Amendment C187
Greater Shepparton Planning Scheme

Planning Authority Submission to the Independent Planning Panel

20 September 2016

Responsible Officer:	Grace Docker	Team Leader Strategic Planning:	Michael MacDonagh
Signature:		Signature:	
Date:		Date:	

CONTENTS

1. INTRODUCTION

This submission is made on behalf of Greater Shepparton City Council (**Council**), which the Planning Authority for Amendment C187 (**Amendment**).

The Amendment relates to the Subject Land, being part of 25 Congupna West Road, Congupna (Lot 1 PS717710) and part of 226 Old Grahamvale Road, Congupna (Lot 2 LP207658).

The 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.

Council submits that the Amendment is appropriate and should proceed subject to post-exhibition changes.

2. PARTICULARS OF THE AMENDMENT

The proponent of the Amendment is Greater Shepparton City Council.

Specifically, the Amendment seeks to make the following changes to the Greater Shepparton 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.

3. SUBJECT LAND AND SURROUNDS

The Subject Land is located at Congupna, which is approximately ten kilometres north of the Shepparton Central Business District (see *Figure One – Locality Plan*).

Congupna has been divided into two drainage catchments and a drainage basin is proposed to serve each catchment. A basin is proposed to be constructed on two independent sites as follows:

- Basin A: Lot 1 PS717710, known as 25 Congupna West Road, Congupna; and
- Basin B: Lot 2 LP207658, known as 226 Old Grahamvale Road, Congupna.

Basin A:

- is located within the Farming Zone – Schedule 1 (**FZ1**) and is affected by the Land Subject to Inundation Overlay (**LSIO**) (see *Figure Two – Zone and Overlay Map*);
- abuts a Goulburn-Murray Water (**G-MW**) drain to the west (see *Figure two – Zone and Overlay Map);*
- comprises of approximately one hectare and contains no significant native vegetation.
- abuts Goulburn Valley Highway (Road Zone – Category 1) to the east, Congupna West Road to the north and land in the FZ1 to the south and west. Further to the east is land within the Township Zone (**TZ**); and
- is located in close proximity to the Congupna Township (see *Figure Three – Aerial Photograph*).

Basin B:

- is located within the FZ1 and the Land Subject to Inundation Overlay (**LSIO**) applies to the land(see *Figure Two – Zone and Overlay Map*);
- abuts a G-MW drain to the north (see *Figure Two – Zone and Overlay Map);*
- comprises of approximately one hectare and contains no significant native vegetation.
- abuts Congupna East Road to the north, land within the TZ to the west and land in the FZ1 to the south and east; and
- is located in close proximity to the Congupna Township (see *Figure Three – Aerial Photograph*).

Figure One - Locality Plan

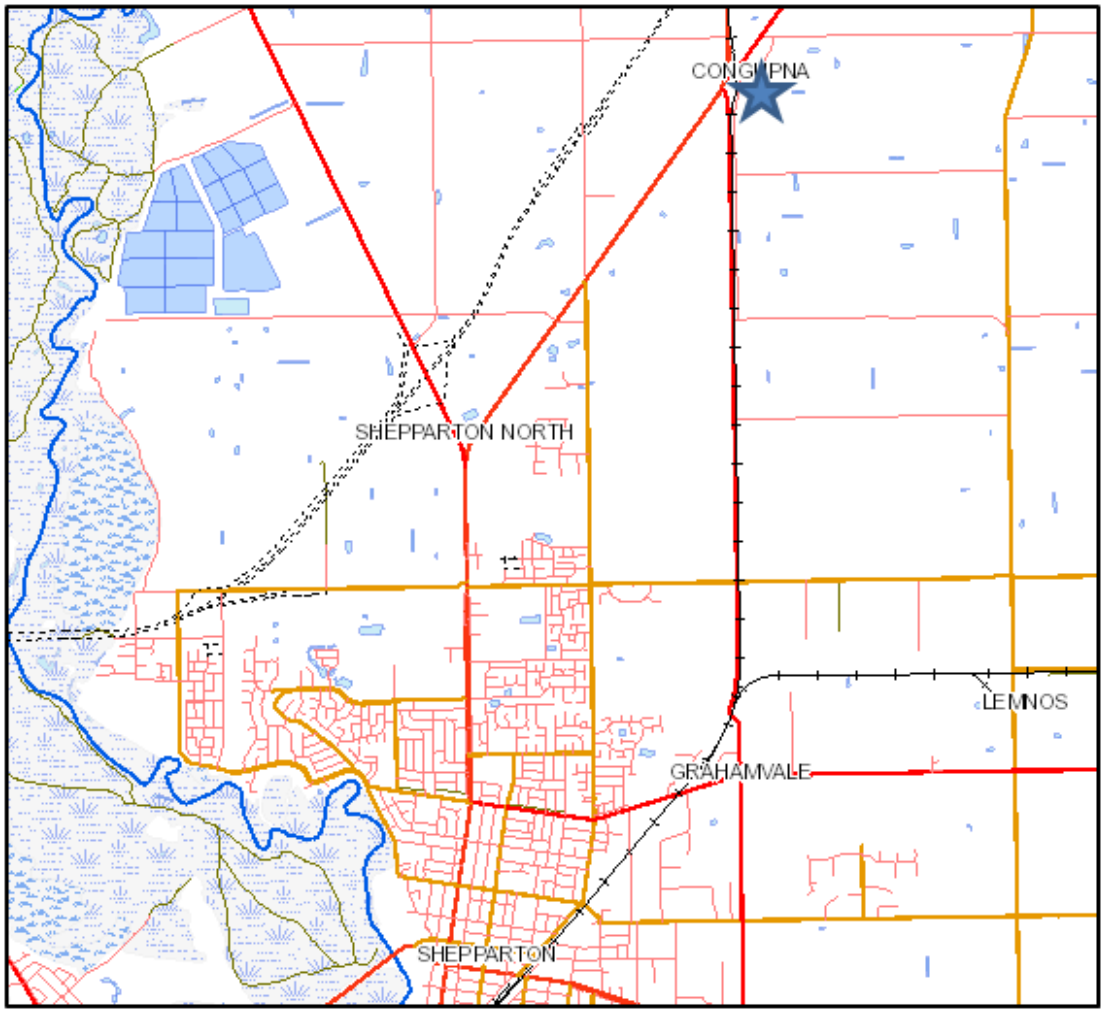


Figure Two - Zone and Overlay Map (land affected outlined in grey and G-MW drains shown as dashed green line)

Figure Three - Aerial Photograph (land affected outlined in blue)

4. STRATEGIC JUSTIFICATION

4.1 Why is the Amendment required?

The proposed Amendment is required to reserve land for the construction of drainage infrastructure necessary to provide the required 1% Annual Exceedance Probability (**AEP**) level of service in the Congupna Township.

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% AEP (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**), (see *Attachment 1 – Congupna Urban Drainage Strategy, March 2016)*, presents the proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment. The Strategy was endorsed by Council at the 17 May 2016 Ordinary Council Meeting. 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 the *Infrastructure Design Manual* (**IDM**) 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.

4.2 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.

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

4.3.1 Environmental

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.

4.3.2 Social

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

4.3.3 Economic

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.

4.4 Does the Amendment address relevant bushfire risk?

The Amendment has been assessed to determine whether it will cause any increase to the risk to life (as a priority), property, community infrastructure or the natural environment from bushfire.

The Amendment is consistent with the Local Planning Policy Framework objectives and strategies that apply to bushfire risk. The Amendment site is not included within the Bushfire Management Overlay. The Subject Land is not within an area identified under the *Building Regulations 2006* as being bushfire prone for the purposes of the building control system.

Acquiring the land for the future construction of a drainage basin will not cause any increase in risk to life, property, community infrastructure or the natural environment.

The Country Fire Authority was provided with an opportunity to comment on this proposal during the formal exhibition process associated with this Amendment. The Country Fire Authority did not provide any comments regarding the proposal.

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

This Amendment is consistent with the Ministerial Direction on the Form and Content of Planning Schemes under Section 7(5) of the *Planning and Environment Act 1987* and is consistent with Ministerial Direction No 11 – *Strategic Assessment of Amendments*.

The Amendment complies with the applicable Minister's Directions.

4.6 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.

4.7 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:

An objective of Clause 21.04-5 – *Community Life* is to *address community safety in the planning and management of the urban environment.*

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 the Congupna Township, the proposed Amendment will facilitate the construction of two new retardation basins in accordance with the IDM. 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.

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

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 Victoria Planning Provisions that specifically provides for land to be acquired by a public authority is the PAO.

4.9 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.

All relevant referral authorities were notified with a copy of the proposed Amendment during exhibition. No referral authorities objected to or requested any changes to the Amendment.

4.10 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, and safety and health and wellbeing.

Given the intention of this Amendment, the future development of a drainage infrastructure will result in a negligible impact regarding traffic on the surrounding road network. The Amendment will not have any significant impact on the transport system, as defined by Section 3 of the *Transport Integration Act 2010*.

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

VicRoads was notified with a copy of the Amendment during exhibition. VicRoads did not object or request any changes to the Amendment.

The Amendment will not have a significant impact on the transport system, considering the very limited development opportunity it creates and the established road network within, and to and from the area.

5. AMENDMENT PROCESS

5.1 Authorisation

In accordance with Section 8A of the *Planning Environment Act* 1987, Council received authorisation to proceed with conditions on 17 May 2016. Minor wording changes were made to the Amendment documentation prior to exhibition to ensure these conditions were satisfied.

5.2 Exhibition

The Amendment was exhibited in accordance with the *Planning and Environment Act 1987* for four weeks; 9 June 2016 to 11 July 2016. This included the following:

- Letters sent to owners and occupiers of land directly affected on 30 May 2016 (see Appendix A – *Map of Owners and Occupiers Notified*);
- Letters sent to relevant referral authorities on 30 May 2016;
- Letters sent to prescribed Ministers on 30 May 2016;
- Notice in the Victorian Government Gazette on 9 June 2016;
- Notice in the Shepparton News on 31 May 2016;
- Notice on Greater Shepparton City Council website;
- Notice on Department of Environment, Land, Water and Planning website; and
- Copy of exhibition documentation in the foyer of the Council offices at 90 Welsford Street, Shepparton.

Eight submissions have been received by Council. Of these, two objected to or requested changes to the Amendment. Five submissions were received from referral authorities and one from the owners of the Subject Land, none of which raised any objections to the Amendment.

