ATTACHMENT TO AGENDA ITEM

Ordinary Meeting

17 May 2016

Agenda Item 9.2 **Endorsement of the Congupna Urban Drainage Strategy, March 2016**

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Greater Shepparton City Council

Congupna Urban Drainage Strategy

Investigations & Options

March 2016

Report

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Executive Summary

The objective of a drainage strategy is to manage the natural storm events in such a way as to reduce the risk of harm to people and property. A clever strategy will employ a variety of complementary solutions. These can include traditional ones such as large underground pipes and less traditional ones such as using overland flow paths, stormwater retention systems and land use controls.

Greater Shepparton City Council has developed a number of site specific and municipal wide drainage strategies after extensive consultation with local communities to set the vision of providing and enhancing sustainable infrastructure, by developing a drainage system that minimises risk to the natural and built environment and maximises use of water as a renewable resource within the constraints of the catchment management responsibilities.

Following the flooding event in early March 2012, which was considered to be around a 1% (1 in 100 years ARI) storm event, Council undertook a drainage catchment analysis to determine possible drainage upgrades for immediate and future implementation for the township of Congupna.

In consultation with the Catchment Management Authority, a detailed drainage catchment study was undertaken to determine natural flow paths and rural drainage flows which impact upon Congupna's urban drainage system. This study was vital to ensure that any upgrades to the existing Congupna drainage system cause no adverse flooding to landowners upstream or downstream of the township of Congupna.

Council initially indicated its intention to upgrade the council drainage infrastructure that currently outfalls into Goulburn Murray Water drain 1/5/11. After reviewing the collected field data, Council proposed alternate concept drainage options for the two catchments areas within Congupna. This alternate proposal would see the existing gravity outlet from both catchments abandoned with new retardation basins constructed to the east and to the west of Congupna. The proposed western basin drainage discharge would be pumped into the Goulburn Murray Water drain 5/11, whereas the drainage discharge from the proposed eastern basin would be pumped into Goulburn Murray Water drain 1/5/11, upstream of the existing drainage outfall.

The proposed Congupna drainage design was required to meet the current objectives of Council's Infrastructure Design Manual (IDM) and to achieve these objectives without detriment to the: -

- environment,
- surface and subsurface water quality,
- groundwater infiltration characteristics,
- adjoining landowners and landowners in the vicinity of the drainage outlet, and
- watercourses, either upstream or downstream of the subdivision.

The design has encompassed the following requirements to: -

- avoid the capacity of the existing drainage Infrastructure being exceeded and peak discharge rate of stormwater runoff beyond the levels which the Infrastructure was originally designed to accommodate,
- protect the public from injury or death, and reduce flood damage to property and Infrastructure, by storing excess runoff during extreme rainfall events and releasing the stored water over time in a controlled manner,
- collect and control all stormwater generated to ensure that it is discharged from the site without detriment to any upstream or downstream property,
- incorporate water quality treatment based on Water Sensitive Urban Design principles into retardation basin design, and
- ensure that all stormwater discharged to natural watercourses and other drainage authority's drains meet the requirements of the Environment Protection Act 1970 and the water quality performance objectives for individual drainage catchments as provided in the State Environment Protection Policies (SEPP's).

The Congupna Urban Drainage Strategy presents the proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment, satisfying the stormwater management plan obligations for the site. The proposed approach minimises the stormwater infrastructure to be maintained and renewed by Council while providing Congupna with an appropriate level of drainage and stormwater detention and treatment in accordance with the Council requirements.

Council has demonstrated that the preferred proposed alternative drainage design has the ability to: -

- preserve existing valuable elements of the stormwater system, such as natural channels, wetlands and stream-side vegetation,
- limit changes to the quantity and quality of stormwater at or near the source, and
- use structural measures, such as treatment techniques and a retardation basin, to improve water quality and control streamflow discharges.

Contents

Table Index

Figure Index

Appendices

1. Introduction

This Drainage Strategy for the Congupna Township has been developed to enhance knowledge about the performance of Council's drainage infrastructure network and flood vulnerable areas. This knowledge is essential to establish flood mitigation works, planning controls, community awareness and an understanding of climate change impacts.

Flooding is a natural phenomenon. In urban areas where drainage relies on pipe networks, open channels and creeks, flooding can cause infrastructure damage (both private and public), loss of amenity, environmental degradation and pose safety risks.

The objective of a drainage strategy is to manage the natural storm events in such a way as to reduce the risk of harm to people and property. A clever strategy will employ a variety of complementary solutions. These can include traditional ones such as large underground pipes and less traditional ones such as using overland flow paths, stormwater retention systems and land use controls.

With improved knowledge of the drainage systems and of flooding events, the Council and individuals will gain greater certainty which can lead to enhanced community confidence and reduced economic loss through the implementation of flood mitigation, planning control and emergency action plans.

Climate change has raised the need to act expeditiously to plan and to achieve knowledge of the performance of Council's drainage infrastructure network and flood vulnerable areas. This knowledge is essential to establish flood alleviating works, planning controls and community understanding.

The integration of a drainage strategy with flood mitigation provides the collective steps required to gain the knowledge and achieve outcomes to support sustainable living within Congupna.

2. Existing Overview

2.1 Congupna Township

Congupna is a rural village and district on the Goulburn Valley Highway in central north Victoria, 10 km north-east of Shepparton. It is thought that the name was derived from an Aboriginal word describing a large fish, probably perch.

Settlement on farm selections began at Congupna during the early 1870s. A school was opened in 1877 and a Methodist church was opened in 1880. In 1881 the railway line was opened from Shepparton to Numurkah, and the Congupna Road railway station resulted in an alternative centre of settlement.

In 1910 the Shepparton Irrigation Trust was formed and five years later the East Goulburn irrigation channel reached Congupna. Improved farm water supply made Congupna attractive for subdivided dairy holdings and there was considerable closer settlement in the mid-1920s. A general store was opened near the station in 1920s and local cricket and tennis clubs were formed at about the same time. During 1956 to 1959 a memorial park and hall were established.

Currently Congupna has a general store, a post office, an automotive garage, a sports reserve, a public hall, a caravan park and a school (66 pupils, 2014). Floodwaters surrounded the sandbagged general store following heavy rain in north-eastern Victoria in 2012.

Congupna's population is currently at 628, based on the 2011 census.

2.2 Drainage within the Congupna Urban Area

Council has identified two drainage catchment areas relevant to the Congupna Urban Area, each contributing to a separate drainage outfall.

2.2.1 Drainage Catchment 1

2.2.1.1. Catchment Areas (Catchment 1)

Drainage Catchment 1 is comprised of four sub catchments, having a combined total catchment area of 13.64ha: -

- Sub Catchment '1A', which is stage 1 of the Congupna Village subdivision, is approximately 6.10ha in area;
- Sub Catchment '1B', being the rural road reserve of Old Grahamvale Road, is approximately 2.24ha in area;
- Sub Catchment '1C', which is the Congupna Township, is approximately 3.29ha in area; and
- Sub Catchment '1D', consists of the Congupna Primary School is approximately 2.01ha in area.

FIGURE 1
LOCALITY PLAN

2.2.1.2. Existing Drainage Network (Catchment 1)

Rural and urban drainage travels north along Old Grahamvale Road via Council table drains into Congupna.

At Wallace Street, drainage from Congupna Village subdivision - stage 1 (Sub Catchment '1A') enters the Council table drain via a 225mm diameter control structure. Congupna Village subdivision was designed to retard local rainfall runoff within wide swales along the front of the properties.

At the Katamatite – Shepparton Road the drainage from Sub Catchments '1A' and '1B' crosses the road via a 225/375mm diameter drainage culvert. Council have deemed the existing road culvert to be under capacity.

After crossing the Katamatite – Shepparton Road the drainage pipeline turns east and follows the north side of Katamatite – Shepparton Road until it reaches a junction pit at the eastern boundary of Incitec Pivot. This junction pit receives drainage from Sub Catchments '1A', '1B', '1C' and '1D'.

The drainage pipeline then turns north at the junction pit and enters the Incitec Pivot property (leased VicTrack land).

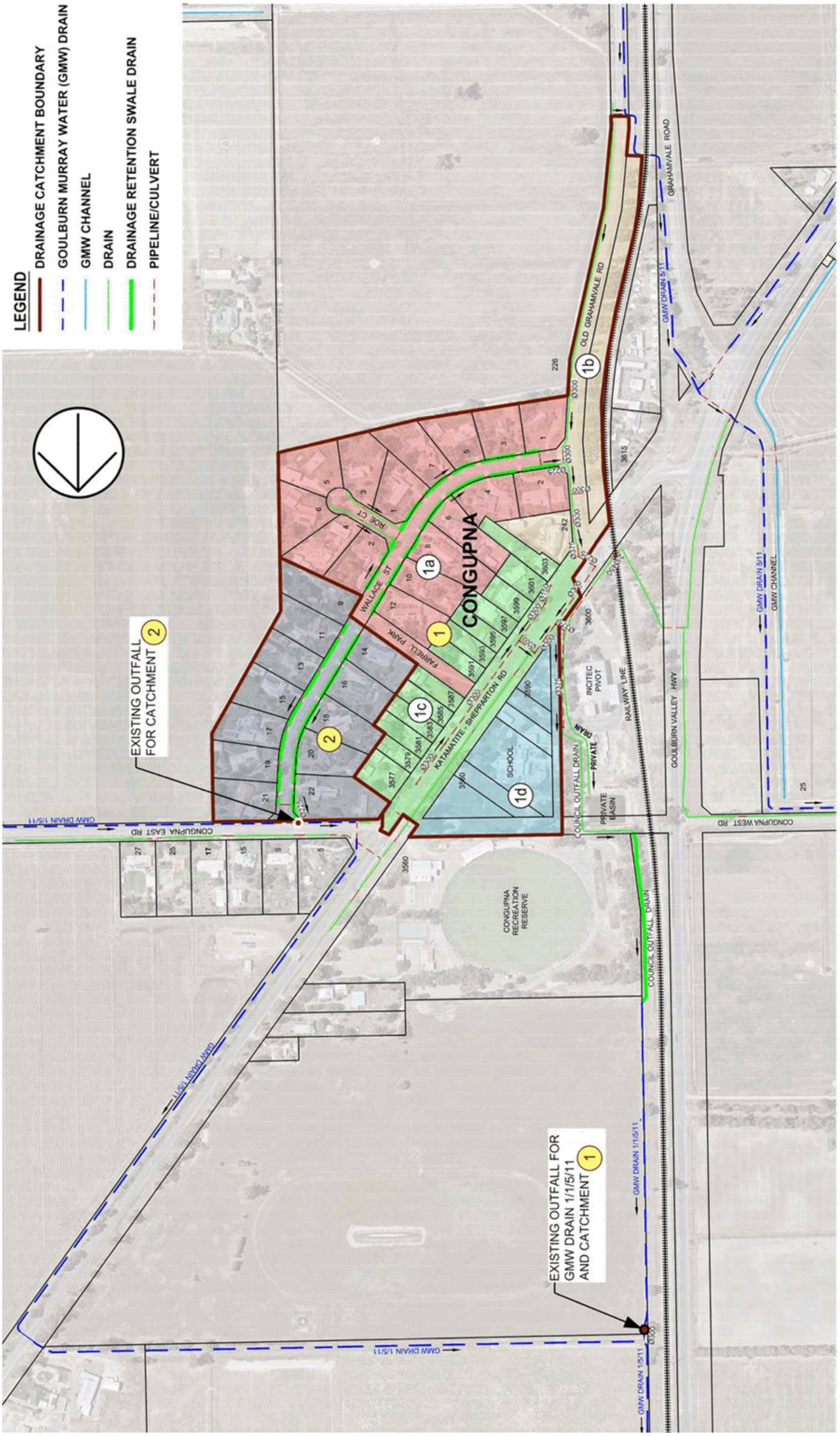
The drainage pipeline runs within the Incitec Pivot property along its eastern boundary. The section of drainage pipeline within Incitec Pivot runs beneath an existing private levee bank. Running beside and parallel on the west of the drainage pipeline is an existing private open drain. This private open drain carries Incitec Pivot's drainage to a private retardation basin at the north end of the property.

The only point that Incitec Pivot's drainage enters the Council drainage network is at the discharge point of the private retardation basin.

Within Incitec Pivot the Council drainage pipeline ends and drainage flows along a Council open drain, exiting Incitec Pivot into railway reserve land to the north. Sections of this open drain have been over excavated and permanently hold water. The breeding of mosquitoes in this standing water is an issue, especially with a school in close proximity.

The Council open drain continues north along the railway reserve beside the Congupna Recreation Reserve. At the north end of the Congupna Recreation Reserve the Council open drain leaves the railway reserve and becomes the Goulburn Murray Water drain 1/1/5/11.

Goulburn Murray Water drain 1/1/5/11 runs north outside of the railway reserve and outfalls into Goulburn Murray Water drain 1/5/11, via a 300mm diameter outlet structure.



CATCHMENT (1) - 13.64ha TOTAL

6.10ha	SUB CATCHMENT (1a) - CONGUPNA VILLAGE SUBDIVISION (STAGE 1)
2.24ha	SUB CATCHMENT (1b) - OLD GRAHAMVALE ROAD
3.29ha	SUB CATCHMENT (1c) - KATAMATITE-SHEPPARTON ROAD
2.01ha	SUB CATCHMENT (1d) - SCHOOL

CATCHMENT (2) - 4.32ha TOTAL

4.32ha	CATCHMENT - CONGUPNA VILLAGE SUBDIVISION (STAGE 2)

FIGURE 2
EXISTING CONGUPNA URBAN DRAINAGE SYSTEM

2.2.2 Drainage Catchment 2

2.2.2.1. Catchment Area (Catchment 2)

Drainage Catchment 2 has a catchment area of 4.32ha.

2.2.2.2. Existing Drainage Network (Catchment 2)

Residential urban drainage runoff from Congupna Village subdivision - Stage 2 (Catchment '2') flows east along Wallace Street via roadside swales. Drainage flows from the roadside swales then discharges into GMW drain 1/5/11 via a 225mm diameter control structure. Congupna Village subdivision was designed to retard local rainfall runoff within the wide roadside swales along the front of the residential properties.

2.3 Management Plans

2.3.1 Congupna Community Plan

The Congupna Community Plan was developed in 2013 after extensive consultation with the local community to set the vision, as well as priorities and actions to achieve this vision.

