands and basins has been optimised as far as possible. The wetlands just meet the requirements for stormwater quality and the retarding basins just meet the requirements to control peak flows. In many cases the wetlands / basins are located in floodplains, which are a sensible and very cost effective design, reducing excavation cost due to the relatively flat sites, minimising site area required, minimising land acquisition cost and minimising loss of developable area. The alternative of providing more local retarding, or requiring developers to design and build their own basins would increase costs and reduce the amount of developable area.

There is one area around proposed RB2 where it was very difficult to effectively control flows, provide drainage and get an outlet to the shallow creek to the east. The design around RB2 in the DCP is reasonable in my opinion, but I understand that alternatives may be proposed, for which there are a number of constraints that need to be considered. If the landowners in this area are able to design a system that meets the required drainage system performance, then the design could be altered. Options could include:

- Negotiating with landowners to the east to relocate the retarding basin.
- Deepening the creek to the east and making the basin deeper and possibly smaller in area.
- Splitting the basin into more than one basin.

Smaller more cost effective “at-source” stormwater treatments were suggested in some submissions, rather than the wetlands in the PSP. My expectation and experience is that there may well end up being some “at source” treatment adopted, but that there are often many difficulties with these types of treatments, including:

- The overall need for an area of land for stormwater treatment is not reduced by using “at source” treatments and therefore more of the treatment areas would have to be provided in otherwise developable areas, instead of the proposed wetlands that are mostly in flood prone areas and in areas that will also need to be used for retarding basins for reducing peak 100 year ARI flood flows.
- There could be some saving in land use if the “at source treatments” were built into the streetscapes, but this is often difficult to achieve, does not always lend itself to coarse sediment and litter control and can create an added maintenance burden that many Councils are reluctant to accept.

By adopting a system of clearly identified and costed works in the DCP that will meet the stormwater treatment requirements, Council and landowners will have a clear base case from which to work. If a landowner can propose a subdivision layout and design that replaces some of the wetland(s) with “at source treatment” then this design can still be used and there will be a clear base case in the DCP for assessing any reimbursements from the DCP funds to the developer for provision of equivalent works.

For the combined retarding basins / wetlands I have undertaken an overview check of the costs used in the DCP. The wetland / retarding basin construction costs are the most significant part of the drainage costs and therefore I have looked at these costs independently to the costs calculated by SMEC Urban for the DCP.

I have reviewed the construction cost estimates for these items in the DCP, as prepared by SMEC Urban. The SMEC Urban spreadsheet used wetland and surround areas and rates per m^2, rather than the rates that I have used in my calculations. I have discussed the method used by SMEC Urban with John Maxwell of SMEC Urban and understand that SMEC Urban has a significant database of the total construction cost of wetlands / basins and their areas and used this data to prepare their construction cost estimates.

The PSP requires approximately 34 hectares of retarding basin / wetland at a total estimated construction cost of **$51.4 million** as estimated by SMEC Urban, which is approximately $1.5 million per hectare. As the basins are proposed to be excavated, with the permanent pool volumes required and an extra 1.5 to 2 metres of total depth above permanent pool volumes for flood storage, there is a significant volume of excavation required, as detailed in Engeny's report dated 27/2/2012. The total volume of excavation (and soil disposal) required is approximately 700,000 m^3. The rates that I have used below are from recent Melbourne Water rates (in 2011 dollars) for the western region of Greater Melbourne, including areas such as Melton. Other aspects of the basin / wetlands works required include access tracks, pond lining (if required), top soiling, aquatic and terrestrial planting, fencing and outlet works. **Table 5.3** provides my construction cost estimates for these works.

Table 5.3: Approximate costs for basins / wetlands

Item	Quantity	Rate	Estimated Cost
Excavate and dispose of soil – range allows for some rock excavation and/or variation in haul distances	700,000 m^3	$30 to $40/$m^3$	$ 21 M to $28M
Topsoil	34 ha	$34,000 / ha	$ 1.2 M
Planting and weed mat	24 ha	$150,000 / ha	$ 3.6 M
Grassing	10 ha	$20,000 / ha	$ 0.2 M
Outlet works	22 basins	$120,000 each	$ 2.6 M
Access tracks, clay lining, rock lining of sediment ponds, fencing etc.	22 basins	$150,000 each	$ 3.3 M
SUB TOTAL			$ 31.9 M to $ 38.9 M
Plus contingencies, Council fees, survey and design		38.25% in total	$ 12.2 M to $14.9 M
TOTAL ESTIMATED COST			**$ 44.1 M to $ 53.8 M**

My independent estimate of the construction cost of the wetlands and retarding basins is that the total cost is expected to be in the range of $44M to $54M. It should also be noted that the construction costs in Ballarat can be a few percent higher than in western Melbourne due to less competition between contractors and/or greater travel distances if Melbourne based contractors work in Ballarat.

