

MORWELL NORTH-WEST DCP DRAINAGE - WR04

DRAINAGE REVIEW

26 July 2017

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EXECUTIVE SUMMARY

The work in this report provides definition to the concept contained within the Morwell North-West Development Contributions Plan (“DCP”) for the northern internal catchment and proposed combined retarding basin/wetland system (WR04).

This will allow the Latrobe City Council to –

1. Have an independent assessment of hydraulic flows for the area of the DCP
2. Be able to identify 1 in 100 year flood levels required in the reserve to cater for required storage volume.
3. Be able to show and define the connected elements of the WR04 basin –
 - a. Inlet Structure
 - b. Main Storage – weir, batters, floors
 - c. Main wetlands within the Main Storage (WR-04)
 - d. Outlet Structure
 - e. Sedimentation basin and designated drying area for maintenance purposes.
4. Have updated information about sizing of Wetland/Retarding basin WR-04
5. Have technical information for the WR04 basin that shows –
 - a. Storage levels including Normal Water level and Freeboard.
 - b. Sedimentation Basin sizing
 - c. Wetland Sizing
 - d. Sediment Drying area requirements
 - e. Functional information for later detailed design and construction
6. For roads –
 - a. Enable road levels to be determined around the Basin Storage
 - b. Enable decisions to be made on the use of minor retaining walls around the edges of the Basin Storage at road reserve interfaces
7. Enable strategy to be put in place for dealing with developers as to –
 - a. How detailed design is to be undertaken in a coordinated way
 - b. How construction is to be undertaken in a coordinated way
8. Improve the basis for costing of DCP items and Council works

The main points arising from the drainage review for design are –

1. The Functional Design has defined the required extent and levels for the extent of the main retarding basin storage within this catchment.
2. The extent of required basin storage is larger than the available space as provided on the development plan layout. This requires adjustment to the development plan layout.
3. Definition of levels has been achieved for the 1 in 100 year rainfall event passing through this catchment, enabling Council to control the level requirements for future development adjacent to the WR04 basin/wetland.
4. The volume of the Basin Storage that is required is 6,310m³ for a 1 in 100 year storm. This Main Storage maintains pre-development flows by retarding (storing) outflows during the peak runoff period, thereby mitigating potential flooding.
5. The WR04 basin and WSUD assets takes up all of the available space set aside as reserve area (0.9232ha) in the DCP and requires additional land take from 2 northern parcels of land. The developable area encroached by the additional basin area totals 0.3427ha in area.
6. The main wetland has to be within the Main Storage and will be inundated by high flows.
7. Development flows will be captured as part of a traditional pit and pipe network within the road reserve and conveyed to the WR04 basin.
8. Preliminary treatment is proposed in the form of a Sedimentation Basin. The surface area that is required is 1,050m.
9. A weir and outfall pipe (675mm dia) has to be located in the embankment at the north end of the Basin Storage.
10. DCP Pits and Pipes have been allowed for between the Basin Outlet and Jason St. Pipes will follow the proposed road network.
11. Apart from the weir, inlet & outlet structures and pipe outfall, no other additional drainage infrastructure has been allowed for as compared to the DCP.

To enable this review to take place, PGA undertook field survey and civil engineering design, collaborating with Water Technology for hydrologic modelling of the waterway as it currently exists.

Arising from the water quality modelling, changes from the CPG calculated areas to the Water Technology calculated areas are shown in Table 1.

Table 1

| ELEMENT | STORAGE | | WATER QUALITY (treatment area) | |
|---------|---------------------|---------------------|---|---------------------|
| | W-T | CPG | W-T | CPG |
| WR-04 | 6,310m ³ | 5,400m ³ | Wetland - 5,200m ² Sed. Basin – 1,050m ² | 3,200m ² |

Other points arising from this work are –

1. There is a consequent change to the Net Developable Area.
2. The estimated costs of the construction differ from those presented in the DCP.
3. There is a need to identify strategy towards construction of the drainage works –
 - a. For coordination and logistics; and
 - b. Because the works are located on private land.