Ideas were collected through a range of consultation mechanisms (survey, key stakeholder interviews, ideas wall, youth consultation, artwork and the priority setting forum).

The vision for the local community is: -

- Congupna is an attractive rural district with a vibrant, friendly and active community.
- We aim to maintain what we love but improve and beautify our village and services for future generations.

One of the goals that have been identified to achieve this vision is to: -

- Advocate for drainage, both new initiatives and maintenance.

2.3.2 The Greater Shepparton City Council Stormwater Management Plan 2002

The Stormwater Management Plan was developed to address and improve the environmental quality of stormwater within the catchments across the Council.

Providing and Enhancing Sustainable Infrastructure by developing a drainage system that minimises risk to our natural and built environment and maximises use of water as a renewable resource within the constraints of our catchment management responsibilities.

2.4 Greater Shepparton 2030 – Strategy Plan

The City of Greater Shepparton and the Department of Sustainability and Environment have prepared Greater Shepparton 2030, a blueprint for building sustainable economic activity and maximising the quality of life in the municipality over the next 30 years.

This plan updated the previous City of Greater Shepparton Strategy Plan 1996 which formed the basis for the current Municipal Strategic Statement (MSS). The MSS is the local strategy component of the Greater Shepparton Planning Scheme.

A key element of the preparation of this plan was the integrated planning approach, and the process and extent of community engagement involving all stakeholders.

This engagement was achieved from a number of initiatives to obtain a depth of understanding of issues from both technical and personal perspectives. The feedback from the community consultation assisted in the development of visions for the municipality.

Some of the key objectives and strategies for sustaining the growth within the municipality are shown in Table 1: -

Table 1 Objectives & Strategies Summary

Topic	Theme	Objective	Strategies
COMMUNITY LIFE: Enhance social connectedness, physical and mental health and well being, education and participatory opportunities to improve liveability and provide a greater range of community services	Recreation and open space	2. To protect and enhance the network of public open space that contributes to the amenity of the municipality and advances the image of the community.	2.6 Integrate open space planning / landscape treatments with environmental improvements of the stormwater drainage system.
ENVIRONMENT: Conservation and enhancement of significant natural heritage	Floodplain management	1. To recognise the constraints of the floodplain on the use and development of land and minimise the future economic impacts of flooding. 3. To minimise the degree of salinity through an integrated regional surface water management program.	1.4 Ensure that all new developments maintain the free passage and temporary storage of floodwater, minimises flood damage, is compatible with flood hazard and local drainage conditions, and minimises soil erosion, sedimentation and silting and has a neutral impact up and down stream. 1.7 Encourage landholders to carry out works that are compatible with existing and proposed drainage schemes, preferably as part of the Whole Farm Plan certification process. 3.1 Prevent the detrimental impacts of saline water drainage by encouraging best practice water use.
INFRASTRUCTURE: the provision and restructure of urban and rural infrastructure to enhance the performance of the municipality and facilitate growth	Urban & rural services	3 To maintain an efficient and environmentally sensitive stormwater management system	3.5 Ensure the hydraulic capacity of the urban drainage system deliver the level of service defined in the Stormwater Management Policy

3. Proposed Drainage Infrastructure Improvements within the Urban Area

3.1 Flood Event

During the period of 28th February 2012 to 1st March 2012 localised storm event occurs, producing rainfall within the region of 200mm to 250mm. It was considered to be around a 1% (1 in 100 years ARI) storm event.

3.1.1 Drainage Catchment 1

3.1.1.1. Congupna Village Subdivision – Stage 1

Congupna Village subdivision Stage 1 drains via a network of wide roadside swale drains and culverts to a council drain that runs along the east side of Old Grahamvale Road.

At the outfall point of Congupna Village subdivision Stage 1 is a flow control structure. The flow control structure is a 225mm diameter culvert with a removable gate. In a rain event the gate is installed to retard the subdivision drainage flows and contain the water within wide roadside swale drains along both sides of Wallace Street (effectively the entire nature strip). The gate then remains in place until water levels within the outfall drains have fallen sufficiently to avoid flooding the older part of Congupna.

The control structure gate is operated by the residents. It was indicated that a 25mm to 50mm rainfall event would see the gate shut and nature strips holding water for at least two days. This water is unsightly, has a strong and unpleasant smell and breeds mosquitoes.

3.1.1.2. Katamatite – Shepparton Road (300/225mm diameter road crossing)

Drainage flows from sub catchments "1A" and "1B" cross Katamatite – Shepparton Road via an existing 300mm diameter drainage pipeline (with a 225mm diameter section of pipe under the road) at the intersection with Old Grahamvale Road.

The section of the pipeline under the road was installed prior to the construction of the Congupna Village subdivision and was not upgraded to accommodate additional flows. The residents believe that the pipeline is under capacity and suggested replacement with larger capacity box culverts.

During the flood event, capacity of the Katamatite – Shepparton road culvert, outfall pipeline and open outfall drain were exceeded. Flood water being held up on the South side of Katamatite – Shepparton Road was pumped by residents across the road and into a drain that under normal rainfall events would flow north-east into Congupna from the railway reserve. This railway reserve water would then flow into Pivot's drainage system, being held in Pivots storage basin.

The pumped water was forced west into the railway reserve and through a double barrel 450mm diameter railway culvert. After passing through the railway culverts the drainage flowed to a road culvert under a Goulburn Valley Highway and into a Council drain that flows north along the west side of the Goulburn Valley Highway.

3.1.1.3. Katamatite – Shepparton Road (roadside drainage)

Urban drainage along Katamatite – Shepparton Road (Congupna's main street) is collected by a network of drainage pipelines and open roadside drains. These drainage flows discharge into a 300mm diameter Council outfall pipeline which heads north through Incitec Pivot (land leased from VicTrack).

Congupna outfall pipeline's limited drainage discharge capacity leads to backing up of drainage runoff resulting in roadside inundation (in larger events property inundation) along Katamatite – Shepparton Road.

3.1.2 Drainage Catchment 2

3.1.2.1. Congupna Village Subdivision – Stage 2

Congupna Village Stage 2 drains via a network of wide roadside swale drains and culverts to the Goulburn Murray Water drain 1/5/11 that runs along the west side of Congupna East road.

At the outfall point of Congupna Village subdivision Stage 2 is a flow control structure. The flow control structure is a 225mm diameter culvert with a removable gate. In a rain event the gate is installed to retard the subdivision-drainage flows and contain the water within wide roadside swale drains along both sides of Wallace Street (effectively the entire nature strip). The gate then remains in place until water levels within GMW drain 1/5/11 fall sufficiently.

The control structure gate is operated by the residents. It was indicated that a 25mm to 50mm rainfall event would see the gate shut and nature strips holding water for at least two days. This water is unsightly, has a strong and unpleasant smell and breeds mosquitoes.

3.2 Investigations Undertaken and Options Considered

Following the flooding event in early March 2012, Greater Shepparton City Council undertook a drainage catchment analysis to determine possible drainage upgrades for immediate and future implementation for the township of Congupna.

3.2.1 Investigations Undertaken

In consultation with the Catchment Management Authority, a detailed drainage catchment study was undertaken to determine natural flow paths and rural drainage flows which impact upon Congupna's urban drainage system. This study was vital to ensure that any upgrades to the existing Congupna drainage system cause no adverse flooding to landowners upstream or downstream of the township of Congupna.

The following investigations were considered: -

- Katamatite – Shepparton Road Culvert Upgrade;
  - It was initially recommended to remove and replace the existing 375mm and 225mm pipe culverts with a single 1200mm x 450mm box culvert.

- High Flow Diversion Structure;
  - It was initially recommended that possible flooding mitigation may be achieved via installation of a new high flow diversion structure, located on the north side of the Katamatite – Shepparton Road. This structure would have been sized to not exceed the capacity of the existing twin 450mm diameter pipe culverts running under the railway tracks.
  - In order to match the discharge rate from the twin 450mm diameter railway culverts a 1200 x 300 box culvert at 1 in 445 grade would have been required. The high flow diversion structure would have had a gate installed inside the pit on the 1200 x 300 opening face where it could have been lifted during storm events to allow excess flow to drain into the nearby table drain and continue under the railway tracks into Goulburn Murray Water Drain 5/11.

- Katamatite - Shepparton Road (South) Drainage Investigation;
  - Preliminary sizing to cater for the flows generated in sub catchment "1C" were undertaken for a 1 in 5 year storm event. It was found through analysis that the contributing flows to each section of pipe were not significant and thus produced low flows. The steepening and reducing of pipe sizes were analysed however it was found the grade required would dramatically affect the depth of the overall system for no beneficial gain.

- Investigate Council Open outfall Drain Capacity Downstream of Incitec Pivot;
  - From the analysis of the existing open drain network it was determined that the profile of the Council outfall drain varies significantly along its length. The change in profile notably affects the volume of water able to pass through the drain. Furthermore, analysis of the outfall drain slope indicated that the drain is quite flat, however this may have needed to be flattened further to allow the upstream pipe network more flexibility in design.
  - Outfall drain upgrade works would have involved reshaping and enlarging the open drain profile. The drain would have needed to be enlarged at two to three stages along the existing open drain. As each additional catchment enters it would have triggered the need to enlarge the drain profile to cater for the additional flows.

- Future Retardation Basin Investigation (servicing drainage catchment 1);
  - To control future flood events Council considered the possibility of a retardation basin to help mitigate the stormwater and reduce the flooding in the Congupna Township.
  - The concept retardation basin was initially sized to cater for a 1 in 100 year storm event. The estimated overall volume required for a 1 in 100 year storm event was 8,835.3m^3. Calculations on the foot print size determined a required area of 8,515m^2. This area translated into dimensions of 131m (L) x 65m (W) x 3.3m (D). The calculations also included 1 in 8 batters, 0.3m free board and 3.5m access track around the perimeter.
- Farrell Park drainage;
  - Survey Farrell Park to investigate options to drain low points via such means as re-grading existing surface, installation of drainage culverts and pits.

3.2.2 Stakeholder Consultation

Consultation was undertaken with the following stakeholders: -

- Congupna Community Meetings
  - An initial community meeting was held during March 2012, in which Council attended a town meeting at Congupna. The community voiced their concerns and Council provided the community with a commitment that solutions to drainage issues would be sought and a follow up town meeting organised to update the community on how the drainage issues are to be addressed by Council.
  - A follow-up community meeting was held on the 23rd April 2012, where representatives from Council were present to listen to community concerns and suggestions. Council informed the community of the steps being undertaken to investigate and upgrade sections of Congupna's existing urban drainage infrastructure.
- Vic Roads concerning any proposed alterations to drainage infrastructure on their declared road reserves (Katamatite – Shepparton Road is a Vic Roads declared road).
- Goulburn Murray Water regarding;
  - The removal of vegetation, debris and silt from Goulburn Murray Water drain 1/1/5/11 (downstream of open outfall drain).
  - For a feature and level survey of the existing open outfall drain to the existing 300mm diameter pipe outlet structure into Goulburn Murray Water drain 1/5/11.
  - Increasing the diameter of the existing 300mm diameter pipe outfall structure.
  - Modifying the existing outfall structure to allow higher flows through the structure in the event of a flood (i.e. with a locked gate).

- For the option of splitting of outfall flows during a flood event, to investigate any possible options for providing high flow drainage diversion to the west through the railway reserve, along roadside drains eventually out falling into a Goulburn Murray Water drain. It would only operate during a flood event and it would be controlled by a lockable gate.
- To enable the outfall capacity for Congupna Village Subdivision into and through Goulburn Murray Water Drain 1/5/11 and hence to investigate the possibility of increasing the diameter of the existing 225mm diameter pipe outfall structure, to modifying the existing outfall structure to allow higher flows through the structure in the event of a flood (i.e. with a locked gate) and to Investigate if the regrading of drain bed or the removal of any vegetation, debris and silt from Goulburn Murray Water drain 1/5/11 will improve drainage outfall capacity.

- VicTrack to investigate the possibility of allowing flood event drainage flows from Congupna to be diverted through the VicTrack reserve;
  - If consent is gained to divert flood event high flows, a design would then be carried out to incorporate a diversion structure into the junction pit north of Katamatite – Shepparton Road on the outfall pipeline.
  - A control gate would have to be incorporated into the upstream end of Pivot's driveway culvert to prevent diverted flows from being pushed into Pivot's drainage system.

3.2.3 Options Considered

In summary the sequences of options considered are: -

- Stages 1 & 2 (Drainage Catchment 1);

1. Upgrade 225/300mm pipe under the Katamatite – Shepparton Road and use same outfall alignment flowing next to PIVOT and along drain next to railway line.
2. Improving the drainage to the west was also considered but was identified as minimal benefit without a retardation basin, as it relied on the existing roadside outfall drainage along the Goulburn Valley Highway and Congupna West Road. So (2) was not considered further (without a future new basin).
3. Same as (1) but due to poor grades in (1) consider constructing a new basin north of existing recreation reserve, this was abandoned due to impact on this site as the future recreation reserve extension.
4. Same as (1) but investigate construction of a basin at the west end of the recreation reserve, abandoned due to environmental impact and adverse impact on the operation of sport and parking in the recreation reserve. Also (1), (3) & (4) would still have maintenance and operating issues of this alignment (i.e. access issues on VicTrack land and physical restrictions of alignment). So (1), (3) & (4) were abandoned.

5. Council staff considered constructing a retardation basin west of the Goulburn valley Highway. Two alignments under the railway line were considered. The north-west side of the Katamatite – Shepparton Road had considerable VicTrack railway infrastructure to negotiate and it was more cost effective to align the pipe on the under the railway line on the south-east side of the Katamatite –Shepparton Road.
6. The paddock on the south-west corner of the intersection of the Goulburn Valley Highway and Congupna West Road (i.e. part of 25 Congupna West Road) was identified as a suitable location for a retardation basin. The southern part of this paddock was identified and was initially discussed with the landowners as the preferred location for the basin as it was the shortest distance.
7. The landowners requested that the basin be sited at the north end of the paddock so that land did not become land locked. Even though this added extra cost to the project the Council agreed to this as it provided a better and safer access to the site via Congupna West Road instead of the Goulburn Valley Highway. A meeting held with VicRoads also confirmed that this access would not be compromised by any future long term priority changes to the Goulburn Valley Highway and Shepparton Alternative Truck Route planned by VicRoads.