Based on my review of the SMEC Urban cost estimates and my own independent calculation of the likely construction cost of the wetlands and retarding basins my opinion is that the estimated cost of $51.4 million used in the DCP is appropriate.

5.5 Apportionment

The exhibited Ballart West DCP proposes one contribution rate across the three precincts.

A number of submissions refer to the costing spreadsheet provided by Council with the exhibited DCP that estimates the cost of drainage works per hectare for each of the three precincts as well as the "weighted average" rate for drainage works.

There are a number of points that should be understood about the numbers provided in the spreadsheet with the DCP:

- The estimated construction costs for each of the three precincts were provided in the spreadsheet, but didn't include all costs on a precinct basis.
- The construction costs per precinct didn't include the land acquisition costs.
- There was an error in the pipe cost calculations for precinct 4 that underestimated the cost of the pipes by approximately $1M, resulting in a lower published rate for precinct 4.
- All three precincts drain into the one waterway and are part of the same catchment. All of the three precincts are located in the Winter Creek catchment as shown on the plan in **Appendix D**. The plan in **Appendix D** also shows the sub-catchment boundaries for each of the PSP precincts.
- Updated costs per hectare, including land acquisition costs have been included in this report and in the Schedule for the DCP (refer to Table 5.1 above).

There are precedents for drainage charge schemes for proposed urban development in Victoria. These precedents include Melbourne Water Drainage Schemes (or Development Services Schemes) which have been used for over 40 years. The principles in these schemes have been developed with input from landowners, developers and consultants and have been tested in various forums including at Panel Hearings and at VCAT. Engeny has recently reviewed a number of Melbourne Water's drainage schemes with areas ranging from a few hundred hectares to a couple of thousand hectares.

Since the introduction of DCPs in the 1995 amendments to the Planning and Environment Act, a number of greenfield DCPs have been developed which have included drainage works. A recent regional example of a large scale DCP is at Armstrong Creek, south of Geelong. The Armstrong Creek Growth area is all part of one large drainage catchment with a total development area of approximately 2500 hectares. Two DCP rates have been adopted for Armstrong Creek East and Armstrong Creek West respectively. The adoption of one DCP area with 947.5 ha of developable land for the Ballarat West DCP area is consistent with the size of areas used for the Armstrong Creek development area.

Both Melbourne Water Drainage Schemes and DCPs have typically used a contribution rate per hectare. In my opinion the use of the developed catchment area is the recognised best measure of the demand for drainage services that each site has and that it is the most appropriate unit for apportioning the cost of drainage works (i.e. $ per hectare).

The choice by the City of Ballarat to adopt one DCP contribution rate is reasonable in my opinion. The Ballarat West PSP area is all in one catchment (the Winter Creek catchment as shown on the plan in **Appendix D**) and the size of the DCP area is a sensible size and consistent with the size of other schemes and DCPs.

Alternatively drainage rates could be adopted on a sub catchment or precinct basis. A larger number of separate rates would increase the complexity of management of the DCP(s), and would only be preferred to one rate if the overall DCP rates including all items in the DCP for each precinct or sub-catchment are substantially different.

I have also considered the apportionment of costs related to the other land uses in the sub-catchments covered by the DCP that are not in the PSP area (i.e. external apportionment). In some of the sub-catchments there are existing urban areas. The design of the works for the DCP have been carefully determined to ensure that the works that are included in the DCP only cater for the effects of the proposed development in the PSP area and do not provide drainage, stormwater treatment or flood control for the effects of the development outside the PSP.

5.6 Should drainage infrastructure be included in the DCP

My opinion is that it is important for regional drainage infrastructure to be included in the DCP and for the cost to be shared by all benefitting properties for the following reasons:

- The DCP can adopt the most efficient and cost effective drainage layout across the area, meaning that the overall cost is as low as possible, improving affordability for all. The alternative would be for each property to have to treat stormwater to best practice and control peak flows to rural flow rates. This would result in a less than optimal design and higher costs. For example basins and wetlands would be located on developable land instead of in the floodplain and would be located on steeper sites, requiring more earthworks and larger sites.

- The DCP drainage system provides an outfall pipe for properties, which means that individual developments do not have to negotiate easements and access to downstream works, or allow for flows from upstream properties in an ad hoc manner.

- The overall outcomes of draining each property, providing flood protection within the PSP area, treating runoff and managing peak flows into the waterways can all be achieved with certainty for landowners, Council and the CMA.