5.3 Submissions that did not object or request changes to the Amendment

5.3.1 Submission No 1

Submission received from VicRoads.

No objection or changes to the Amendment.

No action required by Council.

5.3.2 Submission No 2

Submission received from the Goulburn Broken Catchment Management Authority.

No objection or changes to the Amendment.

No action required by Council.

5.3.3 Submission No 3

Submission received from Environment Protection Authority (Victoria – North East).

No objection or changes to the Amendment.

No action required by Council.

5.3.4 Submission No 4

Submission received from Department of Environment, Land, Water and Planning.

No objection or changes to the Amendment.

No action required by Council.

5.3.5 Submissions No 5

Submission received from Camerons Lawyers Pty Ltd care of the land owners of 226 Old Grahamvale Road, Congupna (Subject Land).

No objection or changes to the Amendment.

No action required by Council.

5.3.6 Submissions No 8

Submission received the Department of Economic Development, Transport, Jobs and Resources.

No objection or changes to the Amendment; provides support for the Amendment.

No action required by Council.

5.3.7 Submissions No 9

Submission received the Goulburn-Murray Water.

No objection or changes to the Amendment.

No action required by Council.

5.4 Submissions that objected or requested changes to the proposed Amendment

Council officers have received two submissions that objected to or requested changes to the proposed Amendment. (see Appendix B – *Submissions Received Objecting to Amendment)*. These submissions were unable to be resolved (see *Figure Four – Locations of Submitters with Objections*).

Figure Four - Locations of Submitters with Objections

Council officers met with these two submitters to discuss the content of their submissions. See meeting details, below.

- Submitter 6

  1st Meeting: 8:30am on 12 July 2016 at Council Offices.

  Attendees: Submitter 6, Graduate Strategic Planner Amendments, Senior Strategic Planner, Design Officer, Team Leader Design Services.

  2nd Meeting: 3:45pm on 15 July 2016 at Council Offices.

  Attendees: Submitter 6, Graduate Strategic Planner Amendments, Senior Strategic Planner.

- Submitter 7

  Meeting: 9:00am on 12 July 2016 at Council Offices.

  Attendees: Submitter 6, Graduate Strategic Planner Amendments, Senior Strategic Planner, Design Officer, Team Leader Design Services.

- Submitters 6 & 7

  Meeting: 8:30am on 22 July 2016 at Council Offices.

  Attendees: Submitters 6 & 7, Senior Strategic Planner, Graduate Strategic Planner Amendments, Design Officer, Coordinator Property.

5.4.1 Submission No 6

Submission received from land owners B & T Jones of 19 Wallace Street, Congupna.

Raised concerns regarding the location of proposed basin B, questioned the need for the proposed basins, the fence and tree barrier around proposed basin B, maintenance of proposed basin B, drainage of proposed basin B and access through proposed basin B to the rear of 19 Wallace Street, Congupna.

Council's position regarding submissions is detailed in Part 7 of this Submission. Submission referred to an Independent Planning Panel for consideration.

5.4.2 Submission No 7

Submission received from land owners M & M Walker of 21 Wallace Street, Congupna.

Raised concerns regarding the location of proposed basin B, the fence and tree barrier around proposed basin B, maintenance of proposed basin B, drainage of proposed basin B and access through proposed basin B to the rear of 21 Wallace Street, Congupna.

Council's position regarding submissions is detailed in Part 7 of this Submission. Submission referred to an Independent Planning Panel for consideration.

6. KEY ISSUES RAISED IN SUBMISSIONS

6.1 Location of the proposed basin

Submission Nos. 6 and 7 raise concerns regarding the location of proposed basin B. The submissions request that the basin be located further to the east along Congupna East Road on the other side of the paddock.

6.2 Need for the proposed drainage infrastructure

Submission Nos. 6 questioned the actual need for the proposed drainage infrastructure.

6.3 Fence and tree barrier around the proposed basin

Submission Nos. 6 and 7 raise concerns regarding the proposed 1.8 metre chain wire fence and tree screen plantation around the perimeter of proposed basin B, stating that the fence and tree screen plantation will obstruct the adjacent land owners' view from the back of their lots, thus impacting on the amenity they currently enjoy.

6.4 Maintenance of the proposed basin

Submission Nos. 6 and 7 raise concerns that proposed basin B would provide an area for snakes and foxes to live, and present fire risk if it was not properly maintained. The concern is that the maintenance schedule currently employed at similar rural basins is not regular enough to satisfy concerns. Additionally, the practice of spraying around fences to kill all grasses will create mud and dust.

6.5 Drainage of the proposed basin

Submission Nos. 6 and 7 raise concerns that water will lie stagnant in proposed basin B creating an unpleasant odour and an environment for mosquitos to breed.

6.6 Access through the proposed basin

Submission No. 6 requests that an easement be granted across proposed basin B so that access to the basin exists so that Submitter No. 6 may ensure that the basin is maintained and is not a habitat for snakes and foxes.

Submission No. 7 requests an easement be granted across proposed basin B to allow access to the back of 21 Wallace Street, Congupna.

An access point over the G-MW drain exists on the north west boundary of 226 Old Grahamvale Road, Congupna, where basin B is proposed. Submitter No. 7 has a "handshake agreement" with the land owners of 226 Old Grahamvale Road, Congupna to use that access point over the G-MW drain to gain access to the rear of their property where a shed has been recently built. The shed was intended to store a caravan. The shed cannot be accessed by the caravan (height restriction of carport) from the front of their property and would rely on access from the rear of their property.

Submitter No. 7 stated that they were unaware of Council's intention to apply the PAO when the building permit was lodged for the shed and would have made alternative access arrangements if they had been made aware at that time.

7. COUNCIL'S POSITION REGARDING SUBMISSIONS

This section details Council officers' position regarding the concerns raised in submissions and meetings with objectors. Letters of response to Submission Nos. 6 and 7 are attached in Appendix C – *Letters of Response to Objections*.

7.1 Location of the proposed basin

Council officers do not support moving the location of the basin.

Reasons for proposed basin location:

- When initially approached by Council, the landowner of the proposed site for basin B indicated that this would be their preferred location (best configuration for usable farm land).
- The proposed basin is designed to discharge into the existing G-MW drain along Congupna East Road, which is the drain that the Wallace Street drainage currently outfalls to. The proposed basin is located adjacent to this G-MW drain. This will reduce construction costs.
- Proposed basin location is at lowest corner of paddock.
- Proposed basin location is close to the drainage catchment which it shall serve.

To locate the proposed basin in another location:

- Further west would require a longer discharge pipe and increase the cost for the works.
- Further east would require a longer 450mm diameter inlet pipe from Wallace Street to the proposed basin (increasing construction cost).

  If the proposed basin was located further to the east, the basin would need to be deeper increasing the probability of encountering unfavourable ground conditions.

Additionally, Council officers do not believe that potential maintenance concerns are justification to shift the basin.

7.2 Need for the proposed drainage infrastructure

The justification for the proposed drainage infrastructure is provided in the *Congupna Urban Drainage Strategy, March 2016* (see Appendix D – *Congupna Urban Drainage Strategy, March 2016)* and the Expert Witness Report (see Appendix F – *Expert Witness Report*). A summary of the justification is provided below.

Residential development along Wallace Street was designed and constructed in two stages as follows:

- Congupna Village Subdivision Stage 1 – Old Grahamvale Road to Farrell Park (existing drainage catchment designed to drain to the south)
- Congupna Village Subdivision Stage 2 –Farrell Park to Congupna East Road (existing drainage catchment designed to drain to the north)

Wallace Street residential development occurred at a time when less stringent development conditions were in place.

Congupna Village Subdivision Stage 1 and Stage 2 drainage catchments currently achieve drainage retardation via large roadside drains along both sides of Wallace

Street (straddling nature strip and private property). These roadside drains currently have insufficient storage capacity to meet current IDM/G-MW requirements.

The IDM is a manual that was designed to clearly document and standardise Council requirements for the design and development of municipal infrastructure. All new developments are required to meet IDM requirements.

G-MW requires drainage runoff generated from a 1% AED rainfall event falling on a catchment to be retained within that catchment for 24 hours prior to discharging into a G-MW drains at an appropriate rate.

The proposed drainage basins shall provide sufficient drainage storage capacity away from nature strips of services the Congupna Village Subdivision Stage 2 to meet the IDM/G-MW requirements.

7.3 Fence and tree barrier around the proposed basin

The proposed tree screen plantation has been removed from the design as a result of submissions.

The proposed perimeter fence of the basin can be altered from a 1.8 metre chain wire fence to a rural post and wire fence. With the alteration in fence type, to ensure safety, the basin walls will be flattened to a grade of 1 in 8 to provide a more gradual decline from the perimeter of the basin towards the bed of the basin, meeting the IDM requirements.

Council officers have altered the detailed design to accommodate this change.

7.4 Maintenance of the proposed basin

Once the land is acquired, it will become a Council asset and therefore part of Council's maintenance regime. The fences will be sprayed and open areas slashed periodically. Once constructed, the pump at the proposed basin will be observed regularly by Council officers, ensuring that Council's Maintenance Team will be onsite to monitor the condition of the basin.

Additionally, if local residents observe any maintenance concerns, they can contact Council to have the issue addressed.

7.5 Drainage of the proposed basin

The proposed basin is designed to operate as a dry basin, meaning that water shall not be retained permanently within the proposed basin. Water will be completely pumped out of the basin in sufficient time to prevent any issues relating to stagnant water. Water will remain in the basin only during and immediately after a rain event. In a 1 in 100 year event, the basin can fill with water to a depth of 1.67 metres and can discharge into the G-MW drain at a rate of 5.2 litres per second and will be fully discharged in approximately five days.

7.6 Access through the proposed basin

Council officers have received legal advice, which states that Council should not consent to the request to provide an easement for access through proposed basin B as it creates a precedent or expectation for other property owners abutting Council owned reserves to receive similar access rights.

From a risk management perspective, Council could be held liable if anything was to happen to anyone or thing travelling over that easement; Council should not expose itself to this risk.

Providing an easement over proposed basin B may restrict what Council is able to do with the land and its management in the future.

Lastly, Council officers do not believe that potential maintenance concerns are sufficient justification to provide an easement through basin B to allow adjoining land owners to maintain the basin to their satisfaction.