- Stage 3 (Drainage Catchment 2);

a) Catchment analysis determined that run-off from Wallace Street, north of Farrell park falls towards the north to Goulburn-Murray Water Drain 1/5/11.

b) Council staff also considered altering the open drains along Wallace Street so that the northern catchment along Wallace Street would flow to the south. The inverts of the table drains along Wallace Street are off-set towards the fence line so that water storage encroaches into the private properties. This option was not considered further as major works would be required to regrade the drainage which would have required re-grading all driveway culverts and severely impacted nature strips and the frontage of private property including established trees and infrastructure. In addition, this option would have altered catchment area which is not a good engineering practice.

c) The site of the Stage 3 retardation basin was chosen because it was the most cost efficient as it minimised new infrastructure required being the closest land available near Wallace Street and is adjacent to Goulburn-Murray Water Drain 1/5/11. This site also provides an opportunity for the landowner to utilise some of the proposed drainage infrastructure if they wish to subdivide the site in the future. Council staff had a meeting with the landowners to discuss in-principle consideration of the Council to ultimately purchase the site for a retardation basin. The landowners advised that they intend to subdivide the land in the medium to long term.

The land is identified in the *Greater Shepparton Housing Strategy 2011* for rural residential purposes as 'Potential Low Density'. This would be subject to a planning scheme amendment.

3.3 Selection of Recommended Drainage Outfalls

3.3.1 Drainage Catchment 1

Council initially indicated its intention to upgrade the council drainage infrastructure that currently outfalls into Goulburn Murray Water drain 1/5/11. Council after reviewing the collected field data proposed an alternate concept drainage option.

It was determined that due to minimal available fall from Congupna to the existing drainage outfall into Goulburn Murray Water drain 1/5/11, the only way to achieve suitable grade and cover for the proposed pipeline would involve the construction of a retardation basin. Council had previously identified the construction of a retardation basin as a possible long term project.

The proposed alternate option involved the relocation Congupna's existing drainage outfall from Goulburn Murray Water drain 1/5/11 (existing outfall north of Congupna) to Goulburn Murray Water drain 5/11 (west of Congupna). Goulburn Murray Water provided "in principle approval" for the location of the proposed drainage outfall relocation which would service drainage catchment 1.

3.3.2 Drainage Catchment 2

Drainage catchment 2 currently discharges via gravity into Goulburn Murray Water drain 1/5/11.

Council's proposal would see the existing gravity outlet abandoned and a new retardation basin constructed to the east of Congupna. The drainage discharge from the proposed basin would be pumped into Goulburn Murray Water drain 1/5/11, upstream of the existing drainage outfall.

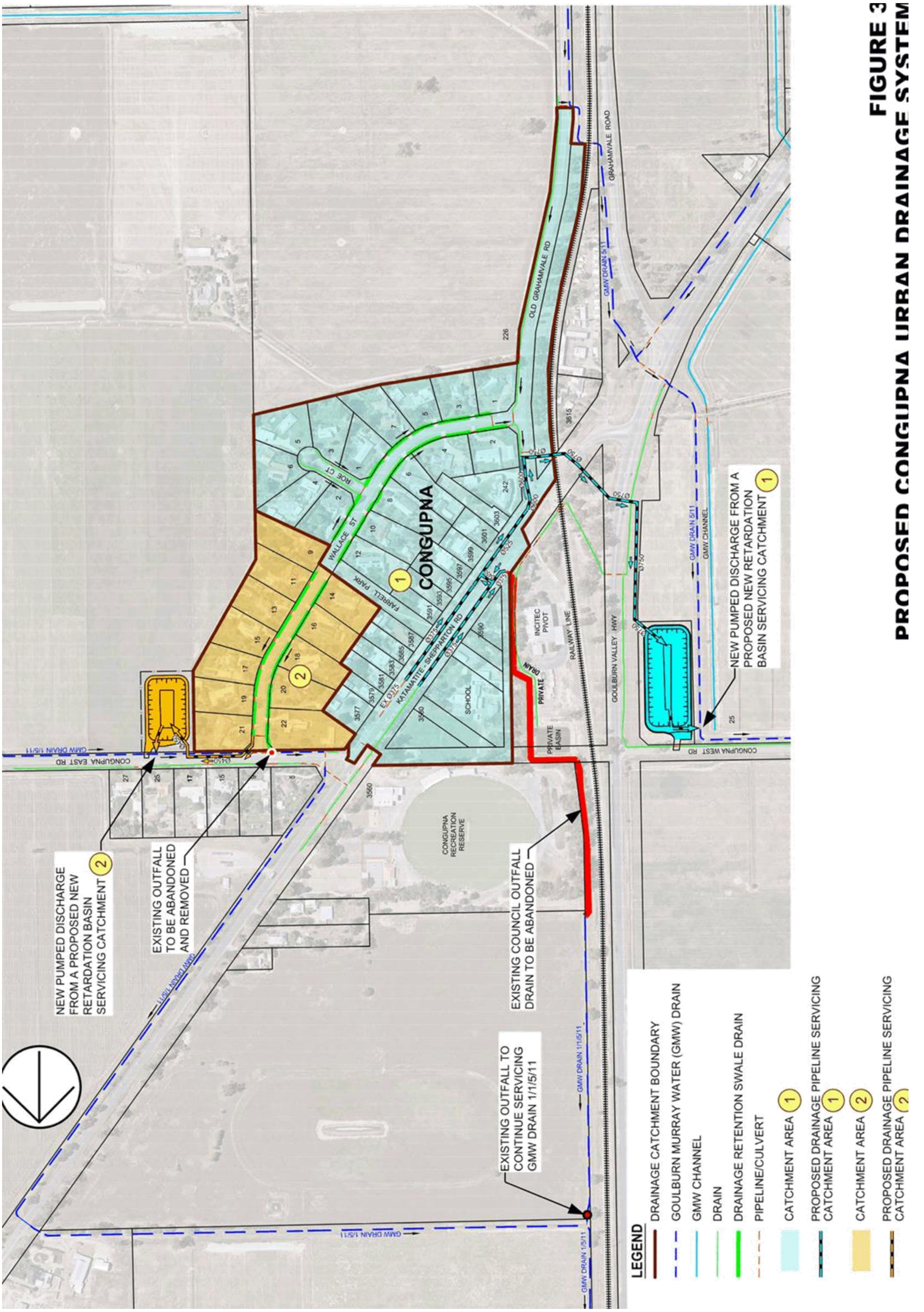


FIGURE 3
PROPOSED CONGUPNA URBAN DRAINAGE SYSTEM
CONGUPNA
NEW PUMPED DISCHARGE FROM A PROPOSED NEW RETARDATION BASIN SERVICING CATCHMENT 1
NEW PUMPED DISCHARGE FROM A PROPOSED NEW RETARDATION BASIN SERVICING CATCHMENT 2
EXISTING OUTFALL TO BE ABANDONED AND REMOVED
EXISTING COUNCIL OUTFALL DRAIN TO BE ABANDONED
EXISTING OUTFALL TO CONTINUE SERVICING GMW DRAIN 1/1/5/11
CONGUPNA RECREATION RESERVE
GOULBURN VALLEY HWY
RAILWAY LINE
KATAMATITE-SHEPPARTON RD
OLD GRAHAMVALE RD
GRAHAMVALE ROAD
CONGUPNA EAST RD
CONGUPNA WEST RD
WALLACE ST
FARRELL PARK
ROE CT
SCHOOL
INCITEC PIVOT
PRIVATE BASIN
PRIVATE DRAIN
LEGEND
DRAINAGE CATCHMENT BOUNDARY
GOULBURN MURRAY WATER (GMW) DRAIN
GMW CHANNEL
DRAIN
DRAINAGE RETENTION SWALE DRAIN
PIPELINE/CULVERT
CATCHMENT AREA 1
PROPOSED DRAINAGE PIPELINE SERVICING CATCHMENT AREA 1
CATCHMENT AREA 2
PROPOSED DRAINAGE PIPELINE SERVICING CATCHMENT AREA 2

4. Planning Scheme Considerations

4.1 Statutory Requirements

The Greater Shepparton Planning Scheme provides the controlling process for the development and redevelopment of land in the Council.

In the planning scheme the following sections currently provide definition, guidance objectives, overlays and standards for drainage development, and flood plain planning:-

- State Planning Policy Framework;
  - 13.02 Floodplain management,
  - 14.02-1 Protection of catchments, waterways and groundwater.
- Local Planning Policy Framework;
  - 21.07-3 Urban Stormwater Management,
  - 21.09 Reference Documents.
- Overlays;
  - 44.03 Floodway Overly,
  - 44.04 Land Subject to Inundation Overlay LSIO,
  - 45.01 Public Acquisition Overlay PAO.
- Particular Provision;
  - 52.02 Easements, Restrictions and Reserves,
  - 56.07-4 Urban run-off Management Objectives.
- Incorporated Documents;
  - Australian Rainfall and Runoff- A guide to Flood Estimation Vol 1 2001,
  - Infrastructure Design Manual,
  - Goulburn Broken Water Quality Strategy.

All Planning Scheme Zones and Overlays are recorded on Planning Certificates and in this way are readily brought to the attention of future land owners and potential purchasers.

4.2 Sites for Future Retardation Basins

4.2.1 Drainage Catchment 1

As a part of the proposed Congupna flood mitigation works, it is proposed that drainage from Drainage Catchment 1 would outfall via a new outfall pipeline following a new alignment (to the West of Congupna). The drainage upgrade will require the construction of a new retardation basin which would then discharge into Goulburn Murray Water drain 5/11 via a new pump station.

The planned site of the new retardation basin for Drainage Catchment 1 is on the north end of property 25 Congupna West Road, Congupna (currently privately owned land).

This land is zoned Farming 1, affected by the Land Subject to Inundation Overlay and abuts a Road Zone (category 1). The proposed use is best defined under the Greater Shepparton Planning Scheme as a 'Minor Utility Installation', being land used for a utility installation comprising a stormwater or flood water drains or retarding basins. A planning permit is not required to use or develop land for a Minor Utility Installation in the Farming Zone 1 or Land Subject to Inundation Overlay.

4.2.2 Drainage Catchment 2

As a part of the proposed Congupna flood mitigation works, it is proposed that drainage from Drainage Catchment 2 would outfall via a new outfall pipeline following a new alignment (to the East of Congupna). The drainage upgrade will require the construction of a new retardation basin which would then discharge into Goulburn Murray Water drain 1/5/11 via a new pump station.

The planned site of the new retardation basin for Drainage Catchment 1 is on the north east corner of property 226 Old Grahamvale Road, Congupna (currently privately owned land).

This land is zoned Farming 1 and affected by the Land Subject to Inundation Overlay. The proposed use is best defined under the Greater Shepparton Planning Scheme as a 'Minor Utility Installation', being land used for a utility installation comprising stormwater or flood water drains or retarding basins. A planning permit is not required to use or develop land for a Minor Utility Installation in the Farming Zone 1 or Land Subject to Inundation Overlay.

4.2.3 Use of Land for Pipeline for Public Zone 4

A planning permit will be required for the use of land for a Minor Utility in the Public Use Zone 4 where the proposed pipeline crosses the two sections of Public Use Zone land (railway owned).

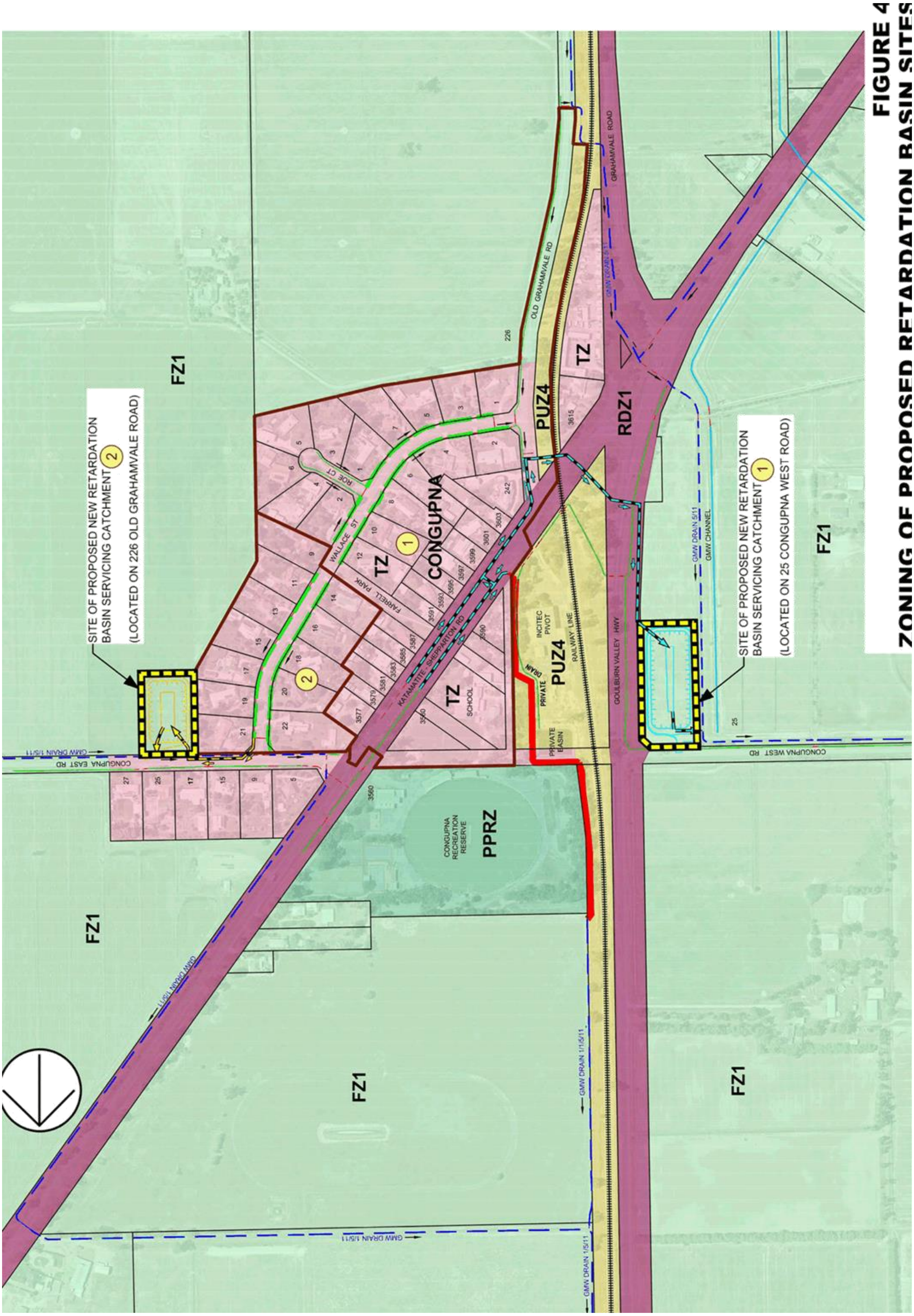


FIGURE 4
ZONING OF PROPOSED RETARDATION BASIN SITES
SITE OF PROPOSED NEW RETARDATION BASIN SERVICING CATCHMENT 2
(LOCATED ON 226 OLD GRAHAMVALE ROAD)
SITE OF PROPOSED NEW RETARDATION BASIN SERVICING CATCHMENT 1
(LOCATED ON 25 CONGUPNA WEST ROAD)
FZ1
TZ
PUZ4
RDZ1
PPRZ
CONGUPNA
CONGUPNA RECREATION RESERVE
OLD GRAHAMVALE RD
GRAHAMVALE ROAD
WALLACE ST
ROE CT
FARRELL PARK
KATANDRA-SHEPPARTON RD
CONGUPNA EAST RD
CONGUPNA WEST RD
GOULBURN VALLEY HWY
RAILWAY LINE
INCITEC PIVOT
SCHOOL
PRIVATE BASIN
PRIVATE DRAIN
GMW CHANNEL
GMW DRAIN 5/11
GMW DRAIN 1/5/11
GMW DRAIN 1/1/5/11

5. Drainage Design

5.1 Basis of Design

The capacity of the drainage networks is based on design principles using catchment area, coefficient of runoff, and rainfall intensities. The rainfall intensities vary according to the size of storm events.