6. SUMMARY OF OPINION

In summary, my opinion is that in relation to drainage the Ballarat West DCP:

1. Should include drainage infrastructure in the DCP to efficiently and cost effectively achieve the following objectives:
   - Provision of drainage outlet pipes.
   - Provision of roads, overland flow paths, retarding basins, floodways and waterway corridors to safely convey 100 year ARI peak flows.
   - Provision of wetlands (and some biofilters) to achieve best practice stormwater treatment to meet SEPP and Planning Scheme requirements.
   - Flood retarding to control peak 100 year ARI flood flows to receiving waterways as required by the Planning Scheme and the Corangamite CMA.

2. The drainage system objectives listed above are to meet environmental, drainage and flood protection standards. My view is that for most of these requirements it would be inappropriate to reduce the required standard to make the drainage works more affordable, as I do not believe that it would be appropriate to:
   - Provide the future residents of Ballarat West with less flood protection than people moving into any other new urban area in Victoria;
   - Provide the future residents and business owners of Ballarat West with a lower standard drainage system than in the rest of Ballarat; and
   - The Ballarat West area should not be allowed to do less than required to protect the downstream environrnent in terms of stormwater quality or controlling downstream flooding to existing levels.

3. Overall the DCP proposes an efficient combination of works to achieve the required outcomes. I have reviewed the submissions and the key items of drainage infrastructure.

4. The design standard for the drainage pipes in the DCP has been proposed to be for a 10 year ARI peak flow standard and my opinion is that this is an appropriate design standard. Council could adopt a 5 year ARI standard instead to reduce costs by approximately $5M across the area for the DCP; however, this would provide a lower standard of drainage capacity in Ballarat West than is provided in the rest of Ballarat.

5. Mandating rainwater tanks could be done to reduce the size and cost of drainage infrastructure (wetlands and biofilters), although my opinion is that this is likely to lead to a small saving in the cost of the drainage infrastructure in Ballarat West as there would be no difference in the size of drainage pipes or retarding basins and there would be a minor saving in the cost of stormwater treatment works. There are a number of issues that would need to be resolved to determine if rainwater tanks are viable and cost effective, including:
   - If “third pipe”, recycled water is proposed (I understand that this has not yet been decided), then there would be limited if any need for rainwater tank water for outdoor irrigation.

- If “third pipe”, recycled water is provided in sufficient quantity to provide for toilet flushing then it would be of little benefit to also mandate rainwater tanks.
- If there was no “third pipe” recycled water then the scenario of rainwater tanks would still need to be analysed in detail and may not improve the affordability in the area as except for deletion of some biofilters and a minor reduction in wetland excavation there would only be likely to be a saving in drainage infrastructure of $1.3M to $3M and the extra costs to each household for the capital and operating costs of the tanks would be likely to significantly exceed this saving.

6. The cost of the construction of the wetlands / retarding basins is a major component of the cost of the drainage works and I have examined the design and cost estimates for these items and conclude that the costs included for these items are appropriate as detailed in this report.

7. The choice by the City of Ballarat to adopt one DCP contribution rate is reasonable in my opinion. The Ballarat West PSP area is all in one catchment and the size of the DCP area is a sensible size and consistent with the size of Melbourne Water Drainage Schemes and the Armstrong Creek DCPs.

7. STATEMENT

I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Andrew Prout

BE Civil, PDMS, MIE Aust, CPEng

8. QUALIFICATIONS

a. In preparing this document, including all relevant calculation and modelling, Engeny Management Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

b. Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

c. Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

   (i) additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

   (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

d. Engeny does not give any warranty nor accept any liability in relation to the completeness or accuracy of the works, which may be inherently reliant upon the completeness and accuracy of the input data and the agreed scope of works. All limitations of liability shall apply for the benefit of the employees, agents and representatives of Engeny to the same extent that they apply for the benefit of Engeny.

e. This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this report.

f. If any claim or demand is made by any person against Engeny on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the report or information therein, Engeny will rely upon this provision as a defence to any such claim or demand.

g. This report does not provide legal advice. Legal advice can only be provided by a qualified legal practitioner.

APPENDIX A

Andrew Prout CV

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WATER MANAGEMENT

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Andrew Prout

General Manager, VIC

BEng (Civil) PDMS, CPEng, MIE Aust

SUMMARY

Andrew has established Engeny Management in Victoria and is the General Manager for the Melbourne office. Andrew has gained more than 30 years professional experience both in the consulting engineering field and with government and semi-government authorities. Andrew is a leader in the surface water management field, having prepared Melbourne Water's current Drainage Design Guide and having lectured at university level. He has undertaken a number of drainage and flood studies as well as water conservation studies and projects to minimise the overall environmental footprints of projects. This included being project Director for the Werribee Plains Urban Water Conservation Study for the Australian Conservation Foundation. Andrew has undertaken projects for a wide range of clients, including Melbourne Water, Catchment Management Authorities, Water Authorities, VicRoads, VicTrack and many public companies and land owners. He has also done work related to water issues for numerous major projects including Eastlink and other roads, Long Term Containment Facility and various windfarms, quarries and mines. His work has taken projects through all stages from studies to designs and construction.