REPORT ON FINDINGS

1. INTRODUCTION

The Morwell North West Development Contributions Plan (“DCP”) covers an area between Latrobe Road and Maryvale Road as shown in **Appendix 1**. This includes a main drainage corridor which was part of a previous drainage study completed by PGA and Water Technology in 2016.

The focus of this design project is for the northern internal catchment and proposed combined retarding basin/wetland system (WR04) including the extent of drainage infrastructure that is required to manage drainage flows for a 1 in 100 year rainfall event. This will enable Council to control required levels of roads and lots within the catchment.

Following a route survey of the proposed reserve set aside for basin WR04 for modelling purposes, initial concepts were able to be modelled and then finalised into the attached Functional Plans. In this work, PGA collaborated with Water Technology who carried out the specialised hydrologic modelling (refer to separate Water Technology report).

Section 2 provides comment on particular aspects of the Functional Layout Plans.

Section 3 identifies changes that are consequential for calculation of the Net Developable Area on which distribution of costs is based.

Section 4 identifies the costs of the drainage infrastructure identified in this report for updating of the DCP cost schedule.

2. FUNCTIONAL DESIGN

2.1. General

In the set of Functional Layout Plans –

- Plan views identify the spatial extent of the required retarding basin works; and notes on those works. In this respect separate linework is shown for –
 - The outline base features of channels and retarding basin on top of existing features and contours.
 - The extent of the water surface for the 1 in 100 year event.
 - The extent of the freeboard at 0.3m above the 1 in 100 year water surface.
 - The extent of temporary cut or fill batters to match the existing land surfaces from the freeboard line.
 - The proposed road reserves boundaries contained in the DCP.
- Cross-sections at various points are a vertical representation of Storage & Sedimentation basins, wetland and similarly identify –
 - Floors for the storage basin, sedimentation basin and drying area and future wetland;
 - Flood level for the 1 in 100 year event;
 - Level of freeboard 0.3m above the level of the 1 in 100 year event.
 - Existing land surface levels.
 - Permanent batters at the edges of channels and the retarding basin at 1 in 5 up to the freeboard line. This slope is suitable for mowing purposes.
 - How temporary batters extend upwards at 1 in 5 from the freeboard line. These batters are to be adjusted later for road and verge design.

Council will reference the levels for the water surface at the 1 in 100 year rainfall event for development control purposes.

2.2. Catchment Analysis

The initial strategy for the northern internal catchment proposed that the entire study area was to drain towards the proposed WR04 retarding basin. A review of the site area survey suggests that due to a ridge line within the overall catchment the area to the north known as the Upper Catchment would require significant filling in order to grade drainage infrastructure and road network back to the WR04 retarding basin.

Refer **Appendix 2** for plan showing catchment contributing to study site WR04 and the Upper catchment which will drain to the north. For purpose of this study into WR04 the upper catchment has been detached, high level modelling has been undertaken by Water Technology for the upper catchment. An approximate attenuation flood storage volume has been outlined in the drainage report to assist council with the future DCP for this area.

2.3. WR04 Retarding Basin

The original concept proposed to set aside different areas within the study area for stormwater treatment and attenuation. Discussions with Latrobe City Council determined that this was not preferred as the DCP had a single drainage reserve set aside.

Refer **Appendix 3** for functional control plans to be read in conjunction with the following section of the report.

The outcomes from the flood modelling recommend an attenuation flood storage volume of 6,310 cubic metres. Comments on this section are –

- The area required for retarding basin storage exceeds the available space provided on the development layout plan.
- Land constraints on the south side of the drainage reserve parcel mean that the additional area required is to be taken from developable land parcels on the northern side.
- The retarding basin dimensions are - basin floor area of 8506m², a basin depth of 0.7m will provide the required storage volume with 300mm freeboard provided above the normal water level.
- Side batters are 1 in 6 up to the proposed 100 year flood level. Batters have been shown on the plans to extend up in a temporary batter of 1 in 5 to match the existing ground surface. Final levels and shape will occur following detailed design of surrounding roads at a future time by others.
- The 100 year flood level is contained within the proposed drainage reserve, acceptable freeboard will need to be provided within the road reserve & to the future allotments.
- Latrobe City Council requires a 2.5m setback from the road reserve to the retarding basin which has been incorporated.