Pipes or waterways have known capacities based on the size and grade of the pipe or waterway and therefore calculations can be made to determine which storm event frequencies can be contained within the network.

Rainfall events are random and vary in duration and intensity, so for design purposes a statistical estimate of the period in years between the occurrences of the rainfall event determines the rainfall intensity used. This is called the Average Recurrence Interval (ARI). That is a 1 in 5 year rainfall event is an event that is statistically likely to occur once in 5 years. This can also be expressed as the percentage likelihood of rainfall event occurrence in one year. This is called the Annual Exceedance Probability (AEP). For example a 20 per cent likelihood of a rainfall event occurring in one year is the same as a 1in 5 year rainfall event.

The storm event and rainfall intensity have been determined by historic rainfall data and over time rainfall intensity has increased.

As a consequence of the increase in rainfall intensity the existing drainage network may not be able to contain the storm event that it was originally designed for.

To design a whole pipe network to take a major storm (1 in 20 years ARI) event would require very large pipe and pit systems and is therefore financially prohibitive. There was a period of time over the past 10 years where the state wide Planning Scheme has permitted a standard where a 1 in 2 year ARI rainfall event has been accepted as the storm event to be carried by the pipe network in new subdivisions.

The proposed Congupna drainage works has been designed to meet the current objectives of Council's Infrastructure Design Manual (IDM). The primary objectives of the IDM are to: -

- clearly document Council's requirements for the design and development of Infrastructure that is or will become Council's Infrastructure,
- standardise development submissions as much as possible and thus to expedite Council's engineering approvals,
- ensure that minimum design criteria are met in regard to the design and construction of Infrastructure within the municipalities regardless of whether it is constructed by Council or a Developer, and
- recognise and deal with the various issues currently impacting on the land development industry, in particular sustainability, integrated water cycle management, timeliness and affordability.

The design has achieved these objectives without detriment to the environment generally, surface and subsurface water quality, groundwater infiltration characteristics, adjoining landowners and landowners in the vicinity of the drainage outlet, and watercourses either upstream or downstream of the subdivision.

The design has encompassed the following requirements to: -

- avoid the capacity of the existing drainage Infrastructure being exceeded and peak discharge rate of stormwater runoff beyond the levels which the Infrastructure was originally designed to accommodate,
- protect the public from injury or death, and reduce flood damage to property and Infrastructure, by storing excess runoff during extreme rainfall events and releasing the stored water over time in a controlled manner,
- collect and control all stormwater generated to ensure that it is discharged from the site without detriment to any upstream or downstream property,
- incorporate water quality treatment based on WSUD principles into retardation basin design, and
- ensure that all stormwater discharged to natural watercourses and other drainage authority's drains meet the requirements of the Environment Protection Act 1970 and the water quality performance objectives for individual drainage catchments as provided in the State Environment Protection Policies (SEPP's).

5.2 Storm Events Adopted for Drainage Design

For residential allotments the current IDM standards require, as a minimum, a pipe network that contains a storm event up to a rainfall intensity equivalent to a 1 in 5 years ARI and for the whole network to achieve a 1 in 100 years ARI through the pipe network and overland flows.

The result of the changes in rainfall intensities and design standards over time is that the existing drainage pipe network has varying capacities and some areas experience surface water flows and flooding more often than others. Many of these surface flows are contained, do not cause damage and are well within acceptable standards (depth of flow and velocity) and form a component of overland flood paths.

As a result of specific storm events there are particular areas (Hot Spots) where, as a result of increased rainfall intensity, urban consolidation or reduced design standards are known to flood and cause inundation of properties and or cause hazards within public areas. These 'Hot Spots' are critically monitored during storm events.

The Council's current approach to the pressures of infill or higher density housing redevelopment is to require (as part of a planning permit) on site retention of the 1 in 100 year rainfall event with the discharge restricted to the capacity of the existing drainage system, taking into consideration the location of the redevelopment within the catchment. Water Sensitive Urban Design is also required to improve the quality of water discharging into the outfall drainage system and natural waterways.

It is expected that climate change will result in further rainfall intensity increases in the future.

As a result of development pressures and climate change the Council's Drainage Strategy has commenced consideration of modification to the drainage pipe design parameters and pit entry conditions.

5.2.1 Adopted Design Storm Event for Drainage Catchment 1

ARI (years)	Proposed drainage infrastructure to service Drainage Catchment 1
5	Drainage infrastructure running through residential allotments
10	Outfall drainage infrastructure (Congupna to proposed retardation basin)
100	Proposed retardation basin storage capacity

Outfall Drainage Infrastructure

Council has determined that to reduce inundation of public areas within the Congupna Township, the proposed drainage outfall pipeline infrastructure shall be designed for a 1 in 10 years ARI event and for the whole network to accommodate a 1 in 100 years ARI capacity through offsite flood storage facility.

Residential Drainage Infrastructure

Council has determined that the proposed residential drainage infrastructure shall be designed for a 1 in 5 years ARI event and for the whole network to accommodate a 1 in 100 years ARI capacity through offsite flood storage facility.

5.2.2 Adopted Design Storm Event for Drainage Catchment 2

ARI (years)	Proposed drainage infrastructure to service Drainage Catchment 1
5	Drainage infrastructure running through residential allotments
100	Proposed retardation basin storage capacity

Residential Drainage Infrastructure

Council has determined that the proposed residential drainage infrastructure shall be designed for a 1 in 5 years ARI event and for the whole network to accommodate a 1 in 100 years ARI capacity through offsite flood storage facility.

5.3 Urban Stormwater

Stormwater includes rainfall collected from roofs as well as road run-off, wash-down water and all other water that discharges into the drainage network, rivers, streams, creeks and lakes from urban areas. Unlike sewage, urban stormwater is generally not treated before being discharged to local waterways.

Urban development can have a significant impact on stormwater quality. The clearing of land and the use of impervious surfaces increases run-off and the transport of pollutants such as sediment, nutrients, pathogens, heavy metals, oil and litter to waterways. The accidental or deliberate discharge of various pollutants from residential, commercial and industrial areas, as well as from roads and other areas, can flow into local drains and waterways. Their individual and cumulative impacts can have a major effect on water quality.

Improved stormwater management is critical in minimising the discharge of pollutants into local waterways. Stormwater management should be based on the following three principles:

- **preservation**: preserve existing valuable elements of the stormwater system, such as natural channels, wetlands and stream-side vegetation
- **source control**: limit changes to the quantity and quality of stormwater at or near the source
- **structural control**: use structural measures, such as treatment techniques or detention basins, to improve water quality and control streamflow discharges.

5.4 Structural Measures

Structural measures, such as treatment techniques or retardation basins, are used to improve water quality and control streamflow discharges. Retrofitting of structural measures to existing outfall structures is often difficult, but is required to address threats.

A Retardation Basin is an area where excess stormwater is stored or held temporarily and then slowly drains when water levels in the receiving channel recede. In essence, the water in a detention basin is temporarily detained until additional room becomes available in the receiving channel.

Retarding basins have been used for many years to reduce the peak flows from urban development which discharge into outfall drains and natural water courses. There has been various design criteria used to determine the design capacities, and permitted discharges from the basins. They currently play a very important role in the existing drainage system.

Most of the basins that were constructed in the past were incorporated into recreation reserves and form part of the public open space. Many of the basins were designed as wet basin i.e. have permanent water in them with free storage capacity and have been used as components of the landscape and recreation.

Planning conditions for new developments and redevelopments require retention of the 1 in 100 ARI events and the type of facility varies depending on the size of the development. The critical element is the amount of free storage space available at the start of the rainfall event is equal to the retention requirement for the 1 in 100 year ARI event.

6. Environmental Issues – Vegetation and Water Quality

6.1 Water Sensitive Urban Design

Stormwater is the water flow from runoff from natural and urban surfaces. Runoff from roofs, roads, paths and other urban surfaces often contain contamination including litter, oil, nutrients and heavy metals which can all flow into the Bays and natural waterways.

Water Sensitive Urban Design (WSUD) is an integrated approach to address the discharge of stormwater in an environmentally and economically sustainable manner.

While the benefits of WSUD can be maximised in new developments retro fitting also provides substantial benefits.

The benefits of WSUD are:-

- Protects the natural waterways and bays from urban development stormwater discharges,
- Integrates stormwater treatment into the landscape,
- Improves the water quality discharge from urban development, and
- Reduces run-off and peak flows.

WSUD is currently being implemented through the planning requirements of the Planning Scheme and the Council for new developments as well as being integrated into new projects as part of the Council's Capital Works Program.

When storm events exceed the capabilities of the infiltration, detention and retention components of the WSUD system the flood flow routing treatments are essential to protect dwellings and minimise damage. Flood flow routing is normally extremely difficult to implement retrospectively which places a high importance to achieve flood flow routing in all new developments.

An appropriate level of water quality treatment can be determined within the retention basin by the use of MUSIC modelling.

A MUSIC model of the surrounding catchment will provide an initial estimate of the bioretention dimensions required to achieve an appropriate level of water quality treatment.

6.2 MUSIC Model

Forming part of the Council stormwater management design, is the investigation into the current level of stormwater treatment that exists within the catchment and potential opportunities that can be incorporated into the proposed Congupna stormwater system. A conceptual stormwater treatment system has been assessed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software to ensure that stormwater emanating from this catchment is treated in accordance with the "Best Practice Environmental Management Guidelines for Urban Stormwater".

MUSIC modelling software is used to estimates stormwater flow and pollution generation and simulates the performance of stormwater using treatment nodes/tools aligned to form a complete "treatment train". Within the software the overall catchment is broken into smaller areas each with associated treatment nodes/tools.

6.2.1 Existing System

The existing stormwater drainage system incorporates roadside swales that service the majority of the residential catchment and will be considered in the model as a stormwater treatment tool. The proposed drainage system will include the construction of a retardation basin that provides the opportunity to incorporate additional water quality improvement into the basin floor.

The existing treatment tools within the Congupna stormwater network comprise of numerous roadside vegetated swales. The existing roadside swales differ in width, depth, length and vegetation height. The MUSIC model has been formed to best simulate the existing level of treatment that the system provides.

The model results are used to determine if additional treatment nodes are required within the stormwater system to provide treatment levels sufficient to meet the requirements outlined in the "Best Practice Environmental Management Guidelines for Urban Stormwater".

6.2.2 Stormwater Quality Objectives

The objectives set out within the Best Practice Environmental Management Guidelines for Urban Stormwater form the minimum treatment requirements as per the Victorian State Environment Protection Policy.

The following table describes the base level of treatment during the construction and post construction phase.

Table 2 Level of Treatment

Pollutant type	Current best practice performance objective
Suspended solids	80% retention of the typical urban annual load
Total phosphorus	45% retention of the typical urban annual load
Total nitrogen	45% retention of the typical urban annual load
Gross Pollutants	70% reduction of typical urban annual load

6.2.3 Results – Music Modelling

Based on the output of the MUSIC modelling, the improved stormwater treatment systems incorporating additional treatment tools achieve the target urban stormwater quality objectives. The model output results are summarised in the table below.

6.2.4 Drainage Catchment 1 – Music Modelling Output

Table 3 MUSIC Modelling Output – Drainage Catchment 1

Pollutant type	Sources	Residual Load	% Percentage Reduction	Compliance
Total Suspended Solids (kg/yr)	3660	353	90.4	✓
Total Phosphorus (kg/yr)	7.32	2.28	68.9	✓
Total Nitrogen (kg/yr)	51.3	28.2	45.1	✓
Gross Pollutants (kg/yr)	910	0.00	100.0	✓

6.2.5 Drainage Catchment 1 – Recommendations

Based on the MUSIC modelling results there is a shortfall in the amount of treatment gained from the existing Congupna catchments roadside swale network.

In order to the meet the stormwater quality objectives MUSIC modelling results indicate that the following additional treatment tools are expected to provide the existing drainage system with an increased level of water treatment in order to meet the minimum water quality objectives: -

- A vegetated swale at the base of the retardation basin is proposed with dimensions 7m (top width) x 5m (base width) and a proposed vegetation height 0f 350mm.
- Alterations to the retardation basin outlet are recommended in order to achieve an extended detention height of 0.75m. This is proposed to be achieved by restricting the pump-station inlet pipe opening to 50mm diameter in order to increase the detention time of stormwater during small events.

6.2.6 Drainage Catchment 2 – Music Modelling Output

Table 4 MUSIC Modelling Output – Drainage Catchment 2

Pollutant type	Sources	Residual Load	% Percentage Reduction	Compliance
Total Suspended Solids (kg/yr)	1090	109	90.0	✓
Total Phosphorus (kg/yr)	2.31	0.705	69.4	✓
Total Nitrogen (kg/yr)	16.4	8.35	49.3	✓
Gross Pollutants (kg/yr)	234	0.00	100.0	✓

6.2.7 Drainage Catchment 2 - Recommendations

Based on the MUSIC modelling results there is a shortfall in the amount of treatment gained from the existing Congupna catchments roadside swale network.