Andrew has done a significant amount of work for local Councils over the last 20 years. This has included strategic drainage studies, preparation of drainage design guides, expert witness services, preparation of Development Contribution Plans and flood mapping. This work has covered most of the municipalities in Greater Melbourne, as well as a number of rural Victorian Councils, including Ballarat, Geelong, Corangamite, Warrnambool, Moyne, Moira, Bass Coast, Surf Coast and South Gippsland and some Councils in New South Wales and Queensland.

He has spoken at conferences and made a number of professional presentations and been active in debates in the industry on topics such as water conservation, climate change impacts on water systems, urban flooding and catchment management.

Andrew's areas of expertise are:

- Flood mapping and Flood Mitigation
- Flood hazards and impacts on developments

- Coastal flooding and climate change impacts
- Wetlands and Waterways
- Stormwater harvesting and water reuse
- Stormwater management and Water Sensitive Urban Design
- Drainage and stormwater treatment master planning and drainage schemes
- Surface water management for quarries and land fills
- EES and EIS work in relation to surface water, erosion and catchments

Andrew has provided professional advice to a wide variety of clients in a range of forums, including VCAT, Panel Hearings and court proceedings. His work in this area and in regional Victoria is summarised on the following pages.

EXPERIENCE

- **Surface Water Study for Learmonth Saleyards** and abattoir for the City of Ballarat. This work included a flood study, drainage study and design of surface water quality management systems. Andrew's work included an expert report and appearance at a Panel Hearing.
- **City of Monash, Development Contributions Plan**: Andrew prepared the City of Monash's Development Contribution Plan (DCP) for drainage works and worked with Council manager's to obtain approval from the Department of Infrastructure (now DPCD) to the DCP. The DCP meets all of the requirements of the Planning and Environment Act and could provide Council with substantial funds every year towards the cost of drainage improvement works.
- ***Lockerbie Property Kalkallo, Surface Water Master Plan*** – ***Stockland.*** Andrew has been working with Stockland and National Pacific on a significant master planning project for the future urban development of over 1100 hectares in the Kalkallo area. The work involved consultation with the landowners, the Growth Area Authority, Melbourne Water, Council and other consultants. The master planning focussed on the drainage, wetlands and retarding basin components of a Structure Plan for the overall development as well as a creek corridor master plan for Merri Creek.
- **Melbourne Water Drainage Scheme Reviews – Melbourne Water**. Andrew has been project director for a number of drainage scheme reviews for Melbourne Water, including hydrologic modeling, stormwater quality modeling and development and costing for drainage infrastructure for proposed urban areas.
- **Drainage Design Guide – Melbourne Water:** Andrew was personally responsible for reviewing the previous design guides and rewriting them to produce the current Melbourne Water Drainage Design Guide. This guide is the industry standard for drainage throughout the greater Melbourne area.
- **Shire of Moira Drainage Strategy**: Andrew was project manager for a comprehensive drainage strategy for Council that included consideration of drainage patterns and urban pollutant loads and management for towns including Numurkah, Nathalia, Cobram, Katamatite, Katunga and Waaia.
- **City of Knox, City wide drainage strategy**: Andrew was Project Director for this municipality wide study into all aspects of the Council drainage system. The study assessed flooding risks, drain capacities and opportunities for Water Sensitive Design. Outputs included overland flow maps, capital works program and recommended planning scheme amendments and funding scheme.