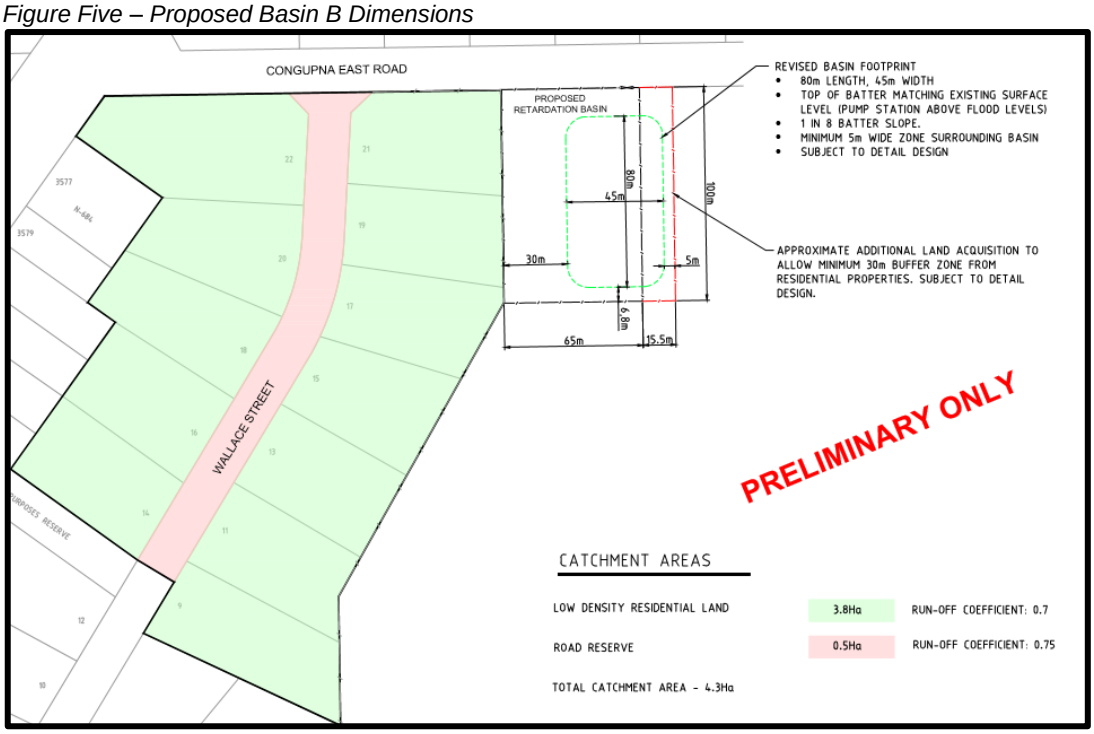
8. POST EXHIBITION CHANGES

Initially, Council proposed an acquisition land for basin B with the dimensions of 65m x 100m. The Environment Protection Authority requires a minimum setback distance of 30m for dams or basins from the boundaries of property that utilise a septic water treatment system, such as the properties adjoining the acquisition site for proposed basin B.

The requirement is the EPA Code of Practice – onsite wastewater management, stating that a retardation basin must have a setback distance of 30m from a property with a septic treatment and grey water effluent treatment.

In order for proposed basin B to comply with the EPA requirement of a 30m buffer, it has been determined that additional land acquisition is required. The amended area of required land acquisition is now 80.5m x 100m (see below *Figure Five – Proposed Basin B Dimensions)*.

Figure Five – Proposed Basin B Dimensions



Council officers met with the land owners of 226 Old Grahamvale Road, Congupna (site of proposed basin B) on 25 July, 2016 to explain the need to increase the extent of the PAO to allow for additional land to be acquired to construct basin B, given the EPA setback requirement.

The land owners of 226 Old Grahamvale Road, Congupna have provided a letter of support for the request to acquire additional land to construct basin B (see Appendix E – *Post-Exhibition Changes*).

Revised amendment documentation (map 11PAO) has been received from the Department of Environment, Land, Water and Planning (see Appendix E – *Post-Exhibition Changes*) reflecting this post-exhibition change.

9. CONCLUSION

Amendment C187 to the Greater Shepparton Planning Scheme has sound strategic justification. The Amendment is supported by the provisions of the Greater Shepparton Planning Scheme and the *Congupna Urban Drainage Strategy, March 2016*.

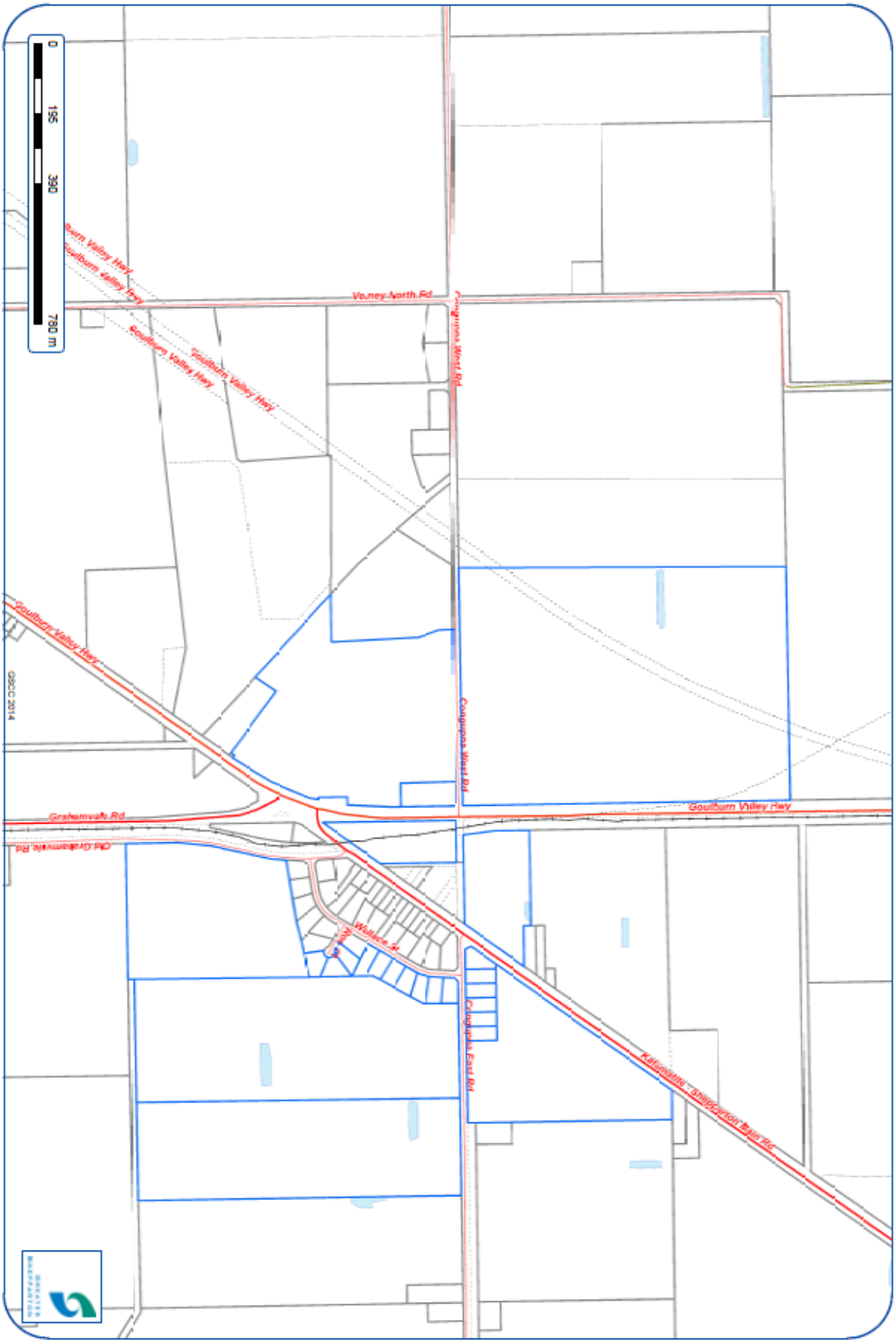
The submissions have been considered by Council and no changes are proposed to be made to the exhibited amendment documentation based on the concerns raised in the submissions. Changes to the design of proposed basin B have been made to satisfy concerns relating to the proposed fence and tree barrier.

Submissions requested that Council should grant access through proposed basin B to the rear of their lots; however, Council cannot consent to this request because it creates precedent for such expectations, creates an unnecessary risk to Council, and may limit Council's use and maintenance of this land in the future.

Post-exhibition changes to Amendment C187 are required to increase the extent of PAO22 to allow for a 30 metre setback distance from residential boundaries with septic water treatment systems (EPA requirement).

All steps in the planning scheme amendment process to date have been undertaken in accordance with the *Planning and Environment Act 1987*.

APPENDIX A – Map of Owners and Occupiers Notified



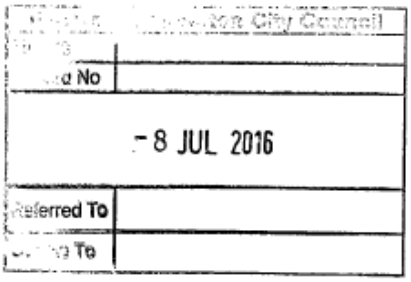
APPENDIX B – Submissions Received Objecting to Amendment

Submission Number 6

Greater Shepparton City Council

90 Welsford St

Shepparton 3630



8th July 2016

Amendment C187

PAO22

Letter of objection

Dear Mr MacDonagh,

Thank you for the notification of the proposed amendment at 226 Old Grahamvale Rd, Congupna. Our concerns are related to the location of the proposed catchment basin as it lies on the boundary of our property. The wet area will provide a favourable place for vermin to live, such as snakes and foxes. The wet area may also in turn attract mosquitos which may prove a problem to our young family during the warmer weather and inhibit our ability to enjoy the outdoors. The stagnant water will potentially have an offensive smell, and if the area not maintained the long grass will prove messy and also a fire risk. Currently the drainage channel along Congupna East Road is not well maintained and this increases our concern of the proposed dam.

We purchased this property with the view to be "out of town" and to have space around. The proposed dam and fencing will potentially close us in, hence defeating the purpose of rural living. The proposed dam and fencing will also prevent access to the rear of our property if this were to be required.

We would not like to see the proposed fencing around the dam as this would look unsightly and also in time the trees will block our view across the land, which we currently enjoy on a regular basis.