In order to the meet the stormwater quality objectives MUSIC modelling results indicate that the following additional treatment tools are expected to provide the existing drainage system with an increased level of water treatment in order to meet the minimum water quality objectives: -

- Approximately 60m of vegetated swale at the base of the retardation basin is proposed with dimensions 4m (top width) x 1m (base width) and a proposed vegetation height of 350mm.
- Alterations to the retardation basin outlet are recommended in order to achieve an extended detention height of 0.45m. This is proposed to be achieved by restricting inlet flows to the pump station by installing a 50mm diameter orifice plate over the basin outlet pipe in order to increase the detention time during small stormwater events.

7. Concluding Remarks

This report presents the proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment satisfying the integrated site based stormwater management plan obligations for the site. The proposed approach minimises the stormwater infrastructure to be maintained and renewed by Council while providing Congupna with an appropriate level of drainage and stormwater detention and treatment in accordance with the Greater Shepparton City Council requirements.

Council has demonstrated that the preferred proposed alternative drainage design has the ability to: -

- preserve existing valuable elements of the stormwater system, such as natural channels, wetlands and stream-side vegetation
- limit changes to the quantity and quality of stormwater at or near the source
- use structural measures, such as treatment techniques and a retardation basin, to improve water quality and control streamflow discharges.

The proposed stormwater quality treatment train for this development can treat the stormwater effectively for suspended solids, phosphorus, nitrogen and hydrocarbons. It has been demonstrated that the proposed retardation basin will achieve the water quality objectives required by Council at the discharge point from the development.

Sufficient consideration of stormwater quantity and quality controls has been made to demonstrate:

- Potential compliance with relevant water quality objectives;
- Compliance with the Stormwater Management Plan;
- Compliance with stakeholders requirements; and
- Potential ecological sustainability in terms of the township's impact upon receiving waters;

The proposed design improves the water quality of the catchment by consisting of the following elements:

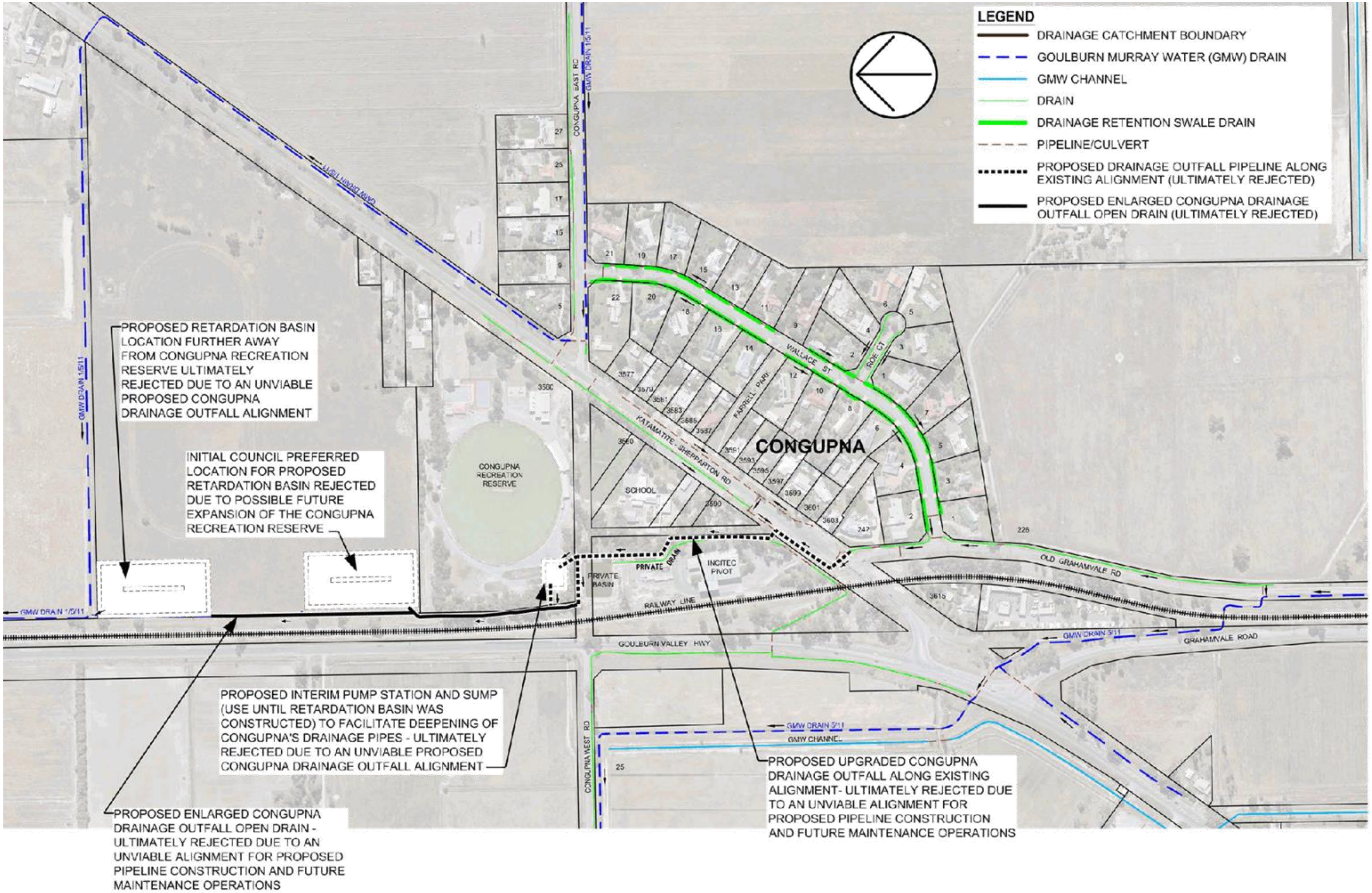
- Collection and transport of run-off throughout the estate via grass swale drains within road reserves to the nominated receival points
- Retardation basins located at the end external road network
- Bio-retention capability located within retardation basin
- Integrated Stormwater Plan

This proposed approach to stormwater management for the site achieves the aims of the Shepparton Planning Scheme in the following ways.

- Water sensitive urban design techniques have been incorporated into the stormwater design system to ensure detention volumes and water quality objectives are achieved
- Mitigation of run-off and peak flows has been demonstrated via modelling for catchment treatments
- Stormwater quality and detention devices have been located and sized to fit in with the local landscape and topography
- The water quality objectives have been achieved by utilising elements of the catchment.

APPENDIX A
Concept – Existing Outfall Alignment

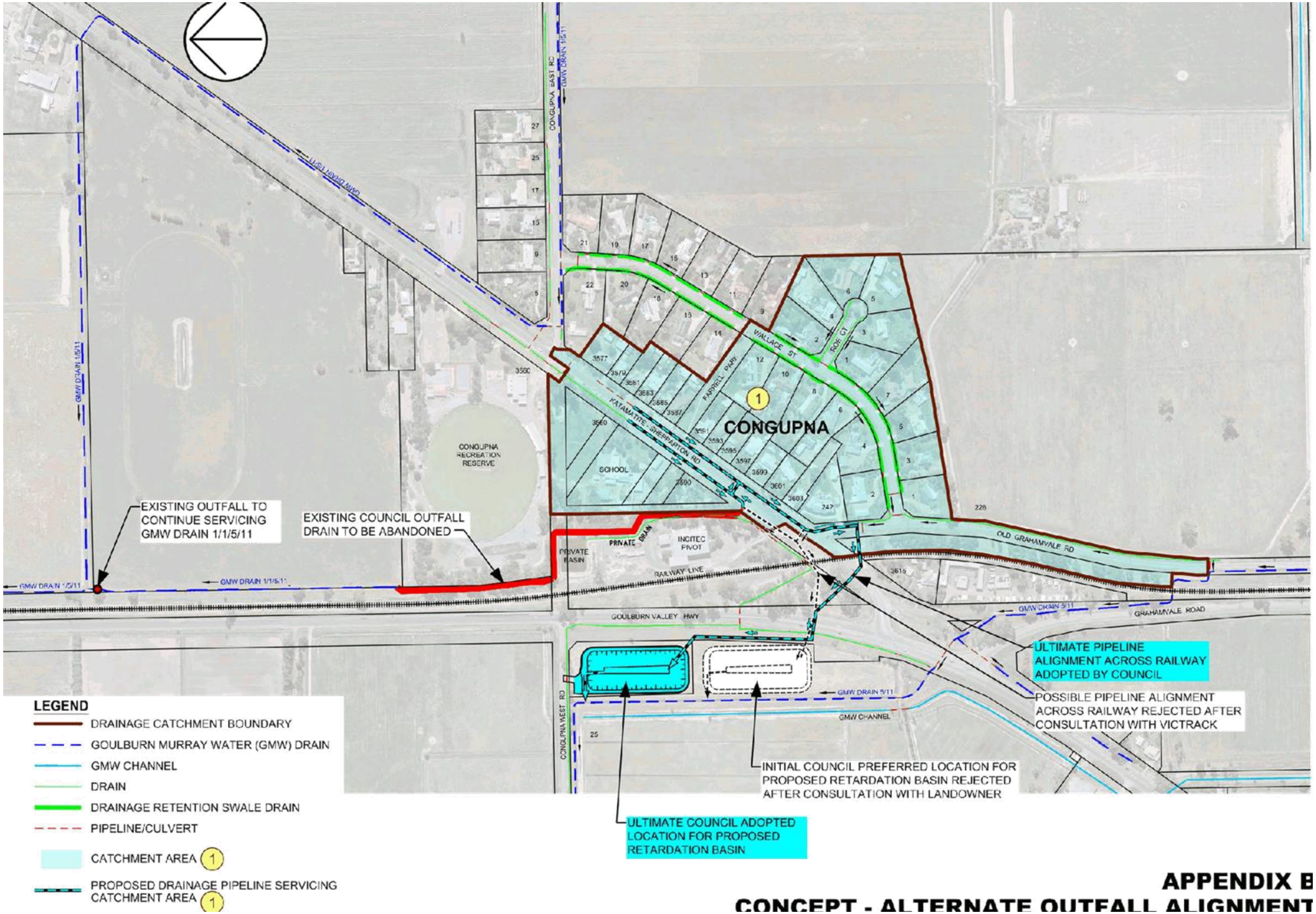
Investigations & Options
Congupna Urban Drainage Strategy– ver 5



APPENDIX A
CONCEPT - EXISTING OUTFALL ALIGNMENT (REJECTED)

APPENDIX B
Concept – Alternate Outfall Alignment

Investigations & Options
Congupna Urban Drainage Strategy– ver 5



APPENDIX B
CONCEPT - ALTERNATE OUTFALL ALIGNMENT

APPENDIX C
Flow Calculations – Catchment 1

Congupna Alternative Drainage Alignment

Preliminary Drainage Design – Computations

RAINFALL INTENSITY-FREQUENCY-DURATION

Location – Township of Congupna

Raw Data

2i(1)	19.28
2i(12)	3.43
2i(72)	0.89
50i(1)	38.99
50i(12)	6.77
50i(72)	1.78
skew	0.15
F2	4.33
F50	15.11

Polynomial Coefficients Table

ARI in years	Coefficient A	Coefficient B	Coefficient C	Coefficient D	Coefficient E	Coefficient F	Coefficient G
1	2.672976494	-6.35E-01	-4.66E-02	1.02E-02	1.15E-03	-5.41E-04	1.66E-05
2	2.938191891	-6.39E-01	-4.53E-02	1.04E-02	1.05E-03	-5.53E-04	2.00E-05
5	3.213325739	-6.48E-01	-4.27E-02	9.09E-03	1.06E-03	-3.64E-04	-1.08E-05
10	3.351888657	-6.54E-01	-4.06E-02	9.46E-03	8.48E-04	-3.77E-04	-3.00E-06
20	3.510105848	-6.58E-01	-3.97E-02	8.82E-03	9.06E-04	-2.84E-04	-2.02E-05
50	3.691463232	-6.64E-01	-3.78E-02	9.11E-03	7.08E-04	-3.02E-04	-1.11E-05
100	3.814395666	-6.67E-01	-3.70E-02	8.57E-03	7.56E-04	-2.23E-04	-2.65E-05

Intensity-Frequency-Duration Table

DURATION	1 Year	2 years	5 years	10 years	20 years	50 years	100 years
5Mins	49.7	65.6	89.4	105	124	152	173
6Mins	46.3	61	83.1	97.1	115	141	161
10Mins	37.5	49.4	66.8	77.9	92.3	112	128
20Mins	27.2	35.7	47.6	55.2	65.1	78.6	89.3
30Mins	21.9	28.7	38.1	44	51.7	62.2	70.5
1Hr	14.5	18.9	24.9	28.6	33.5	40.1	45.3
2Hrs	9.15	11.9	15.6	17.9	20.9	24.9	28.1
3Hrs	6.91	8.98	11.7	13.4	15.7	18.7	21.1
6Hrs	4.25	5.52	7.18	8.21	9.56	11.4	12.8
12Hrs	2.61	3.39	4.4	5.03	5.86	6.98	7.86
24Hrs	1.6	2.08	2.7	3.09	3.6	4.28	4.83
48Hrs	0.952	1.23	1.61	1.84	2.15	2.56	2.89
72Hrs	0.68	0.879	1.15	1.32	1.54	1.84	2.07

FLOW CALCULATIONS FOR INDIVIDUAL CATCHMENTS

Utilising the Rational Method

Peak Discharge: $Q_y = \frac{C_y \times I_{t_c y} \times A}{360}$

Drainage pipeline design is to cater for 1 in 10 year storm frequency.

Retardation basin design is to cater for 1 in 100 year storm frequency.