- ***City of Maribyrnong and City of Moreland Drainage Strategies:*** Responsible for management of these projects which involved preparation of a comprehensive strategy to enable Council to identify drainage problems and prioritise a capital works program to resolve all problems, including flooding and water quality related works. Information was supplied in MapInfo format including maps, reports, calculations and photographs.
- ***Stormwater Drainage Strategies for Councils:*** Andrew developed methodologies and undertook comprehensive municipality wide strategies for a number of councils in greater Melbourne. The strategies included risk based drainage flooding mapping and works programs as well as water sensitive design programs of works, funding advice, design guides and planning advice. Andrew has done studies of this type for many Councils including Darebin, Glen Eira, Manningham, Monash, Whitehorse and Stonnington.
- ***Monash Flood Management Plan – Melbourne Water****.* Andrew was responsible for overseeing this project. The work included workshops, identifying flooding hot spots and developing a detailed action plan for Council, Melbourne Water and VicSES. Andrew brought his decades of experience in the area and working relationships to the project and contributed to a comprehensive plan for managing flood risks in the City of Monash.
- ***Geelong Racecourse stormwater harvesting – Racing Victoria:*** Andrew developed this project with Racing Victoria and was Project Director for the completed study that identified a low cost and viable source of water for the racecourse by harvesting stormwater. Andrew then followed up with the detailed design and implementation of the works that provide over 70ML/annum of water to irrigate the racecourse. Major regional racecourses are important employers and are required for a viable training and racing industry. The Geelong project led to similar studies that Andrew undertook at Ballarat and Bendigo Racecourses.
- **Bandiana Link Road – Water Sensitive Road Drainage Scheme:** Andrew has undertaken work for VicRoads in Wodonga to develop a water sensitive road design system for the Bandiana Link Road and to prepare a cost apportionment scheme to obtain contributions from all benefiting landowners. The results of the study have been used in negotiations with benefitting landowners to offset the value of the works built by VicRoads against the land acquisition compensation.
- **Toora Coastal Flood Risk Report, South Gippsland Shire**. Andrew undertook a site review and prepared an Expert report for the South Gippsland Shire for a VCAT hearing in relation to six proposed dwellings in the Grip Road area in Toora. The report covered issues including local drainage and flooding, coastal flooding, sea level rise, climate change, wastewater disposal and related issues. Andrew gave evidence at VCAT which contributed to a successful outcome for the Shire and a report that has been referenced in various hearings and publications since the hearing.
- **Crowlands Windfarm, Surface Water assessment**: Andrew undertook a detailed surface water assessment of the proposed Crowlands windfarm in the Pyrenees in north western Victoria. His work included a site assessment, input to the windfarm design, assessment of erosion risks, concept design of waterway crossings (including the Wimmera River) and erosion control works and a detailed report.
- **Blackburn Creek rehabilitation, Melbourne Water:** Andrew was Project Director for the design and superintendent for the construction of two stages of waterway rehabilitation works on Blackburn Creek.
- **Surface Water study for Nowingi waste facility EES – Office of Major Projects:** Andrew was project manager for the surface water study for the proposed long term waste facility at Nowingi. Andrew prepared the EES specialist report and an Expert

witness statement and gave evidence to the Panel hearing. The study covered issues including flooding risk, water balance and risk of surface water discharges from the site.

- **Baddaginnie Flood Study – Office of Major Projects:** Andrew was Project Manager for this flood study in central Victoria. The project involved hydrology and hydraulic modelling for four creeks north of Violet Town and south of Baddaginnie. Andrew also undertook significant public consultation, including presentations at public meetings and briefing of Ministerial advisers and his work was central to Government decisions that the site was not appropriate for use for a long term waste facility due to flooding risks.
- **Maribyrnong River Flood Hazard Report, Melbourne Water:** In 2009 Andrew was engaged by Melbourne Water to provide a comprehensive report on flood hazards in the Maribyrnong Township in response to a development application. Andrew prepared a detailed report and also provided expert witness services at a VCAT hearing. The work undertaken by Andrew was influential in a successful outcome for Melbourne Water.
- **Tyers Street, Portland, Drainage Expert Witness Report, multiple parties**: Andrew was engaged by a number of briefing parties to investigate urban flooding in Portland in Victoria and to recommend flood alleviation works to mitigate the flood risk for commercial properties in Portland. This 2010 report recommended a highly efficient, cost effective solution to the existing flooding problem, which was adopted by all parties.
- **Modella Poultry Farm surface water report, landowner:** In 2012 Andrew and his colleague Maria Verrocchi prepared a report related to surface water issues for a proposed poultry farm in Modella in the Koo Wee Rup district. Andrew presented his report at VCAT.
- **Marchington Avenue, Mornington, Flooding Related Expert Witness Report, Melbourne Water**: In 2012 Andrew and his colleague Maria Verrocchi prepared a report related to a proposed residential development adjacent to Tanti Creek in Mornington. The report clearly described the flood hazards related to one of the proposed dwellings in terms of the Land Subject to Inundation and Floodway Overlays. Andrew presented the report at VCAT and Melbourne Water obtained a successful outcome.
- **Dickson and Lyneham wetlands, ACT Government:** Andrew was Project Director for the design, approvals and then construction of two major wetlands in the northern suburbs of Canberra in 2009 and 2010. The wetlands will play a vital role in stormwater treatment and harvesting approximately 400 ML/annum of stormwater for use in open space irrigation. Andrew has overseen the preparation of the Final Sketch Plans, flood study, water treatment and water harvesting modelling and has developed a number of the technical solutions for this project. Andrew has also had a leading role in the agency and public consultation for the projects and the approval process.
- **Surface Water Study for Environmental Effects Statement for Mount Shamrock Quarry Extension:** Andrew completed the surface water EES report and made an Expert Witness statement and presentation to the panel assessing the EES. Andrew's work related to the site water balance, surface water quality, interaction of surface water and groundwater, discharge licensing and flooding risks.
- **Maribyrnong River LSIO rezoning, Keilor, Melbourne Water**: In 2012 Andrew undertook an independent review of a proposed Land Subject to Inundation Overlay for Melbourne Water along the Maribyrnong River in Keilor and Calder Park. Andrew's report assisted Melbourne Water to effectively negotiate all issues with an adjacent landowner.
- **Keysborough Expert Witness Report, landowner**: In 2011/12 Andrew investigated the drainage issues associated with an industrial development in Keysborough South. This work included review of recent developments, Melbourne Water Drainage Scheme,

temporary retarding and stormwater treatment works and the downstream system. Andrew produced a comprehensive report and appeared at hearings at VCAT.