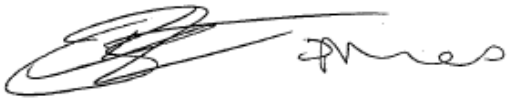
We agree diverting the water from the drains in Wallace St is a great idea, however we would propose the dam be moved further along Congupna East Road away from the boundary fences of the established houses. Also we would prefer not to have a 1.8meter fence surrounding the dam.

We have been into the Welsford St offices and also the depot and have discussed our concerns with the engineering department. After this discussion a verbal report explained an alteration to the gradient of the catchment basin can alter the fencing to a rural fence, rather than 1.8m in height.

We look forward to hearing from you,

Many thanks for considering our concerns.

Ben & Tara Jones



19 Wallace St

Congupna 3633

0407 587 105

Submission Number 7

Monday, 4 July 2016

Michael MacDonagh

Team Leader Strategic Planning

Greater Shepparton City Council

Reference – Amendment C187 PAO22 Lot 1 PS717710

Letter of Objection/Alternatives

Dear Mr MacDONAGH,

I would like to thank you for the opportunity for allowing us to have our say.

As of the beginning of this year my wife and I began planning for a shed. We looked into an American Barn because we like the look and it features a 3.5m high roller door, perfect for a caravan. The only problem was our only access into our backyard was through a 2.3m high carport. So we spoke to our neighbour Vince and Meme Criffo who own the land at the back of our home. The Criffo's have access into their property via Congupna East Road and they are happy for us to use this to access into our backyard.

In February we applied for a building permit to build the shed in our backyard and eventually that was approved with a condition that is was at least 1.5 off the fence, which meant I had to sacrifice 24Sqm of land, we paid the $625 fee.

Once the permit was approved I organised to have the Criffo's entry re-established and a farm gate from my backyard into the Criffo property.

Prior to pouring concrete, a council officer inspected the prepared boxed slab and I explained the process of using my neighbour's property to gain access into my backyard to utilise my sheds potential.

In mid-June we received the letter from council, in which I am writing to you today.

The idea of getting rid of the stagnant drainage water at the front of our townships homes is good one, but we are concerned it will negatively affect our home such dams will attract insects, frogs, mice, snakes, mosquitos and many other creepy crawlies. Regardless if they are said to be kept neat and tidy, pockets will always hold water and after surveying other similar projects in the Shepparton region I don't believe this will be very well maintained.

If a fence was to be put around the dam we may as well have moved to Dhurringile, having such an monstrosity at our backdoor step will not only taint our beautiful little town, but make us rethink living there and at great cost as this project is certain to lower the value of our home.

Also if the dam was to overflow as we receive majority Congupna's rainfall curtesy of this new initiative, will our homes be safe?

Is it possible to have an alternative?

- Could the dam be relocated further up Congupna East Road to the other corner of the Criffo paddock? This will mean the dam will not be so close to the Congupna

Township, will reduce the likelihood of inquisitive kids wanting to mess around in the waters, reduce the likelihood of snakes and other vermin sitting on our backdoor and it will leave the Congupna East Road gate entrance open.

- Alternatively could the dam be unfenced with access from our property to the Criffos Congupna East Road entrance and this will also allow us access to our shed, which we did apply for a permit recently.
- Or if you can't satisfy us with any of these options, can you please put in a bridge from Congupna East Road, into our backyard so we can use the shed that is getting close to a $27,000 project.

Please I hope this letter hasn't been taken too negatively. I hope you consider the alternatives mentioned.

In closing please try to understand a couple of months ago we were very excited about transforming our backyard and with this letter it has all come apart and ultimately to a halt as we wait to hear what the council will do. If this information about this dam was shared when we applied for our building permit and I believe it would have been available we certainly would have had the shed in a different position, we would not have wasted so much time and money restoring a gateway that is likely to be obsolete, wasted money getting a farm gate put into the Acquisitioned property and would have included the bridge from Congupna East Road into our property in the Building Permit.

Thank you and we look forward to your response.

Matthew and Michelle WALKER

21 Wallace Street,

Congupna Vic

APPENDIX C – Letter of Response to Objections

Response to Submission Number 6

GREATER SHEPPARTON
GREATER FUTURE

GREATER SHEPPARTON

27 July 2016

B & T Jones
19 Wallace Street
CONGUPNA VIC 3633

Dear Ben and Tara

RE: AMENDMENT C187 TO THE GREATER SHEPPARTON PLANNING SCHEME

I refer to your submission, received 8 July 2016, and the meetings held with Council officers on 12 July 2016, 15 July 2016 and 22 July 2016 regarding the proposed Amendment C187 to the Greater Shepparton Planning Scheme.

Amendment C187 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 proposed Amendment is required to reserve land for the construction of drainage infrastructure necessary to provide the required 1% AEP level of service in urban Congupna.

Your submission has expressed an objection to the basin proposed on part of 226 Old Grahamvale Road, Congupna (the basin). Your submission cites concerns relating to:

1. the location of the proposed basin;
2. the need for the proposed basin to resolve drainage issues;
3. the fence and tree barrier around the proposed basin;
4. the maintenance of the proposed basin,
5. the drainage of the proposed basin; and
6. access through the proposed basin to the rear of your property at 21 Wallace Street, Congupna.

Council officers' responses to these concerns are as follows:

1. Council officers do not support moving the location of the basin.

   The proposed basin was located here for the following reasons:

- When initially approached by Council, the landowner of the proposed basin site indicated that this would be their preferred location (best configuration for usable farm land).
- The proposed basin is designed to discharge into the existing G-MW drain along Congupna East Road, which is the drain that the Wallace Street drainage currently outfalls to. The proposed basin is located adjacent to this G-MW drain. This will reduce construction costs.

Greater Shepparton City Council
Planning Department
Locked Bag 1000, Shepparton VIC 3632
Central Office: 90 Welsford Street, Shepparton
PH: (03) 5832 9730 Fax: (03) 5831 1987 Email: council@shepparton.vic.gov.au
ABN 59 835 329 843

- The proposed basin location is at the lowest corner of paddock that is also adjacent to the G-MW drain.
- The proposed basin location is close to the drainage catchment that it proposes to serve.

The relocation the proposed basin is not supported for the following reasons:

- Relocation further east would require a longer 450mm diameter inlet pipe from Wallace Street to the proposed basin (increasing construction costs).
- If the proposed basin was located further to the east, the basin would need to be deeper increasing the probability of encountering unfavourable ground conditions.

2. Strategic justification for the need for the proposed basin is established in the *Congupna Urban Drainage Strategy, March 2016* (previously provided to you). Council endorsed the *Congupna Urban Drainage Strategy, March 2016* at the Ordinary Council Meeting held on 17 May 2016.

3. The proposed tree screen plantation has been removed from the design as a result of submissions. The proposed perimeter fence of the basin can be altered from a 1.8 metre chain wire fence to a rural post and wire fence. With the alteration in fence type, to ensure safety, the basin walls will be flattened to a grade of 1 in 8 to provide a more gradual decline from the perimeter of the basin towards the bed of the basin, meeting the *Infrastructure Design Manual* requirements.

   Council officers have altered the detailed design to accommodate this change.

4. Once the land is acquired, it will become a Council asset and therefore part of Council's maintenance regime. The fences will be sprayed and open areas slashed periodically. Once constructed, the pump at the proposed basin will be observed regularly by Council officers, ensuring that Council's Maintenance Team will be onsite to monitor the condition of the basin. If local residents observe any maintenance concerns, they can contact Council to have the issue addressed.

5. The proposed basin is designed to operate as a dry basin. This means that water shall not be retained permanently within the proposed basin. Water will be completely pumped out of the basin in sufficient time to prevent any issues relating to stagnant water. Water will remain in the basin only during and immediately after a rain event. In a 1 in 100 year event, the basin can fill with water to a depth of 1.67 metres and can discharge into the G-MW drain at a rate of 5.2 litres per second and will be fully discharged in approximately five days.

6. Council officers have received legal advice instructing that Council should not consent to the request to provide an easement for access through proposed basin B as it creates a precedent or expectation for other property owners abutting Council-owned reserves to receive similar access rights.

GREATER SHEPPARTON

From a risk management perspective, Council could be held liable if anything was to happen to anyone or thing travelling over that easement. This is not a risk that Council should be exposed to.

Additionally, providing an easement over proposed basin B may restrict what Council is able to do with the land and its management in the future.

Given the above, Council officers are not proposing any further changes to the Amendment as a result of your submission.

Council is proposing post – exhibition changes to increase the extent of land to be included in PAO22 on 226 Old Grahamvale Road, Congupna. This change is required to comply with an Environment Protection Authority (EPA) requirement (EPA Code of Practice, *Onsite Wastewater Management*), which states that a retardation basin must have a minimum setback distance of 30 metres from a property with a septic treatment and grey water effluent treatment system.

Your submission, along with all others, will be referred to an Independent Planning Panel for consideration. The Independent Planning Panel will contact you directly regarding the hearing proceedings.

If you have any queries or would like further information, please contact Sam Kemp, Graduate Strategic Planner Amendments, via e-mail at sam.kemp@shepparton.vic.gov.au or via telephone on (03) 5832 9730.

Yours sincerely

Michael MacDonagh

Michael MacDonagh
TEAM LEADER STRATEGIC PLANNING

Trim: C16/14588

Response to Submission Number 7

GREATER SHEPPARTON
GREATER FUTURE

GREATER SHEPPARTON

27 July 2016

M & M Walker
21 Wallace Street
CONGUPNA VIC 3633

Dear Matthew and Michelle

RE: AMENDMENT C187 TO THE GREATER SHEPPARTON PLANNING SCHEME

I refer to your submission, received 4 July 2016, and the meetings held with Council officers on 12 July 2016 and 22 July 2016 regarding proposed Amendment C187 to the Greater Shepparton Planning Scheme.

Amendment C187 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 proposed Amendment is required to reserve land for the construction of drainage infrastructure necessary to provide the required 1% AEP level of service in urban Congupna.

Your submission has expressed an objection to the basin proposed on part of 226 Old Grahamvale Road, Congupna (the basin). Your submission cites concerns relating to:

1. the location of the proposed basin;
2. the fence and tree barrier around the proposed basin;
3. the maintenance of the proposed basin,
4. the drainage of the proposed basin; and
5. access through the proposed basin to the rear of your property at 21 Wallace Street, Congupna.