$C_{10} = 0.9 \times f + C_{10}^{1} \times (1 - f)$

$t.I^{0.4} = 6.94(L.n)^{0.6}/S^{0.3}$

Catchment A			Catchment B			Catchment C			Catchment D		
L=	368	m	L=	430	m	L=	293	m	L=	261	m
n=	0.02		n=	0.02		n=	0.011		n=	0.02	
S=	0.0012	m/m	S=	0.0007	m/m	S=	0.0013	m/m	S=	0.001	m/m

$t.I^{0.4}$	=	172.8748	Catchment A	∴	I_{10} =	36.4mm/hr
$t.I^{0.4}$	=	223.1152	Catchment B	∴	I_{10} =	29.55mm/hr
$t.I^{0.4}$	=	102.833	Catchment C	∴	I_{10} =	54.0mm/hr
$t.I^{0.4}$	=	148.5805	Catchment D	∴	I_{10} =	41.1mm/hr

Catchment C

$$Q_{10} = \frac{0.49 \times 54.0 \times 3.29}{360} = 0.2418\, m^3/s$$

Catchment D

$$Q_{10} = \frac{0.30 \times 41.1 \times 2.01}{360} = 0.0688\, m^3/s$$

Total flow into Pit Ex.4 = 0.3107m³/s (310.7ℓ/s)

Catchment A

$$Q_{10} = \frac{0.33 \times 36.4 \times 6.10}{360} = 0.2035\, m^3/s$$

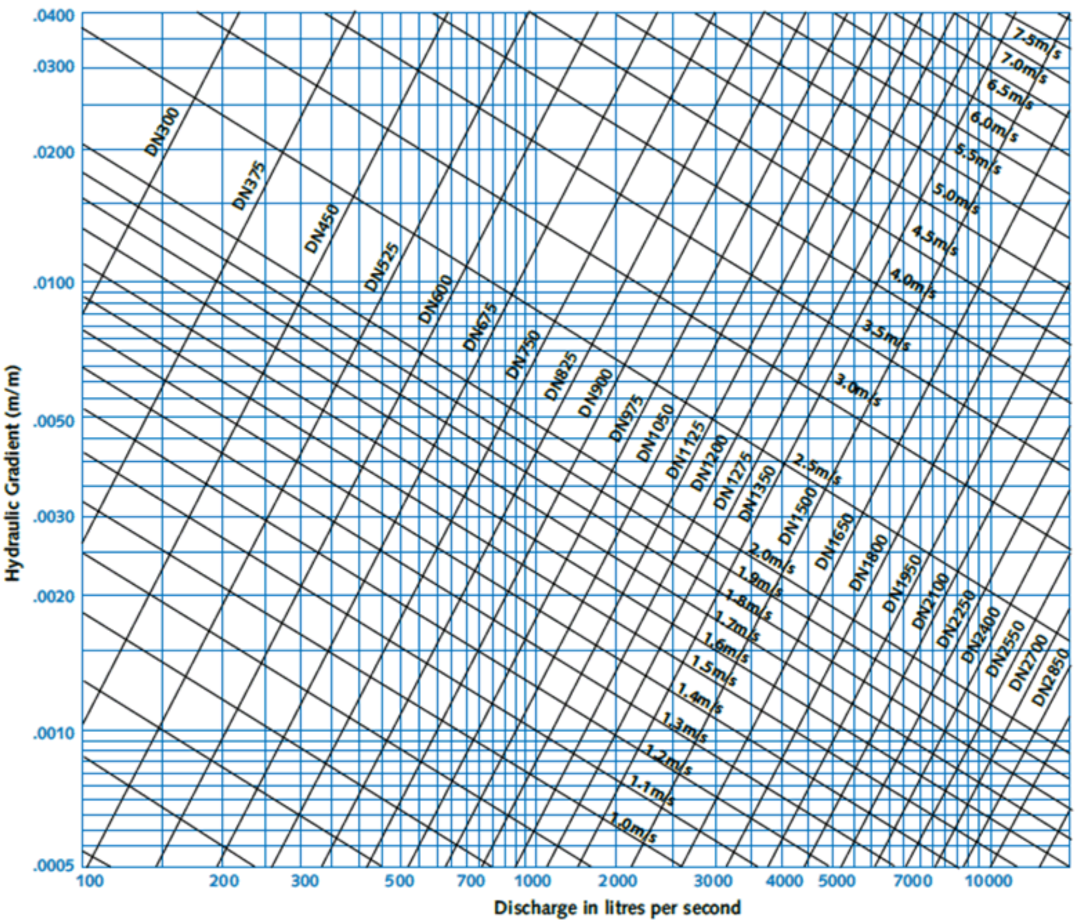
Catchment B

$$Q_{10} = \frac{0.33 \times 29.55 \times 2.24}{360} = 0.0607\, m^3/s$$

Total flow into proposed new inlet pipe = 0.3107m³/s + 0.2642m³/s = 0.57m³/s (574.9ℓ/s)

<u>PIPELINE DESIGN</u>

Minimum allowable pipeline grade = 1 in 500 – for design pipeline grade = 1 in 300



k_s = 0.6mm

Figure 10.7 - Full Flow Conditions Colebrook-White Formula k_S=0.6mm
(applicable to concrete pipes carrying stormwater)

Manning's Equation

$Q = A\ S^{1/2}\ R^{2/3} / n$

Pipe Diameter		0.6	m	0.75	m
Pipe Radius		0.3	m	0.375	m
Wetted Perimeter	W =	1.884956	m	2.356194	m
Area	A =	0.282743	m^2	0.441786	m^2
hydraulic radius	R =	0.15	m	0.1875	m
slope	S =	0.003333	m/m	0.003333	m/m
Manning's n	n =	0.013		0.013	
Capacity	Q =	0.3545	m^3/s	0.642751	m^3/s
Velocity	V =	1.253786	m/s	1.45489	m/s

Hence for a design 1 in 10 year flow of 0.3107m^3/s, minimum pipe diameter = 600mmØ

Hence for a design 1 in 10 year flow of 0.5749m^3/s, minimum pipe diameter = 750mmØ

RETARDATION BASIN DESIGN

1. Critical 100 year ARI storm event for a 24hr event.
2. Minimum freeboard = 300mm for no outfall condition
3. Top of bank to be equivalent to the lowest kerb invert level = 109.68 (adopt 109.70)
4. The top water level in the retarding basin resulting from the minor drainage storm event (1 in 10yr ARI), shall be no higher than the invert of the lowest inlet pipe to the basin = 106.47 (controlling factor for the basin design)
5. Maximum discharge rate to the relevant authority drainage system (G-MW Drain 5/11) of 1.2 lit/sec/ha = 16.37ℓ/s
6. A desirable maximum batter for retardation basins is 1 in 8 for both cut and fill situations. The absolute maximum batters shall not exceed 1 in 5 both cut and fill situations. To cater for item 4, batter slope increased to 1 in 3 to fit within available area.
7. Desirable minimum crossfall for floor to be 1 in 400 graded to the outlet point of the basin.
8. Excavation is not to be limited by the depth of the water table (Council determination)

LAND USAGE	AREA (ha)	% OF TOTAL AREA (ha)	Partial Co-Eff (c)	Ae Co-Eff (c)
HOUSE BLOCKS	10.94	80%	0.5	0.40
ROADS	0.71	5%	0.95	0.05
RESERVE	1.99	15%	0.35	0.05
INDUSTRIAL	0	0%	0.9	0.00
BASIN	0	0%	0.9	0.00
TOTAL	13.64	100%		0.50

Catchment area.	13.64	*ha*
Volumetric runoff coefficient.	0.50	
Discharge rate.	16.37	l/sec

For 100 Year ARI

Maximum Retardation for no outflow condition =	**7,905.74**	**m^3**
Maximum Retardation for given outflow =	**6,541.88**	**m^3**

Cross Section Data:

D =	**4.000**	m			
B =	**0.0**	m	Area =	**128.0**	m^2
Batter Slope =	**8.0**	1 in	∴ required length of basin at base =	**61.8**	m
Batter width =	**32.0**	m	Total length of basin at surface =	**125.8**	m
Basin Width =	**64.0**	m			

D =	**4.000**	m			
B =	**0.0**	m	Area =	**80.0**	m^2
Batter Slope =	**5.0**	1 in	∴ required length of basin at base =	**98.8**	m
Batter width =	**20.0**	m	Total length of basin at surface =	**138.8**	m
Basin Width =	**40.0**	m			

D =	**4.000**	m			
B =	**16.0**	m	Area =	**112.0**	m^2
Batter Slope =	**3.0**	1 in	∴ required length of basin at base =	**70.6**	m
Batter width =	**12.0**	m	Total length of basin at surface =	**94.6**	m
Basin Width =	**40.0**	m			

For 10 Year ARI

Maximum Retardation for no outflow condition =	**5,051.09**	**m^3**
Maximum Retardation for given outflow =	**3,764.86**	**m^3**

Cross Section Data:

D =	**2.000**	m			
B =	**8.0**	m	Area =	**48.00**	m^2
Batter Slope =	**8.0**	1 in	∴ required length of basin at base =	**105.2**	m
Batter width =	**16.0**	m	Total length of basin at surface =	**137.2**	m
Basin Width =	**40.0**	m			

D =	**2.000**	m			
B =	**20.0**	m	Area =	**60.00**	m^2
Batter Slope =	**5.0**	1 in	∴ required length of basin at base =	**84.2**	m
Batter width =	**10.0**	m	Total length of basin at surface =	**104.2**	m
Basin Width =	**40.0**	m			

D =	**2.000**	m			
B =	**28.0**	m	Area =	**68.00**	m^2
Batter Slope =	**3.0**	1 in	∴ required length of basin at base =	**74.3**	m
Batter width =	**6.0**	m	Total length of basin at surface =	**86.3**	m
Basin Width =	**40.0**	m			

APPENDIX D
Flow Calculations – Catchment 2

CONGUPNA URBAN DRAINAGE – CATCHMENT 2 INVESTIGATION

Storm Water Retardation Calculations – Congupna Catchment Area

Catchment Details

Design A.R.I.	100	Years	
Design Catchment area.	4.3	ha	
C (Runoff coefficient).	0.44		
Catchment Type Total Area of Catchment =	4.3	ha	Coefficients of Runoff
Total Low Density Area =	3.8	Ha	0.4
Total Road Reserve Area =	0.5	Ha	0.75
Weighted Coefficient Cw =	0.441		
Therefore Adopt C =	0.44		

Storm Water Retardation Calculations - Wallace Street, Congupna Catchment Area

Catchment Details

Design A.R.I.		100	Years
Design Catchment area.		4.3	ha
C (Runoff coefficient).		0.44	

Discharge Details

Diameter of discharge pipe.		100	mm
Hydraulic gradient of pipe.	1 in	100	
Roughness coefficient 'k'.		0.3	mm
Discharge rate.		6.5	l/sec

Duration	30min			60min			120min			180min			360min			720min			1440min		
		70.7	mm/hr		45.5	mm/hr		28.1	mm/hr		21	mm/hr		12.8	mm/hr		7.8	mm/hr		4.81	mm/hr
Interval min.	%	Intensity mm/hr	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.	%	Intensity mm/hr.	Cumulative Intensity mm/hr.
0																					
60				100	45.50	45.50	78.4	44.06	44.06	65.4	41.20	41.20	35.9	27.57	27.57	18.9	17.69	17.69	9.6	11.08	11.08
120							21.6	12.14	56.20	22.9	14.43	55.63	27.5	21.12	48.69	28.6	26.77	44.46	22.8	26.32	37.40
180										11.7	7.37	63.00	14.7	11.29	59.98	8.0	7.49	51.95	14.1	16.28	53.68
240													10.8	8.29	68.28	8.9	8.33	60.28	6.9	7.97	61.64
300													6.8	5.22	73.50	5.4	5.05	65.33	5.1	5.89	67.53
360													4.3	3.30	76.80	8.2	7.68	73.01	4.1	4.73	72.27
420																6.5	6.08	79.09	6.5	7.50	79.77
480																4.4	4.12	83.21	4.4	5.08	84.85
540																4.1	3.84	87.05	1.9	2.19	87.04
600																2.7	2.53	89.58	3.4	3.92	90.97
660																2.5	2.34	91.92	2.8	3.23	94.20
720																1.8	1.68	93.60	2.1	2.42	96.62
780																			2.5	2.89	99.51
840																			3.8	4.39	103.90
900																			1.5	1.73	105.63
960																			1.7	1.96	107.59
1020																			1.0	1.15	108.74
1080																			0.8	0.92	109.67
1140																			1.4	1.62	111.28
1200																			1.1	1.27	112.55
1260																			0.9	1.04	113.59
1320																			0.7	0.81	114.40
1380																			0.4	0.46	114.86
1440																			0.5	0.58	115.44

Retardation Summary

Duration			*Adopted	Cumulative		
			Cumulative	Runoff	Discharge Volume	
Interval min.			Equivalent Intensity mm/hr	CIA /360 m^3	based on discharge rate	Excess m^3
0			0			
60			45.50	860.86	23.56	837.30
120			56.20	1063.30	47.11	1016.19
180			63.00	1191.96	70.67	1121.29
240			68.28	1291.77	94.23	1197.54
300			73.50	1390.57	117.79	1272.79
360			76.80	1453.06	141.34	1311.71
420			79.77	1509.23	164.90	1344.33
480			84.85	1605.33	188.46	1416.87
540			87.05	1646.95	212.02	1434.93
600			90.97	1721.09	235.57	1485.52
660			94.20	1782.25	259.13	1523.11
720			96.62	1828.11	282.69	1545.42
780			99.51	1882.72	306.25	1576.47
840			103.90	1965.71	329.80	1635.91
900			105.63	1998.47	353.36	1645.11
960			107.59	2035.60	376.92	1658.69
1020			108.74	2057.45	400.48	1656.97
1080			109.67	2074.92	424.03	1650.89
1140			111.28	2105.50	447.59	1657.91
1200			112.55	2129.52	471.15	1658.37
1260			113.59	2149.18	494.71	1654.47
1320			114.40	2164.47	518.26	1646.20
1380			114.86	2173.20	541.82	1631.38
1440			115.44	2184.12	565.38	1618.75

FOR 1 IN 100 YEAR ARI

Maximum Retardation for no outflow condition = 2184.12 m3

Maximum Retardation for given outflow = 1658.69 m3

Outflow 100 mm dia. @ 1 in 100

Retardation Basin Capacity Calculations

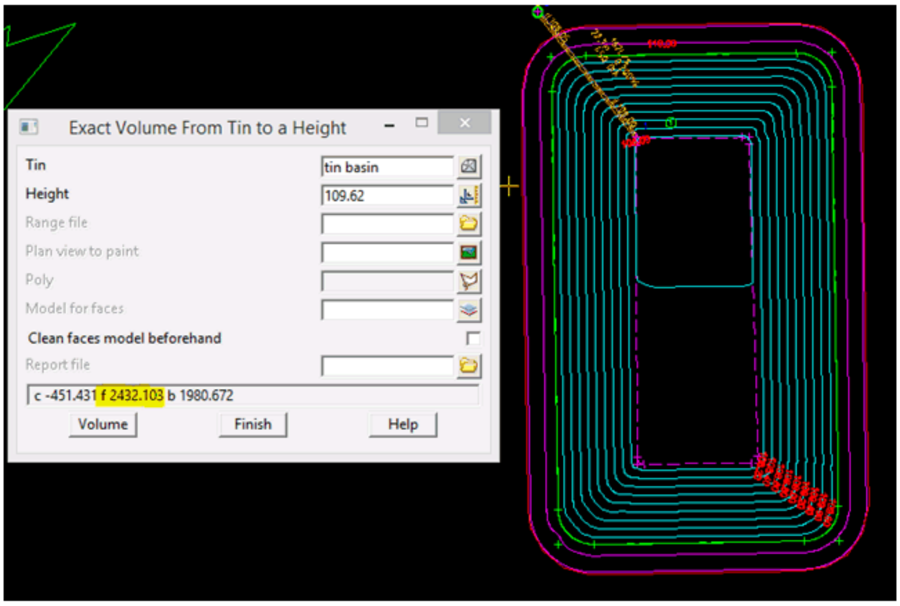
Notes:

The proposed retardation basin TWL (109.62) is based upon the existing invert level of the roadside swale drains located on Wallace Street. IDM requirements specify a minimum freeboard of 300mm below Top of Bank as long as this is "less than or equal to" the minimum invert of kerb/swale drain level within the catchment area. The minimum invert of existing swale drains is approximately 109.65 so this is OK. These levels are subject to finalisation of site and feature surveys.