- **Ruffey Creek rehabilitation, Melbourne Water**: Andrew was Project Director for the design and superintendent for the construction of works on Ruffey Creek in Doncaster in 2007/08. The creek was deeply incised and in poor condition. The works included rock work, batter works, planting and an off stream wetland.
- **Southern Hydro - Dollar Wind Farm Expert Witness Report and Presentation**. Andrew was peer reviewer for the civil design study for the Dollar Wind Farm in South Gippsland for Southern Hydro. His report related to surface water management and erosion control for the proposed development of the wind turbine project. Andrew made a presentation and was cross examined at the panel hearing in Foster in 2005.
- **Spindrift Avenue waterway impact report, Landowner**: In 2010 Andrew prepared an expert witness report and assisted a landowner in mediation in relation to development and works on a property in Spindrift Avenue, Flinders.
- **Melbourne Water - Lower Stony Creek VCAT report**. Andrew represented Melbourne Water in relation to filling and realignment of Lower Stony Creek in Tottenham. Andrew's role included briefing of Melbourne Water's barrister on technical issues, preparation of reports and maps and appearances at VCAT hearings.
- **Melbourne Water – Lower Stony Creek Flood Impact Study**. Andrew was project manager for a flood study that analysed the flooding impact of recent fill and creek alignment works on Stony Creek in Tottenham.
- **Melbourne Water – Lower Stony Creek Waterway Design**. To mitigate the effects of recent filling and realignment of the creek a design was prepared to reduce the flooding impact, stabilise the creek, improve the creek environment and to allow for access across the creek.
- **City of Boroondara – Yarra River Flood Risk report.** Andrew investigated the flooding risks associated with a property in Coppin Grove, Hawthorn. The property is adjacent to the Yarra River and the owner had made an application to Council for a Planning Permit for dwellings on the high part of the site. Andrew prepared a flood risk report in accordance with the Planning and Environment Act to assist Council in deciding on the limit of residential development, the location of a path and the extent of Council's Public Acquisition Overlay.
- **Jacksons Creek – Flood Risk Report.** In 2002 Andrew prepared a flood risk report in relation to a proposed supermarket adjacent to Jacksons Creek in Gisborne. The report was prepared for the owner of a nearby supermarket as part of their submission to VCAT.
- **Wensleydale Coal Mine, Winchelsea, Victoria:** The project involved risk assessment and design of stabilisation works for this disused mine in south-west Victoria. Severe erosion of the creek through the site occurred following a flood in 1995. Andrew developed a site management plan and detailed design of major stabilisation works.
- **Waterway Condition Assessment – Melbourne Water:** Manager of waterway condition assessment studies for the Bunyip River, Tarago River, King Parrot Creek and Woori Yallock Creek catchments.
- **Dromana Flood Study:** Andrew was project director for this project for the Mornington Peninsula Shire in Victoria. The flood mapping was done with the 2D flood model TUFLOW. Scenarios modelled included a range of storms as well as potential climate change scenarios considering sea level rise and increases in rainfall intensity. Andrew provided a report and policy advice on the implications of the study results.

- **Gunbower Forest Watering, Goulburn Broken CMA and Goulburn Murray Water**: Andrew undertook technical and peer reviews for the design of the water diversion scheme to provide additional environmental water for the Gunbower Forest.
- **Racecourse Lake / Murray Valley Highway irrigation channel technical review, Goulburn Murray Water**: Andrew oversaw hydraulic analysis and recommendations to improve channel capacity without impacting on flooding patterns for this irrigation system between Kerang and Swan Hill.
- **Lake Mokoan alternative water supply, Goulburn Murray Water**: Andrew undertook technical reviews of proposed channel and pipe works to provide irrigation water to customers following the decommissioning of Lake Mokoan near Benalla.
- **Merri River and Russell Creek flood studies, Warrnambool, Glenelg Hopkins CMA and Shire of Warrnambool**: Andrew was project manager for this flood study and undertook hydrologic modeling and hydraulic modeling, as well as producing the flood study report and recommendations.
- **Moyne River Flood Study, Port Fairy; Glenelg Hopkins CMA and Shire of Moyne**: Andrew was project manager for this flood study and undertook hydrologic modeling and hydraulic modeling, as well as producing the flood study report and recommendations.
- **Hattah Lakes environmental watering, Mallee CMA**: Andrew developed concepts for water diversions for Hattah Lakes including channel works and regulating structures to provide environmental watering that would closely replicate flow patterns prior to regulation of flows in the Murray River catchment.
- **Environmental Effects Statements:** Manager of hydrology and water quality sections of a number of Environmental Effects Statements, including Mount Stirling, Apollo Bay Sewage Treatment Plant and Scoresby Transport Corridor.