Council officers' responses to these concerns are as follows:

1. Council officers do not support moving the location of the basin.

   The proposed basin was located here for the following reasons:

   - When initially approached by Council, the landowner of the proposed basin site indicated that this would be their preferred location (best configuration for usable farm land).
   - The proposed basin is designed to discharge into the existing G-MW drain along Congupna East Road, which is the drain that the Wallace Street drainage currently outfalls to. The proposed basin is located adjacent to this G-MW drain. This will reduce construction costs.
   - The proposed basin location is at the lowest corner of paddock that is also adjacent to the G-MW drain.

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- The proposed basin location is close to the drainage catchment that it proposes to serve.

The relocation the proposed basin is not supported for the following reasons:

- Relocation further east would require a longer 450mm diameter inlet pipe from Wallace Street to the proposed basin (increasing construction costs).
- If the proposed basin was located further to the east, the basin would need to be deeper increasing the probability of encountering unfavourable ground conditions.

2. The proposed tree screen plantation has been removed from the design as a result of submissions. The proposed perimeter fence of the basin can be altered from a 1.8 metre chain wire fence to a rural post and wire fence. With the alteration in fence type, to ensure safety, the basin walls will be flattened to a grade of 1 in 8 to provide a more gradual decline from the perimeter of the basin towards the bed of the basin, meeting the *Infrastructure Design Manual* requirements.

   Council officers have altered the detailed design to accommodate this change.

3. Once the land is acquired, it will become a Council asset and therefore part of Council's maintenance regime. The fences will be sprayed and open areas slashed periodically. Once constructed, the pump at the proposed basin will be observed regularly by Council officers, ensuring that Council's Maintenance Team will be onsite to monitor the condition of the basin. If local residents observe any maintenance concerns, they can contact Council to have the issue addressed.

4. The proposed basin is designed to operate as a dry basin. This means that water shall not be retained permanently within the proposed basin. Water will be completely pumped out of the basin in sufficient time to prevent any issues relating to stagnant water. Water will remain in the basin only during and immediately after a rain event. In a 1 in 100 year event, the basin can fill with water to a depth of 1.67 metres and can discharge into the G-MW drain at a rate of 5.2 litres per second and will be fully discharged in approximately five days.

5. Council officers have received legal advice instructing that Council should not consent to the request to provide an easement for access through proposed basin B as it creates a precedent or expectation for other property owners abutting Council-owned reserves to receive similar access rights.

   From a risk management perspective, Council could be held liable if anything was to happen to anyone or thing travelling over that easement. This is not a risk that Council should be exposed to.

   Additionally, providing an easement over proposed basin B may restrict what Council is able to do with the land and its management in the future.

GREATER SHEPPARTON

Given the above, Council officers are not proposing any further changes to the Amendment as a result of your submission.

Council is proposing post – exhibition changes to increase the extent of land to be included in PAO22 on 226 Old Grahamvale Road, Congupna. This change is required to comply with an Environment Protection Authority (EPA) requirement (EPA Code of Practice, *Onsite Wastewater Management*), which states that a retardation basin must have a minimum setback distance of 30 metres from a property with a septic treatment and grey water effluent treatment system.

Your submission, along with all others, will be referred to an Independent Planning Panel for consideration. The Independent Planning Panel will contact you directly regarding the hearing proceedings.

If you have any queries or would like further information, please contact Sam Kemp, Graduate Strategic Planner Amendments, via e-mail at sam.kemp@shepparton.vic.gov.au or via telephone on (03) 5832 9730.

Yours sincerely

Michael MacDonagh

Michael MacDonagh
TEAM LEADER STRATEGIC PLANNING

Trim: C16/14575

APPENDIX D – Congupna Urban Drainage Strategy, March 2016

Paffrath Consulting
ABN: 71 801 250 286

Greater Shepparton City Council

Congupna Urban Drainage Strategy

Investigations & Options

March 2016

Report

Version Number 5

Date Issued 11th March 2016

Document Status Final Report

Version Control

Version	Issue Date	Description
1	24/01/2016	Draft Report
2	17/02/2016	Report
3	22/02/2016	Updated Report
4	28/02/2016	Final Report
5	11/03/2016	Final Report – inclusion of Executive Summary

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.

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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.

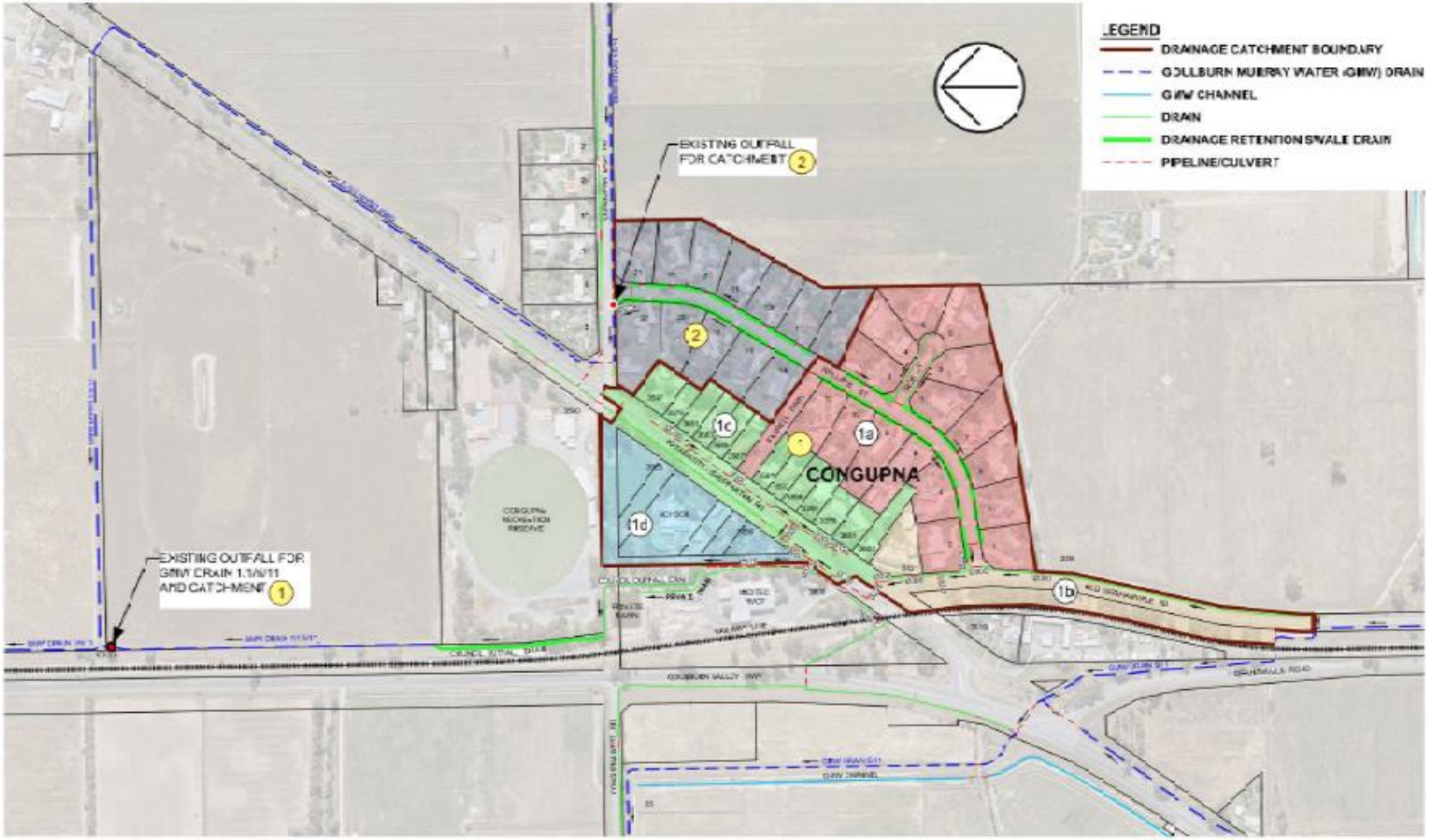


FIGURE 2
EXISTING CONGUPNA URBAN DRAINAGE SYSTEM

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 8,835.3m³. Calculations on the foot print size determined a required area of 8,515m². 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.