The WR04 retarding basin at its downstream end will have –

- An embankment through which a low flow pipe outlet is required, comprising a 675mm diameter reinforced concrete pipes and accompanying endwall structures.
- A concrete weir (20m width) above the embankment to allow for any flows higher than the 1 in 100 year rainfall event to pass over the embankment. Detailed design must include scour protection.

The outcomes from the water quality analysis recommend preliminary treatment are provided in the form of a sediment basin and tertiary treatment by a wetland system. Comments on this section are –

- The sediment basin is to be located directly downstream of the minor storm event inlet to the drainage reserve.
- An area of 960m² is required based on permanent pool depth of 1.1m and extended detention depth of 0.5m (overall depth of sedimentation basin is 1.6m)
- To achieve best practice treatment performance indicators a wetland surface area of 5,200m² is required for the study area catchment.
- The wetland may include siltation ponds and deeper ponds as well as shallow treatment areas.
- All of the sediment basin and wetland will be inundated by flood flows.
- An area of 2,000m² has been set aside in the drainage reserve for sediment drying during periodic clean outs.

2.4. Outfall

Pits and Pipes have been allowed for between the Basin Outlet and Jason St to outfall flows from the study site. Pipes will follow the proposed road network as indicated on the functional control plans.

3. CHANGE TO NET DEVELOPMENT AREA

Alteration is required to the value of Net Developable Area (“NDA”) on which the DCP apportionment to owners is based. This is due to –

- The need to increase the drainage reserve area available for WR04 attenuation storage and treatment systems.

These adjustments are as follows –

- Drainage Reserve area set aside as per DCP base is 0.9232ha
- Drainage Reserve area required for WR04 retarding basin and water quality treatment systems is 1.2659ha
- Therefore the additional Drainage Reserve area required is 0.3427ha.
- The extended drainage reserve to the north encroaches on two properties. The area breakdown is:
 - 0.1730ha (Western property next to Jason St)
 - 0.1697ha (Eastern property)

4. ESTIMATED COSTS

Table 2 identifies the items for incorporation in the DCP spreadsheet as a result of the functional design. These are current estimates except for the main retarding basin WR-04 where the 2013 rates have been used for storage and treatment areas. The current adjusted 2016 rate for this item should be adopted.

TABLE 2

| DR | Drainage | | Quantity | Unit | Rate | Cost |
|-------|-------------------------|-------------------------------------|----------|------|---------|--------------|
| WR_04 | East of Jason Street | Treatment area approx. 0.52ha | 5200 | sqm | \$93 | \$483,600.00 |
| | | Retardation storage approx. 6600cbm | 6600 | cbm | \$47 | \$310,200.00 |
| | Pipes (675mm dia. RCP) | Inlet & Outlet to WR04 | 297 | lm | \$625 | \$185,625.00 |
| | Pits (900x600mm) | | 7 | No. | \$2,000 | \$14,000.00 |
| | Headwalls (incl. Apron) | @ Inlets and Outlets | 3 | No. | \$9,500 | \$28,500.00 |

5. CONCLUSIONS

The Functional Plans developed by PGA in conjunction with modelling carried out by Water Technology provide the basis for Latrobe City Council to confidently assess and control development activities in a coordinated way within the northern internal catchment of the Morwell North Development Plan area.