Education

- Bachelor of Engineering (Civil), Swinburne Institute of Technology, 1984
- Postgraduate Diploma in Management Studies, Melbourne University, 1992

Registrations/Affiliations

- Member, Institution of Engineers, Australia.
- Member, College of Civil Engineers, I.E. Aust.
- Chartered Professional Engineer

Professional History

- Engeny, General Manager Victoria, 2010 - Present
- URS Australia Pty Ltd, Principal Water Surface Engineer, 2003-2010
- GHD Pty Ltd, Business Development Manager, Waterways and Water Resources, July 2002-2003
- Egis Consulting Australia Southern Region, Manager - Water Resources, 2001-2002
- Hyder Consulting, Principal Engineer, 1997-2001

- Sinclair Knight Merz, Senior Project Manager, 1994-1996
- AGP Consulting, Consulting Engineer, 1992-1994
- Swinburne University, Part-time Lecturer, 1993-1994, 1999-2001
- Dandenong Valley & Western Port Authority, Works Program Engineer, 1990-1992
- Dandenong Valley Authority, Planning and Investigation Engineer, 1986-1989
- Port of Melbourne Authority, Planning Engineer, 1984-1986
- Dandenong Valley Authority, 1982-1984

APPENDIX B

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8.	Ballarat West DCP (Version 3.2) – Urban Enterprise	June 2012
9.	Submissions (pre December 2012) ▪ Australand ▪ Neil and Vicki Dodgshun ▪ Ross Closter (Carngham Road) ▪ TGM (Precinct 4 working group) ▪ John Barnes ▪ Dreyer Pty Ltd ▪ G&N Closter Pty Ltd ▪ Urban Land Developments ▪ Leo Hayes (9 Yarra Gum Place, Mt Clear) ▪ Stockdale & Leggo, Daylesford (per D Wynack) ▪ Joanne Tiburcy (13 Fay Drive, Smythes Creek) ▪ Ulrich Tiburcy (13 Fay Drive, Smythes Creek) ▪ Integra (Lucas Estate) ▪ Charles and Rita Armeni (50 Rosscreek Road, Bonshaw)	May- December 2012

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	▪ Ballarat Basketball (Peter Eddy) ▪ Ballarat Basketball Association (Mark Valentine) ▪ Ballarat Community Health (Robyn Reeves) ▪ Bill Byrne (4 Wendouree Parade) ▪ John Cicero (Kaufmann Property Consultants) ▪ ERM (per Debra Butcher) - for Lascorp Development Group Pty Ltd – owners of land on the south-west corner of the Glenelg Hwy and Cherry Flat Road ▪ WM Flynn Pty Ltd (15 College St, Wendouree) ▪ B Hayward 87 [**indistinct*] Road, Bonshaw ▪ Neil Jens (PRD Nationwide Ballarat) ▪ Paul McCuskey (Macneil Group) ▪ D&J Ringin (17 Fay Drive, Smythes Creek)	
10.	Submissions (December 2012)	December 2012
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18.	Ballarat West Precinct Structure Plan (Final June 2012)	June 2012
19.	Native Vegetation Precinct Plan – sub-precincts 1,2 and 4 (SMEC)	8 March 2012
Supporting Reports		
20.	▪ Open Space and Community Facilities Infrastructure ▪ Infrastructure Needs Assessment (CPG)	June 2012 Jan 2010
21.	Prowse (Revised cost plans - several)	19 January 2012
22.	Costs sheets (Roads)	undated
23.	Cost sheets (Intersections)	undated
24.	Costs sheets (Drainage)	undated

25.	Costs sheets (Adjustments)	undated
26.	PSP Drainage Report (Engeny) V1100_075	27 Feb 2012
27.	Transport and road infrastructure report (SMEC)	20 Dec 2011
28.	Economics (Macro Plan) (refer to Council webpage via link below)	Nov 2010
Standardised Development Contributions Advisory Committee		
29.	Review of Local Infrastructure Charges for Regional and Rural Councils	June 2012
30.	Issues Paper – A New Victorian Development Contributions System	July 2012
31.	Terms of Reference	Sep 2012
Other documents		
32.	Planning Panels Victoria Guidelines for Expert Witness Statements	
33.	Developer Contributions Guidelines (v5.9)	March 2007
34.	Ministerial Direction – Development Contributions Plans	15 May 2003

Documents available from Council's website, not provided in the Council brief:
http://www.ballarat.vic.gov.au/building-and-planning/strategic-planning/ballarat-west-main-page/ballarat-west-psp.aspx

Yours faithfully

Terry Montebello
Partner

enc

APPENDIX C

Clause 56.07

56.07 INTEGRATED WATER MANAGEMENT

09/10/2006
VC42

56.07-1 Drinking water supply objectives

09/10/2006
VC42

To reduce the use of drinking water.