Required Capacity	2,200m^3	
Existing Surface Level	110.00m	Excavated Depth
FSL (Top of Bank)	109.95m	
TWL	109.62m	(Existing Basin TWL)
Support Basin Floor Level	107.95m	
* Lowest Swale Drain Level	109.65m	

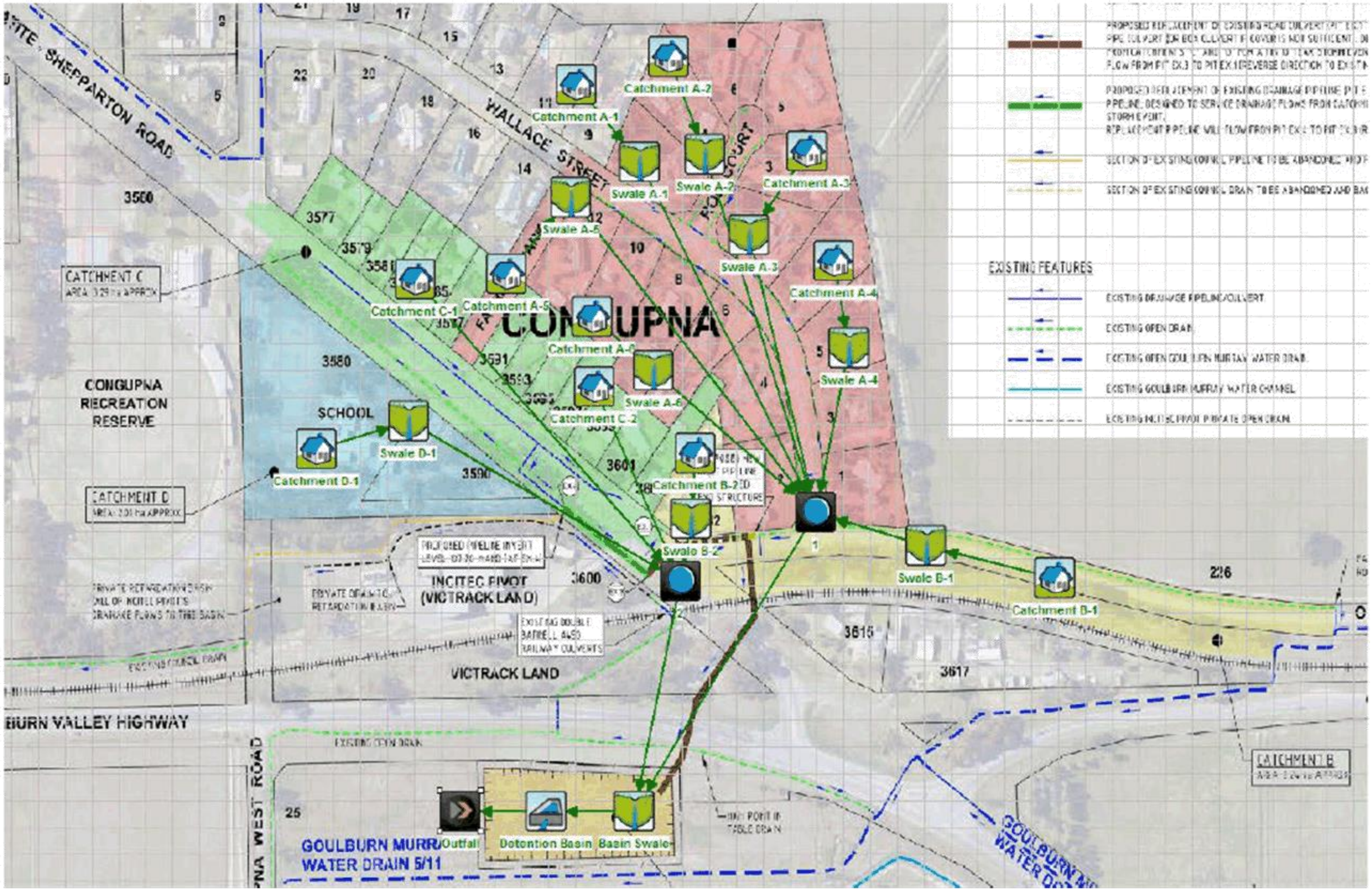
STAGE 1 SUPPORT RETENTION BASIN CAPACITY			
AVAILABLE SOIL m3			
Re-Use Sump Dimensions:			
Side A		Excavated Depth	2 m
Top	40 m	Side Slope	1 in 6
Water Level	36.04 m	Freeboard	0.33 m
Base	16 m	Depth of Water	1.67 m
Side B			
Top	70 m		
Water Level	66.04 m		
Base	46 m	APPROX. CAPACITY	2602 m^3
		EXCAVATED VOLUME	3536 m^3

12d Model Volume Calculations:



Investigations & Options
Congupna Urban Drainage Strategy– ver 5

APPENDIX E
MUSIC Concept Stormwater Treatment – Catchment 1



Investigations & Options
Congupna Urban Drainage Strategy– ver 5

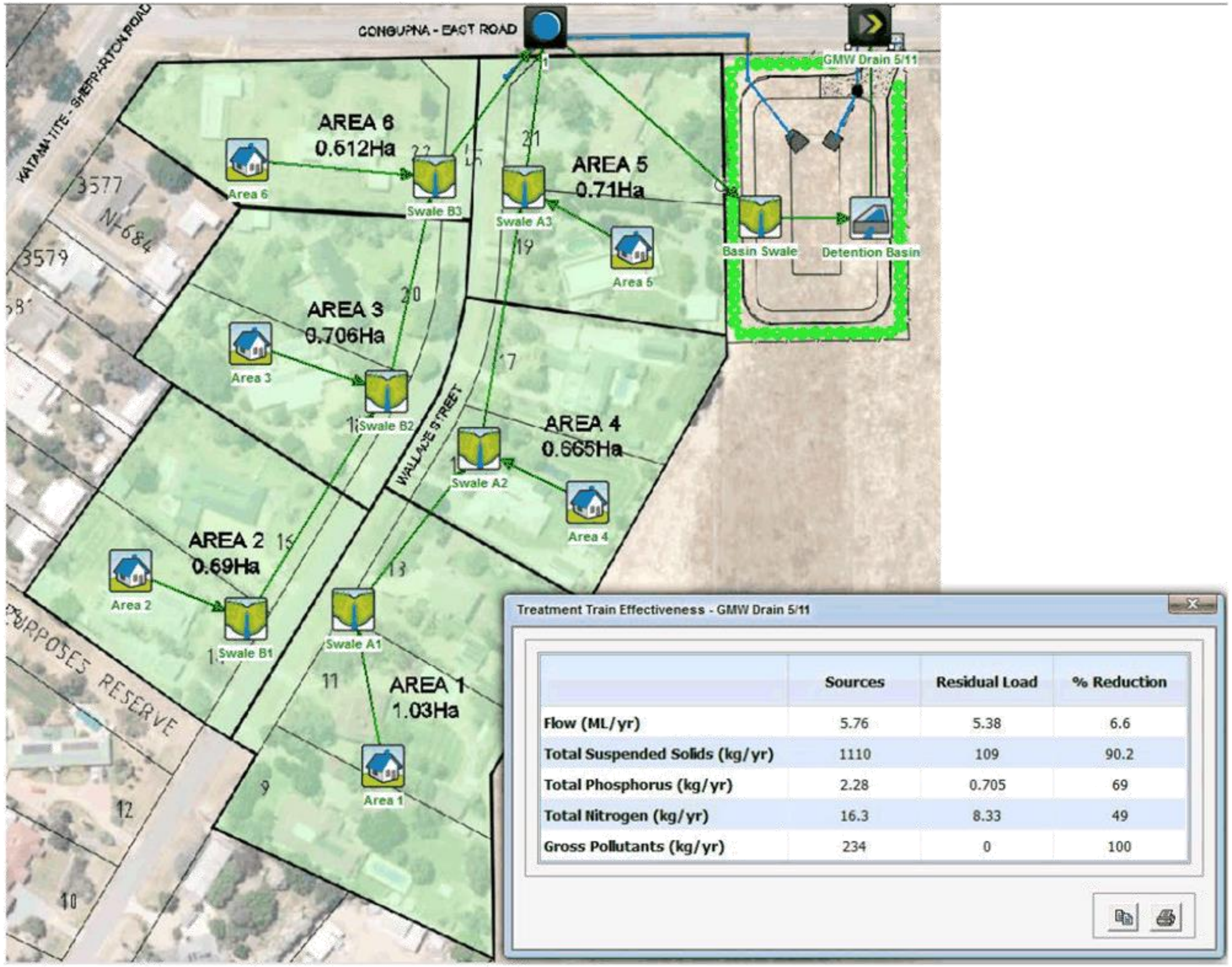
Investigations & Options
Congupna Urban Drainage Strategy– ver 5

The catchment area has been defined as follows:		The treatment nodes have been defined as follows:	
Catchment A-1 -	Area = 0.22ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale A-1 -	Total / Effective Length = 22m / 11m Bed Slope = 0.35% Base Width = 1.0m Top Width = 3.0m Depth = 0.30m Vegetation Height = 0.05m
Catchment A-2 -	Area = 0.287ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale A-2 & A-3 -	Total / Effective Length = 86m / 43m Bed Slope = 0.35% Base Width = 1.0m Top Width = 3.0m Depth = 0.3m Vegetation Height = 0.050m
Catchment A-3 -	Area = 0.92ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)		
Catchment A-4 -	Area = 1.55ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale A-4 -	Total / Effective Length = 210m / 105m Bed Slope = 0.35% Base Width = 0.7m Top Width = 7.0m Depth = 0.3m Vegetation Height = 0.050m
Catchment A-5 -	Area = 0.29ha Fraction Impervious = 25% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale A-5 -	Total / Effective Length = 180m / 9m Bed Slope = 0.35% Base Width = 1.0m Top Width = 3.0m Depth = 0.3m Vegetation Height = 0.050m
Catchment A-6 -	Area = 2.18ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale A-6 -	Total / Effective Length = 290m / 145m Bed Slope = 0.35% Base Width = 1.0m Top Width = 3.0m Depth = 0.3m Vegetation Height = 0.050m

The catchment area has been defined as follows:	The treatment nodes have been defined as follows:
Catchment B-1 - Area = 1.67ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value) Catchment B-2 - Area = 0.37ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value) Catchment C-1 - Area = 1.22ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value) Catchment C-2 - Area = 2.18ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value) Catchment D-1 - Area = 2.49ha Fraction Impervious = 25% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Existing Swale B-1 - Total / Effective Length = 430m / 215m Bed Slope = 0.10% Base Width = 3.0m Top Width = 9.0m Depth = 0.35m Vegetation Height = 0.5m Existing Swale B-2 - Total / Effective Length = 40m / 20m Bed Slope = 0.30% Base Width = 1.5m Top Width = 3.6m Depth = 0.50m Vegetation Height = 0.2m Existing Swale D-1 - Total / Effective Length = 220m / 110m Bed Slope = 0.20% Base Width = 1.0m Top Width = 3.0m Depth = 0.50m Vegetation Height = 0.1m Retardation Basin - (With extended detention time) Extended Detention Depth = 0.75m Basin Surface Area = 680m^2 Low Flow Pipe Diameter = 50mm New Swale (Within Retardation Basin) Total / Effective Length = 76m / 76m Bed Slope = 0.25% Base Width = 5.0m Top Width = 7.0m Depth = 0.50m Vegetation Height = 0.3m

APPENDIX F
MUSIC Concept Stormwater Treatment – Catchment 2

Investigations & Options
Congupna Urban Drainage Strategy– ver 5



	Sources	Residual Load	% Reduction
Flow (ML/yr)	5.76	5.38	6.6
Total Suspended Solids (kg/yr)	1110	109	90.2
Total Phosphorus (kg/yr)	2.28	0.705	69
Total Nitrogen (kg/yr)	16.3	8.33	49
Gross Pollutants (kg/yr)	234	0	100

The catchment area has been defined as follows:		The treatment nodes have been defined as follows:	
Catchment A-1 -	Area = 1.03ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)	Existing Swale A1 -	Total / Effective Length = 80m / 40m Bed Slope = 0.35% Base Width = 1.0m Top Width = 4.0m Depth = 0.35m Vegetation Height = 0.05m
Catchment A-2 -	Area = 0.69ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)	Existing Swale A2 & A3 -	Total / Effective Length = 70m / 35m Bed Slope = 0.35% Base Width = 1.0m Top Width = 4.0m Depth = 0.3m Vegetation Height = 0.05m
Catchment A-3 -	Area = 0.706ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)	Existing Swale B1 -	Total / Effective Length = 80m / 40m Bed Slope = 0.35% Base Width = 1.07m Top Width = 4.0m Depth = 0.3m Vegetation Height = 0.05m
Catchment A-4 -	Area = 0.665ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)	Existing Swale B2 -	Total / Effective Length = 80m / 40m Bed Slope = 0.35% Base Width = 1.0m Top Width = 3.0m Depth = 0.3m Vegetation Height = 0.05m
Catchment A-5 -	Area = 0.71ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)	Existing Swale B3 -	Total / Effective Length = 40m / 20m Bed Slope = 0.35% Base Width = 1.0m Top Width = 4.0m Depth = 0.3m Vegetation Height = 0.05m
Catchment A-6 -	Area = 0.512ha Fraction Impervious = 30% Soil Storage Capacity = 30mm (Default Value) Field Capacity = 20mm (Default Value)		

The catchment area has been defined as follows:	The treatment nodes have been defined as follows:
	Proposed Basin Swale - Total / Effective Length = 60m / 60m Bed Slope = 0.20% Base Width = 1.0m Top Width = 4.0m Depth = 0.35m Vegetation Height = 0.35m Retardation Basin - (With extended detention time) Extended Detention Depth = 0.45m Basin Surface Area = $680m^2$ Low Flow Pipe Diameter = 50mm

Existing vegetated swale drains located on Wallace Street.