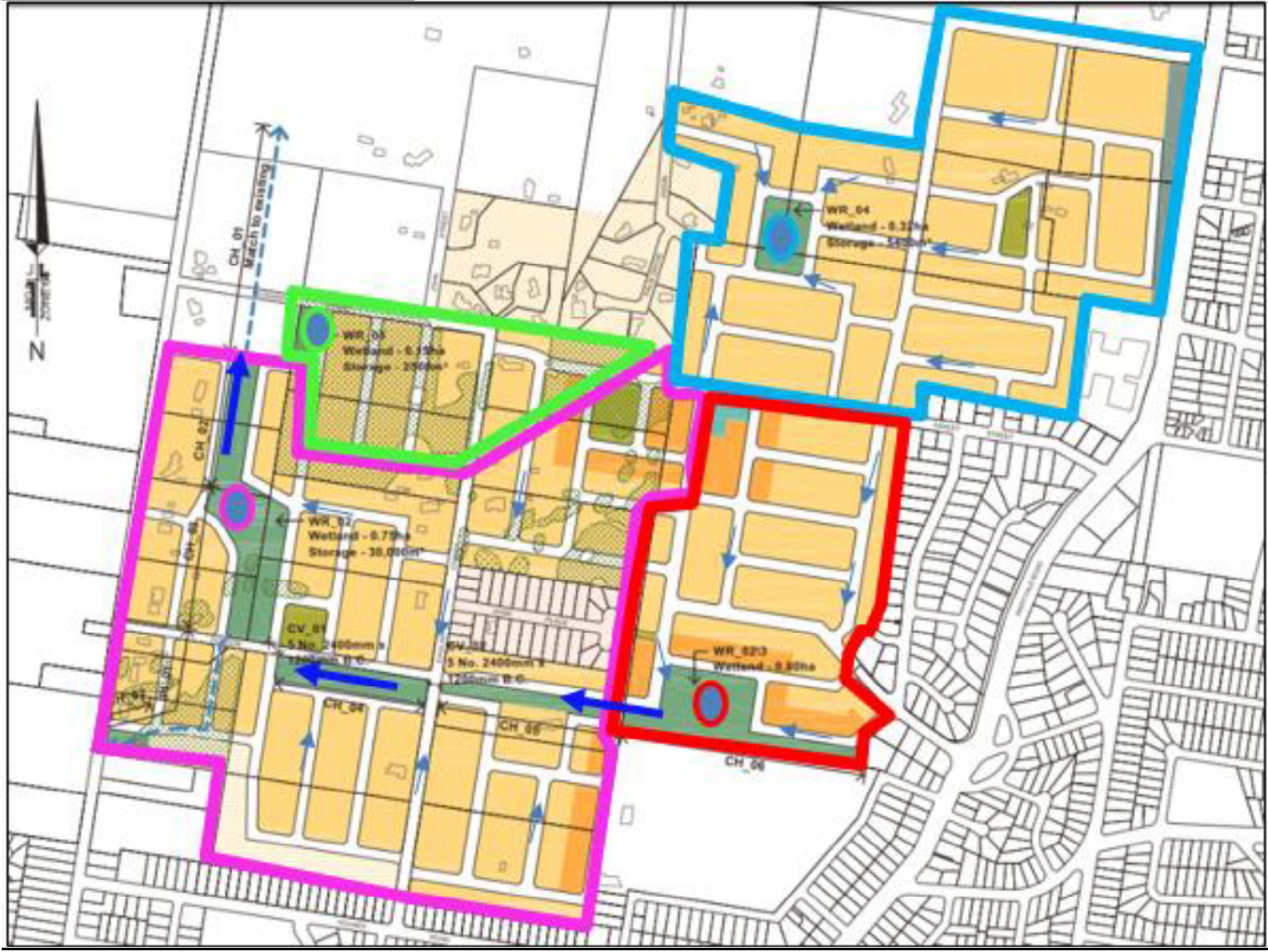
The Drainage Strategy outlined in the drainage report prepared by Water Technology and the Functional Control Plans prepared by Paroissien Grant & Associates need to be maintained and coordinated through the detailed designs developed by others for individual developments or for final design of drainage facilities necessary for the DCP area.