To provide an adequate, cost-effective supply of drinking water.

Standard C22

The supply of drinking water must be:

- Designed and constructed in accordance with the requirements and to the satisfaction of the relevant water authority.
- Provided to the boundary of all lots in the subdivision to the satisfaction of the relevant water authority.

56.07-2 Reused and recycled water objective

09/10/2006
VC42

To provide for the substitution of drinking water for non-drinking purposes with reused and recycled water.

Standard C23

Reused and recycled water supply systems must be:

- Designed, constructed and managed in accordance with the requirements and to the satisfaction of the relevant water authority, Environment Protection Authority and Department of Human Services.
- Provided to the boundary of all lots in the subdivision where required by the relevant water authority.

56.07-3 Waste water management objective

09/10/2006
VC42

To provide a waste water system that is adequate for the maintenance of public health and the management of effluent in an environmentally friendly manner.

Standard C24

Waste water systems must be:

- Designed, constructed and managed in accordance with the requirements and to the satisfaction of the relevant water authority and the Environment Protection Authority.
- Consistent with any relevant approved domestic waste water management plan.

Reticulated waste water systems must be provided to the boundary of all lots in the subdivision where required by the relevant water authority.

56.07-4 Urban run-off management objectives

09/10/2006
VC42

To minimise damage to properties and inconvenience to residents from urban run-off.

To ensure that the street operates adequately during major storm events and provides for public safety.

To minimise increases in stormwater run-off and protect the environmental values and physical characteristics of receiving waters from degradation by urban run-off.

Standard C25

The urban stormwater management system must be:

- Designed and managed in accordance with the requirements and to the satisfaction of the relevant drainage authority.
- Designed and managed in accordance with the requirements and to the satisfaction of the water authority where reuse of urban run-off is proposed.
- Designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999) as amended.
- Designed to ensure that flows downstream of the subdivision site are restricted to pre-development levels unless increased flows are approved by the relevant drainage authority and there are no detrimental downstream impacts.

The stormwater management system should be integrated with the overall development plan including the street and public open space networks and landscape design.

For all storm events up to and including the 20% Average Exceedence Probability (AEP) standard:

- Stormwater flows should be contained within the drainage system to the requirements of the relevant authority.
- Ponding on roads should not occur for longer than 1 hour after the cessation of rainfall.

For storm events greater than 20% AEP and up to and including 1% AEP standard:

- Provision must be made for the safe and effective passage of stormwater flows.
- All new lots should be free from inundation or to a lesser standard of flood protection where agreed by the relevant floodplain management authority.
- Ensure that streets, footpaths and cycle paths that are subject to flooding meet the safety criteria $d_a V_{ave} < 0.35$ m^2/s (where, d_a = average depth in metres and V_{ave} = average velocity in metres per second).

The design of the local drainage network should:

- Ensure run-off is retarded to a standard required by the responsible drainage authority.
- Ensure every lot is provided with drainage to a standard acceptable to the relevant drainage authority. Wherever possible, run-off should be directed to the front of the lot and discharged into the street drainage system or legal point of discharge.
- Ensure that inlet and outlet structures take into account the effects of obstructions and debris build up. Any surcharge drainage pit should discharge into an overland flow in a safe and predetermined manner.

- Include water sensitive urban design features to manage run-off in streets and public open space. Where such features are provided, an application must describe maintenance responsibilities, requirements and costs.

Any flood mitigation works must be designed and constructed in accordance with the requirements of the relevant floodplain management authority.

APPENDIX D

Catchment Plan

N
W E
S

Legend

- Waterways
- Hydrologic Modelling Catchments
- Precincts 1, 2 and 4
- Parcel Boundaries
- Creek Flow Direction

Lake Wendouree

Sturt Street

Precinct 4

Precinct 2

Precinct 1

Wiltshire Street

Glenelg Highway

KENSINGTON CREEK

BONSHAW CREEK

Skipton Street

WINTER CREEK

WINTER CREEK

WINTER CREEK

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ENGENY WATER MANAGEMENT

CITY OF BALLARAT

0 0.8 1.6

Scale in Meters (1:40,000 @ A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994. (GDA94)
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Ballarat West DCP

Appendix D

Winter Creek Catchment

Job Number: V2000_051
Revision: 0
Drawn: TK
Checked: AP
Date: 12 June 2013