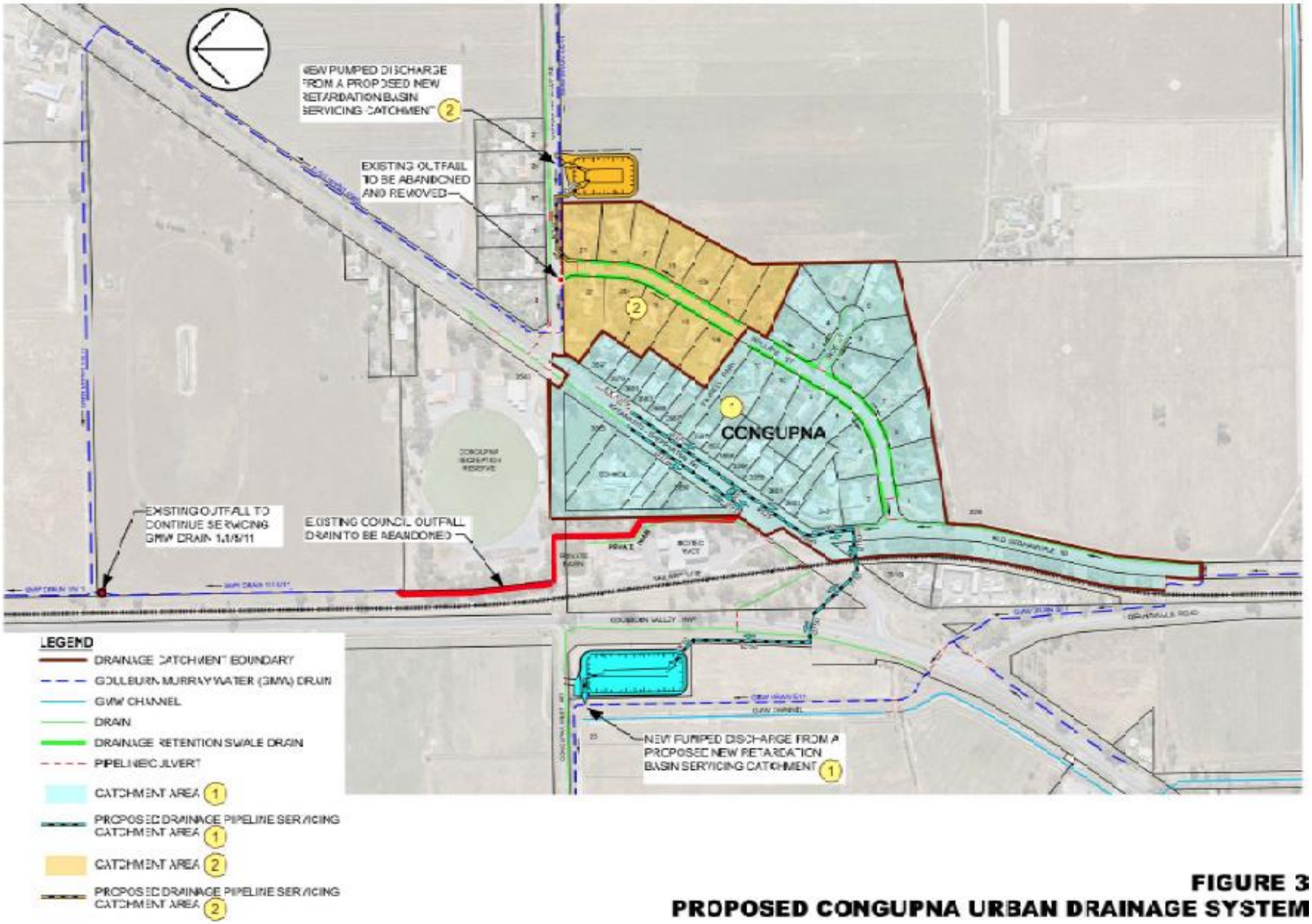


FIGURE 3
PROPOSED CONGUPNA URBAN DRAINAGE SYSTEM

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).

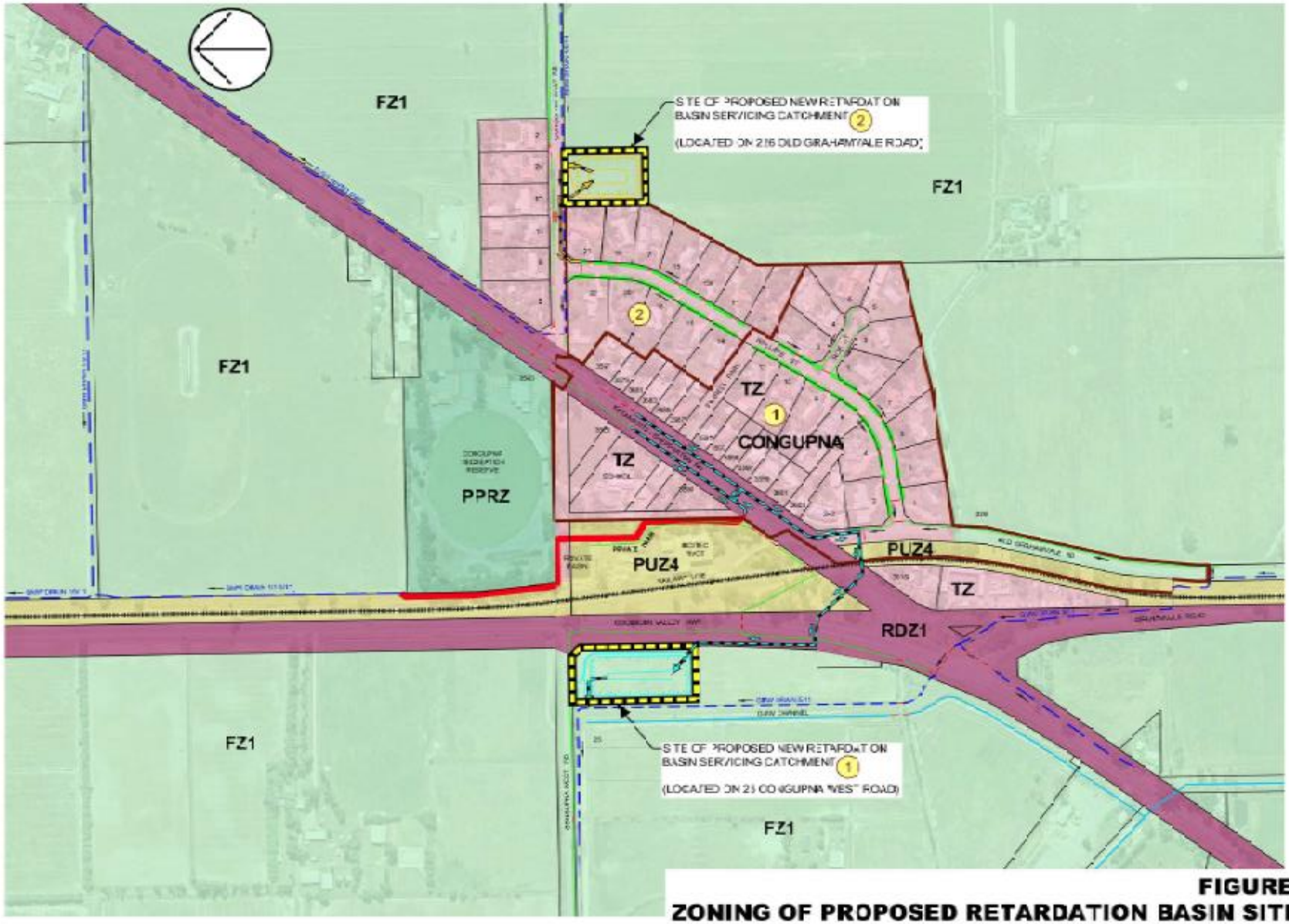


FIGURE 4
ZONING OF PROPOSED RETARDATION BASIN SITES

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;

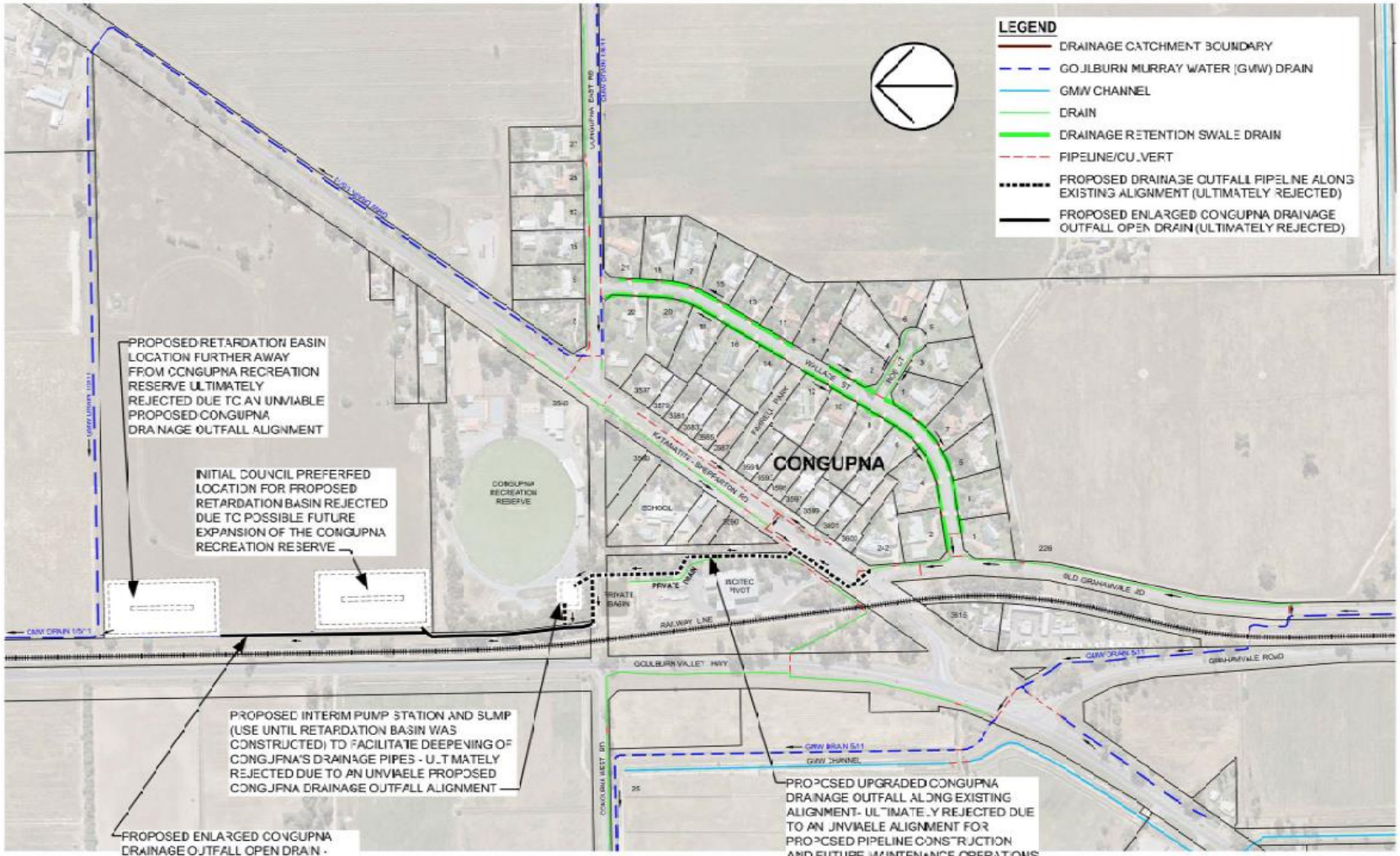
The proposed design improves the water quality of the catchment by consisting of the following elements:

- 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.