Planning and Environment Act 1987

GREATER SHEPPARTON PLANNING SCHEME

AMENDMENT C187

EXPLANATORY REPORT

Who is the planning authority?

This amendment has been prepared by Greater Shepparton City Council, which is the planning authority for this amendment.

The Amendment has been made at the request of Greater Shepparton City Council.

Land affected by the Amendment

The proposed Amendment applies to part of 25 Congupna West Road, Congupna (Lot 1 PS717710) and part of 226 Old Grahamvale Road, Congupna (Lot 2 LP207658) as shown below on *Figure 1 – Proposed Public Acquisition Overlay*.

The land at 25 Congupna West Road, Congupna and 226 Old Grahamvale Road, Congupna is situated in the Farming Zone – Schedule 1 (FZ1) and affected by the Land Subject to Inundation Overlay.

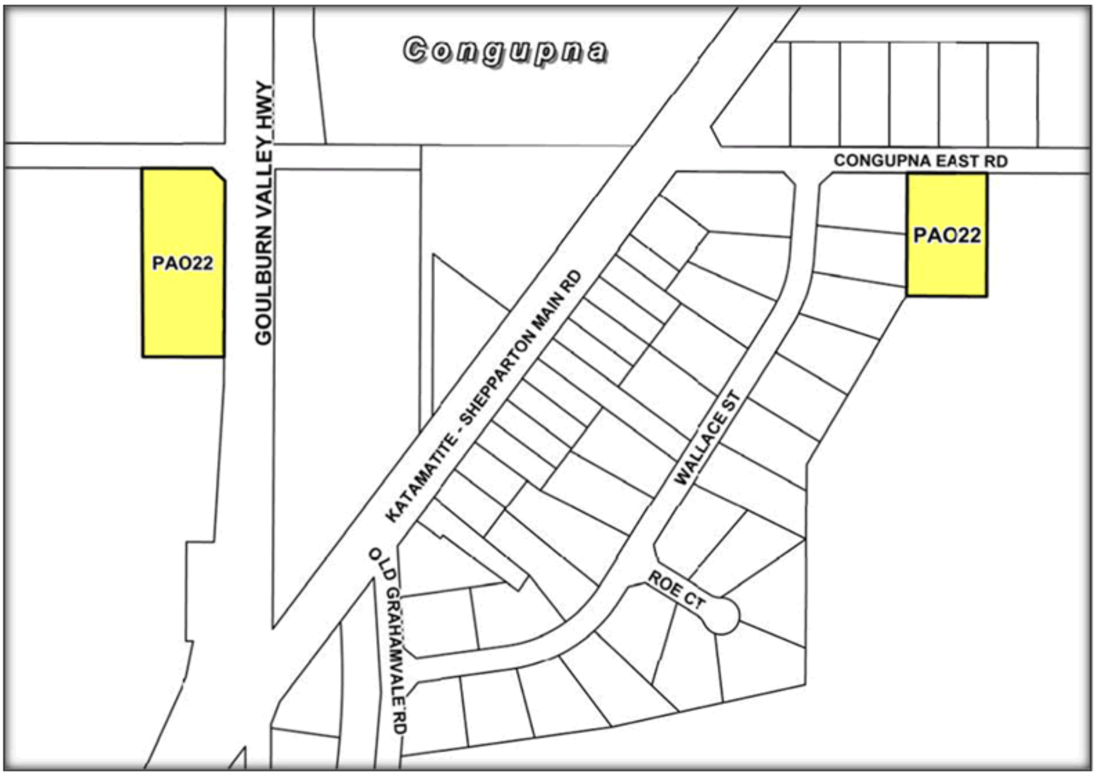


Figure 1 – Proposed Public Acquisition Overlay (Extent shaded in yellow).

What the amendment does

The proposed Amendment seeks to apply the Public Acquisition Overlay (PAO22) to part of 25 Congupna West Road, Congupna and part of 226 Old Grahamvale Road, Congupna.

The Amendment proposes to make the following changes to the Greater Shepparton Planning Scheme (Planning Scheme):

- Amend map 11PAO to include part of 25 Congupna West Road, Congupna and part of 226 Old Grahamvale Road, Congupna; and
- Amend the Schedule to the Public Acquisition Overlay (at Clause 45.01) to include PAO22.

Strategic assessment of the Amendment

Why is the Amendment required?

The proposed Amendment is required to reserve land for the construction of drainage infrastructure necessary to address flooding issues in urban Congupna.

A localised storm event occurred within the region of Congupna during the period of 28 February 2012 to 1 March 2012 that produced rainfall of 200mm to 250mm. It was considered to be around a 1% annual exceedance probability (1 in 100 years ARI) storm event.

During this flood event, sections of the swale drains along both sides of Wallace Street, Congupna (effectively the entire nature strip) were observed to hold water for at least two days, affecting public and private infrastructure.

The *Congupna Urban Drainage Strategy March 2016* (the Strategy) presents the proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment. The Strategy seeks to satisfy the integrated site based stormwater management plan obligations for the catchment. The proposed solution seeks to minimise the drainage and stormwater infrastructure to be maintained and renewed by Council while providing Congupna with an appropriate level of drainage and stormwater, detention and treatment in accordance with the requirements of Greater Shepparton City Council and Goulburn-Murray Water (G-MW).

The Strategy recommends that a drainage upgrade will require the construction of two new retardation basins to be located at the north end of 25 Congupna West Road, Congupna and part of 226 Grahamvale Road, Congupna, abutting Congupna East Road. The land is privately owned and must be acquired to realise the ultimate stormwater drainage infrastructure for the catchment.

Preliminary discussions with landowners have been undertaken; however, Council officers have not been able to negotiate the purchase of this land. The only alternative for Council to acquire this land is through the application of the Public Acquisition Overlay (PAO). This would facilitate the acquisition of the land in accordance with the *Land Acquisition and Compensation Act 1986*.

How does the Amendment implement the objectives of planning in Victoria?

The Strategy identifies the land proposed for inclusion within the PAO for stormwater and drainage infrastructure uses. The acquisition of this land will enable the stormwater and drainage upgrades required to address flooding issues in the urban areas of Congupna. This will result in a safer and more pleasant environment for both the existing and future communities of Congupna. As such, the proposed Amendment is consistent with the objectives of planning in Victoria set out at Sections 4(1)(a), (b), (c), (e), (f) & (g) of the *Planning and Environment Act 1987* (the Act).

In regard to Objective 4(1)(b), it is expected that the proposed acquisition of land will have positive impacts on the subject site and surrounding natural and physical environs. Appropriate infrastructure to store and treat stormwater prior to it discharging into the existing G-MW drain will reduce flood associated risks and damage to property, and infrastructure by storing excess runoff during extreme rainfall events and releasing the stored water over time in a controlled manner.

How does the Amendment address any environmental, social and economic effects?

Environmental Effects

The proposed Amendment will result in positive environmental outcomes as the realisation of the Strategy will enhance the water quality prior to its discharge into the G-MW drainage system and will reduce the opportunity for water to stagnate in urban Congupna and breed mosquitos or generate strong odours.

The land affected by the proposed Amendment does not appear to have any significant environmental attributes; therefore, applying a PAO to the land will not have any adverse environmental effects.

Social Effects

The proposed Amendment will have positive social benefits for the residents of urban Congupna by facilitating the stormwater drainage infrastructure upgrades required to create a safer and more pleasant environment. In addition, the proposed Amendment will reduce the likelihood and severity of flood damage to property and infrastructure during an extreme flood event.

There are no significant adverse social implications associated with this proposed Amendment.

Economic Effects

The proposed Amendment will have positive economic benefits by facilitating the stormwater drainage infrastructure upgrades required to address flooding issues in urban Congupna that have had detrimental economic impacts in the past, including damage to property and loss of productivity.

The construction of two new retardation basins in Congupna will reduce the likelihood and severity of flood damage to property and infrastructure by storing excess runoff during extreme rainfall events and releasing the stored water over time in a controlled manner.

There are no significant adverse economic implications associated with this proposed Amendment.

Does the Amendment address relevant bushfire risk?

The subject land is not located within a Bushfire Management Overlay and the drainage infrastructure proposed in the Strategy will have no impact on the risk of bushfire.

Does the Amendment comply with the requirements of any Minister's Direction applicable to the amendment?

The proposed Amendment is consistent with the Ministerial Direction on the Form and Content of Planning Schemes under Section 7(5) of the Act.

The proposed Amendment is consistent with Ministerial Direction No. 11 Strategic Assessment of Amendments under Section 12(2)(a) of the Act.

How does the Amendment support or implement the State Planning Policy Framework and any adopted State policy?

The proposed Amendment is consistent with and supportive of the State Planning Policy Framework as follows:

A strategy of Clause 11.10-3 – *Planning for growth* is relevant *to support growth and development in other existing urban settlements and foster the sustainability of small rural settlements.*

A focus on economic growth and development in Shepparton has been identified as a priority in the *Hume Regional Growth Plan 2014*. The proposed Amendment will facilitate the realisation of stormwater drainage infrastructure, and promote the growth and development in this area of Shepparton.

A strategy of Clause 19.03-2 – *Water supply, sewage and drainage* is *to plan urban stormwater drainage systems to include measures to reduce peak flows and assist screening, filtering and treatment of stormwater, to enhance flood protection and minimise impacts on water quality in receiving waters.*

The inclusion of the subject land within the PAO will enable Council to acquire the land in order to upgrade the stormwater drainage infrastructure in accordance with the Strategy, and improve water quality, reduce peak flows and enhance flood protection during a flood event.

How does the Amendment support or implement the Local Planning Policy Framework, and specifically the Municipal Strategic Statement?

The proposed Amendment is supportive of and assists in the implementation of the Municipal Strategic Statement (MSS) as follows:

A strategy of Clause 21.05-2 – *Floodplain Management* is *to ensure all new development maintains the free passage and temporary storage of floodwater, minimises flood damage, is compatible with flood hazard local drainage conditions, and minimises soil erosion, sedimentation and silting.*

Two objectives of Clause 21.07-3 – *Urban Stormwater Management* are relevant to the proposed Amendment and are listed below:

- To maintain and enhance stormwater quality throughout the municipality.
- To ensure that new development complies with the Infrastructure Design Manual.

In response to recent flooding in urban Congupna, the proposed Amendment will facilitate the construction of two new retardation basins in accordance with the *Infrastructure Design Manual*. The upgrade to stormwater drainage infrastructure will provide the capacity to store and treat stormwater prior to it discharging into the existing G-MW drain, and reduce flood associated risks and damage to property and infrastructure. The proposed Amendment is consistent with an objective of Clause 21.04-5 – *Community Life* and is listed below:

- To address community safety in the planning and management of the urban environment.

Does the Amendment make proper use of the Victoria Planning Provisions?

The proposed Amendment makes proper use of the Victoria Planning Provisions (VPPs). The purpose of the PAO is to *designate a Minister, public authority or municipal council as an acquiring authority for land reserved for a public purpose.*

The subject land is required to serve a public purpose (drainage infrastructure for the storage, treatment and discharge of stormwater). The only overlay within the VPPs that specifically provides for land to be acquired by a public authority is the PAO.

How does the Amendment address the views of any relevant agency?

During the preparation of the Strategy, G-MW provided "in principle approval" for the location of the proposed drainage infrastructure.

VicRoads was also consulted during the preparation of the Strategy and has provided comments on the location and construction of the proposed drainage infrastructure.

Whilst the relevant agencies have been contact and the views are largely known, all relevant authorities will be notified in accordance with the *Planning and Environment Act 1987.*

Does the Amendment address relevant requirements of the Transport Integration Act 2010?

The purpose of the *Transport Integration Act 2010* is to create a new framework for the provision of an integrated and sustainable transport system in Victoria. The vision statement recognises the aspirations of Victorians for an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible state.

The objectives of the *Transport Integration Act 2010* relate to social and economic inclusion, economic prosperity, environmental sustainability, integration of transport and land use, efficiency, coordination and reliability, safety, and health and wellbeing.

The Minister has not prepared any statements or policy principles under Section 22 of the *Transport Integration Act 2010*; therefore, no such statements are applicable to the proposed Amendment.

The proposed Amendment will allow for the implementation of the Strategy. The location of the proposed PAO does not have any transport implications.

Resource and administrative costs

- **What impact will the new planning provisions have on the resource and administrative costs of the responsible authority?**

The proposed Amendment will not place any unreasonable resource or administrative cost on the Greater Shepparton City Council.

Where you may inspect this Amendment

The Amendment is available for public inspection, free of charge, during office hours at the following places:

Greater Shepparton City Council
90 Welsford Street
Shepparton

The Amendment can also be inspected free of charge at the Department of Environment, Land, Water and Planning website at www.delwp.vic.gov.au/public-inspection.

Submissions

Any person who may be affected by the Amendment may make a submission to the planning authority. Submissions about the Amendment must be received by [insert submissions due date].

A submission must be sent to:

Greater Shepparton City Council
Locked Bag 1000
Shepparton VIC 3632

Panel hearing dates

In accordance with clause 4(2) of Ministerial Direction No.15 the following panel hearing dates have been set for this amendment:

- directions hearing: [insert directions hearing date]
- panel hearing: [insert panel hearing date]