Changes to costs and Net Developable areas will need to be made to the DCP schedules as identified.

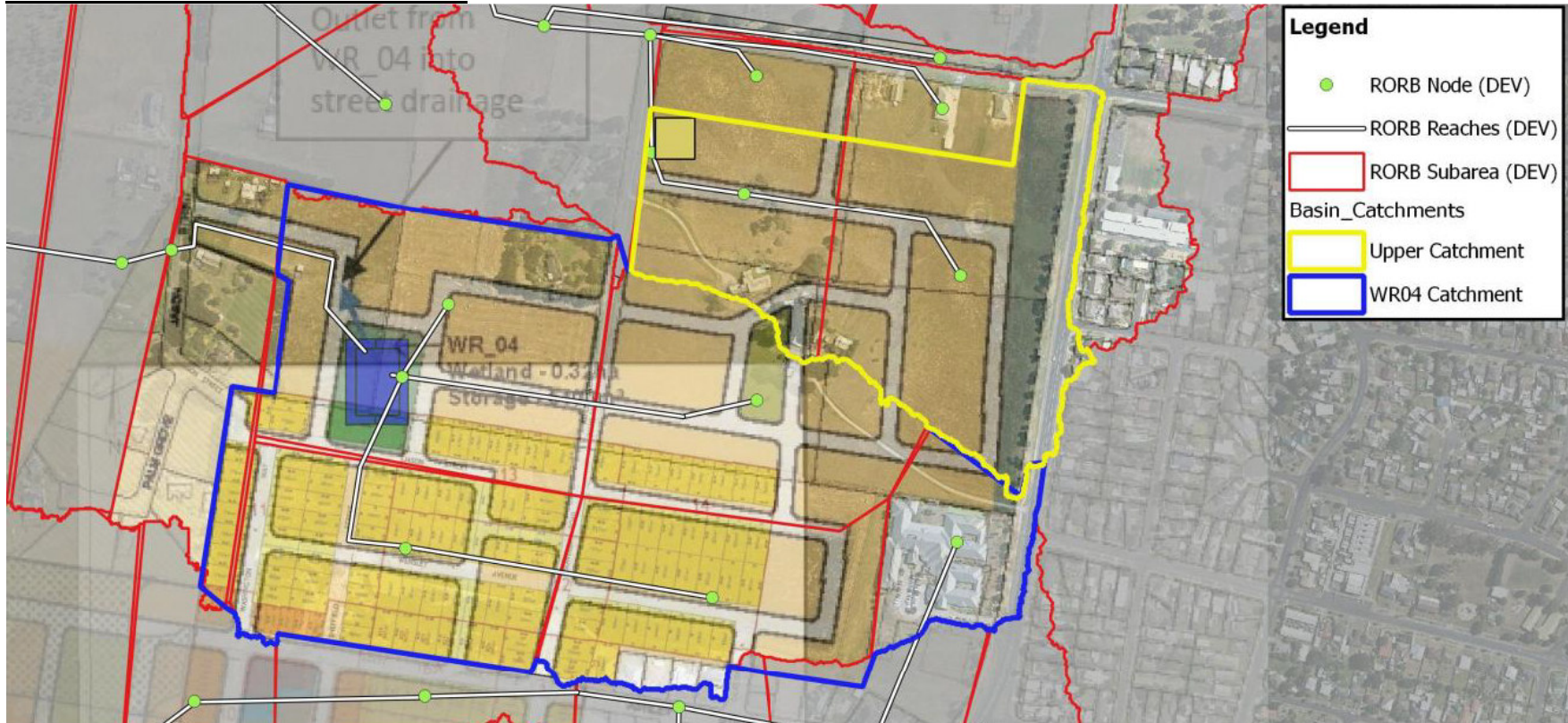


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APPENDIX 1 – SITE CONTEXT PLAN



APPENDIX 2 – CATCHMENT ANALYSIS





APPENDIX 3 – FUNCTIONAL DESIGN PLANS

Refer to the drawing set.