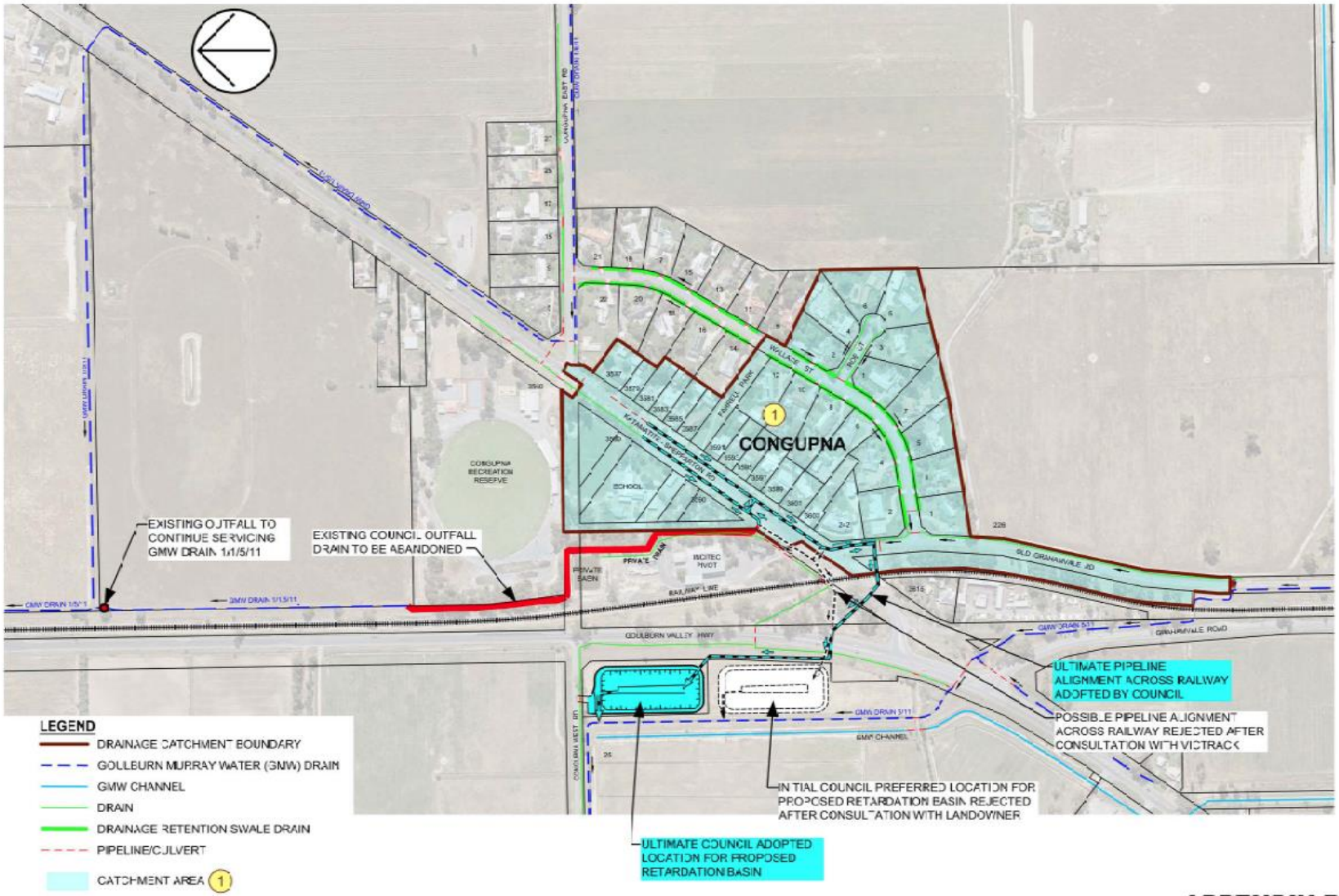
- Water sensitive urban design techniques have been incorporated into the stormwater design system to ensure detention volumes and water quality objectives are achieved
- Mitigation of run-off and peak flows has been demonstrated via modelling for catchment treatments
- Stormwater quality and detention 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



APPENDIX A
CONCEPT - EXISTING OUTFALL ALIGNMENT (REJECTED)

APPENDIX B
Concept – Alternate Outfall Alignment



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

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

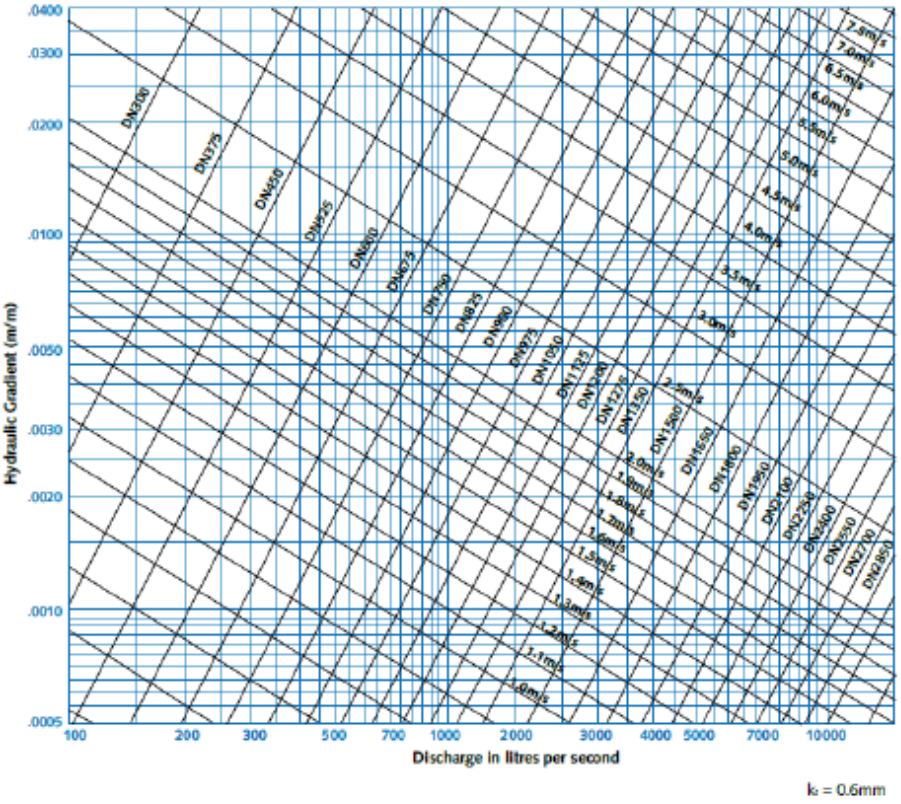
Catchment B

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

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

PIPELINE DESIGN

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 m³**

Maximum Retardation for given outflow = **6,541.88 m³**

Cross Section Data:

D =	**4.000**	m			
B =	**0.0**	m	Area =	**128.0**	m²
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**	m²
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**	m²
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** **m³**

Maximum Retardation for given outflow = **3,764.86** **m³**

Cross Section Data:

D =	**2.000**	m			
B =	**8.0**	m	Area =	**48.00**	m²
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**	m²
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**	m²
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		46.5	mm/hr		28.1	mm/hr		21	mm/hr		12.8	mm/hr		7.6	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	46.50	46.50	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	11.06	11.06
120							21.6	12.14	56.20	22.9	14.43	55.63	27.5	21.12	48.69	26.6	25.77	44.46	22.8	25.32	37.40
180										11.7	7.37	63.00	14.7	11.29	59.98	8.0	7.49	51.95	14.1	16.26	53.66
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 m³	based on discharge rate	Excess m³
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	2,200m³	
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	

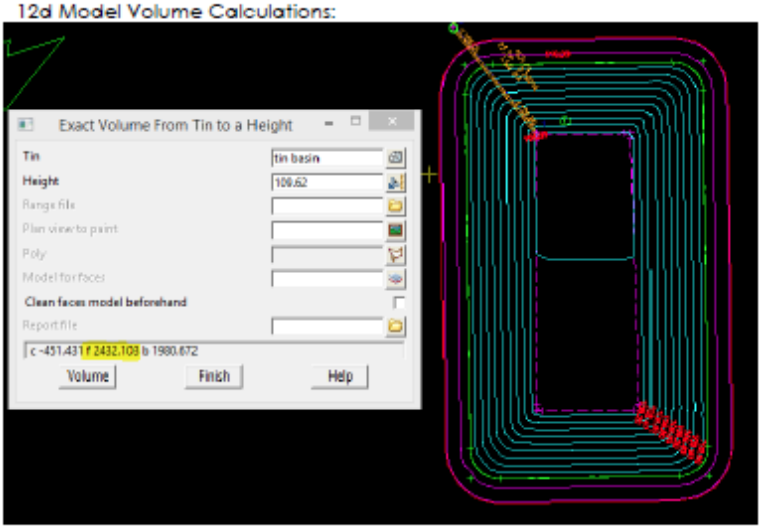
STAGE 1 SUPPORT RETENTION BASIN CAPACITY

AVAILABLE SOIL m³

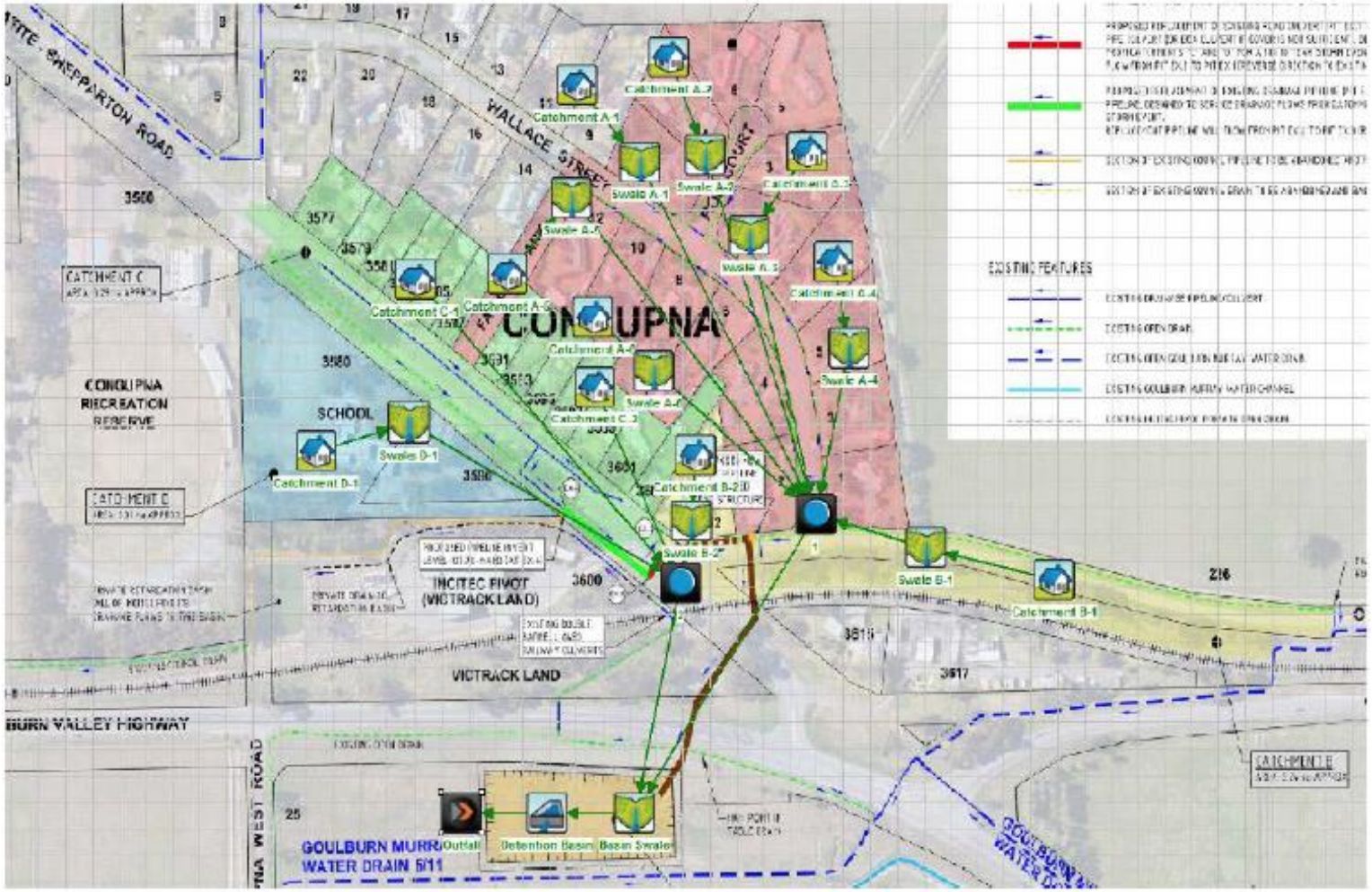
Re-Use Sump Dimensions:

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 m³
		EXCAVATED VOLUME	3536 m³

12d Model Volume Calculations:



APPENDIX E
MUSIC Concept Stormwater Treatment – Catchment 1

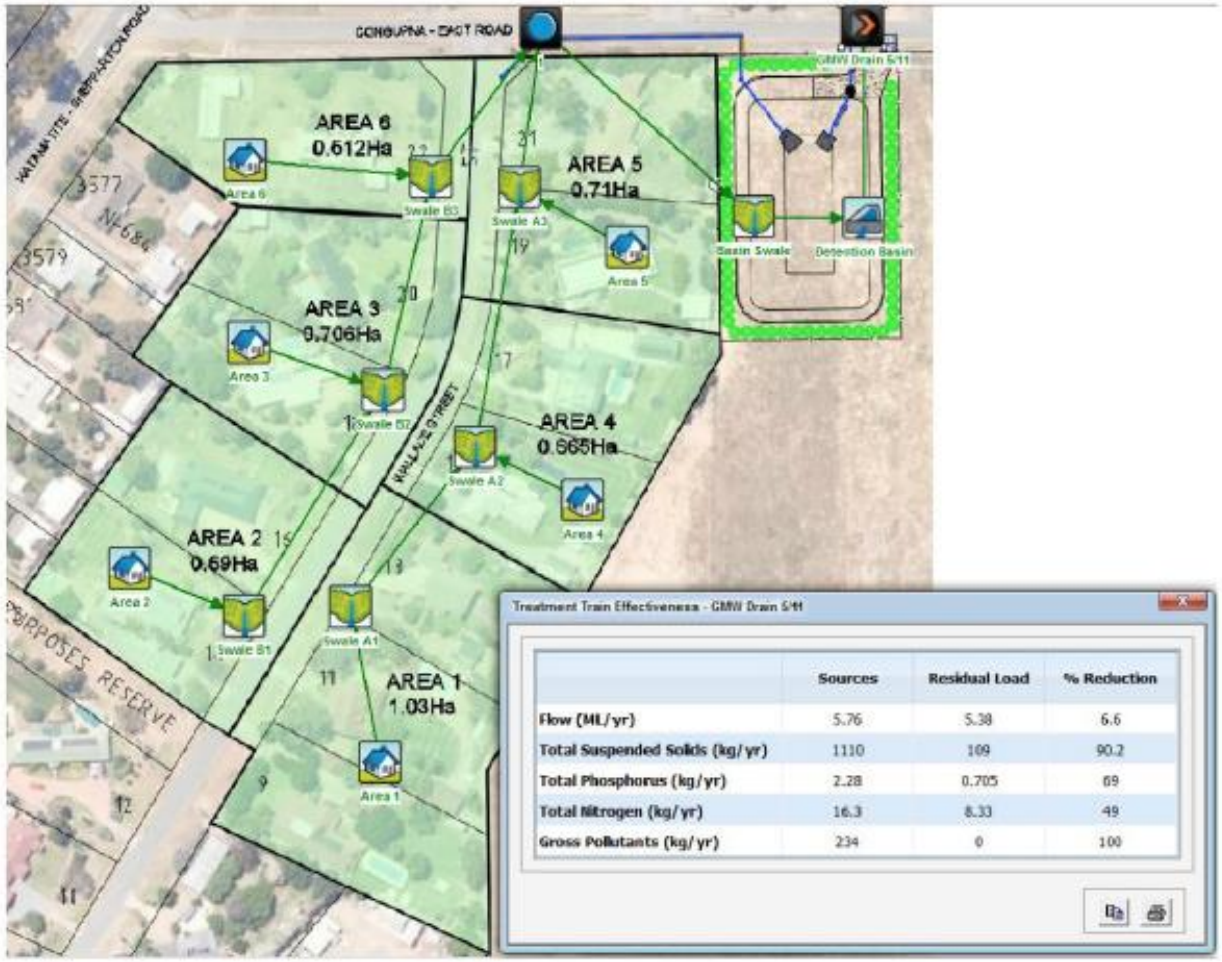

WALLACE STREET
CONGUPNA
CONGUPNA RECREATION RESERVE
SCHOOL
INCITEC PIVOT (VICTRACK LAND)
VICTRACK LAND
GOULBURN MURRAY WATER DRAIN 5/11
Outfall
Detention Basin
Basin Swales
Catchment A-1
Catchment A-2
Catchment A-3
Catchment A-4
Catchment A-5
Catchment A-6
Catchment A-7
Catchment B-1
Catchment B-2
Catchment C-1
Catchment C-2
Catchment D-1
Swale A-1
Swale A-2
Swale A-3
Swale A-4
Swale B-1
Swale B-2
Swale C-1
Swale D-1
EXISTING FEATURES

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)	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-4 -	Area = 1.55ha Fraction Impervious = 40% 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-5 -	Area = 0.29ha Fraction Impervious = 25% 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
Catchment A-6 -	Area = 2.18ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)		

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)	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
Catchment B-2 -	Area = 0.37ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	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
Catchment C-1 -	Area = 1.22ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	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
Catchment C-2 -	Area = 2.18ha Fraction Impervious = 40% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	Retardation Basin - (With extended detention time)	Extended Detention Depth = 0.75m Basin Surface Area = 680m^2 Low Flow Pipe Diameter = 50mm
Catchment D-1 -	Area = 2.49ha Fraction Impervious = 25% Soil Storage Capacity = 120mm (Default Value) Field Capacity = 80mm (Default Value)	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



	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.

APPENDIX E – Post-Exhibition Changes

Letter to Landowner

GREATER SHEPPARTON
GREATER FUTURE

GREATER SHEPPARTON

27 July 2016

D & V Crifo
226 Old Grahamvale Road
CONGUPNA VIC 3633

Dear Mr & Mrs Crifo

RE: AMENDMENT C187 TO THE GREATER SHEPPARTON PLANNING SCHEME

I refer to the meeting with Council officers held on 25 July 2016 at Council offices regarding the extent of land to be included in the proposed Public Acquisition Overlay at 226 Old Grahamvale Road, Congupna.

Amendment C187 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 proposed Amendment is required to reserve land for the construction of drainage infrastructure necessary to provide the required 1% AEP level of service in urban Congupna.

Initially, Council proposed an acquisition of your land with the dimensions of 65m by 100m for the purpose of constructing a drainage basin in accordance with *Congupna Urban Drainage Strategy, March 2016.* However, these dimensions do not meet the Environment Protection Authority (EPA) requirements for minimum setback distances for dams or basins from the boundaries of property that utilise a septic water treatment system; the properties adjoining the acquisition site for the proposed basin use such treatment systems.

The relevant requirement in the EPA Code of Practice, *Onsite Wastewater Management,* states that a retardation basin must have a setback distance of 30m from a property with a septic treatment and grey water effluent treatment system.

In order for the proposed basin to comply with the EPA requirement of a 30m buffer, it has been determined that additional land acquisition is required. The amended area of required land acquisition is now 80.5m by 100m 9 (see Attachment 1 – *Proposed Basin Dimensions*).

If you have any concerns regarding increasing the extent of land to be included in PAO22, please advise Council of this in writing.

A template letter for providing in principle support to this proposal is attached (see Attachment 2 – *In Principle Support Template*); please sign and forward it to Council if you do not have any objections.

Greater Shepparton City Council
Planning Department
Locked Bag 1000, Shepparton VIC 3632
Central Office: 90 Welsford Street, Shepparton
PH: (03) 5832 9730 Fax: (03) 5831 1987 Email: council@shepparton.vic.gov.au
ABN 59 835 329 843

If you have any queries or would like further information, please contact Sam Kemp, Graduate Strategic Planner Amendments, via e-mail at sam.kemp@shepparton.vic.gov.au or via telephone on (03) 5832 9730.

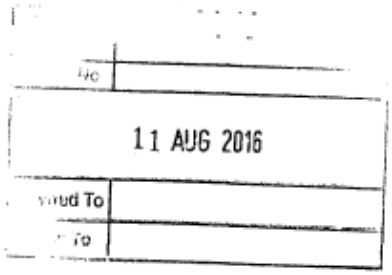
Yours sincerely

Michael MacDonagh
TEAM LEADER STRATEGIC PLANNING

Trim: C16/14576

Letter of Support From Landowners

Planning Department
Greater Shepparton City Council
Locked Bag 1000
SHEPPARTON VIC 3632



AMENDMENT C187 TO THE GREATER SHEPPARTON PLANNING SCHEME

Dear Sir / Madam

I refer to the letter dated 25 July 2016, providing an explanation for the need to increase the extent of the proposed Public Acquisition Overlay (PAO22) on part of 226 Old Grahamvale Road, Congupna.'

I do not object to the post-exhibition change to increase the extent of proposed PAO22 on my land in accordance with the draft detailed designs, provided (Drawing No. R C19-8(2)).

Yours sincerely

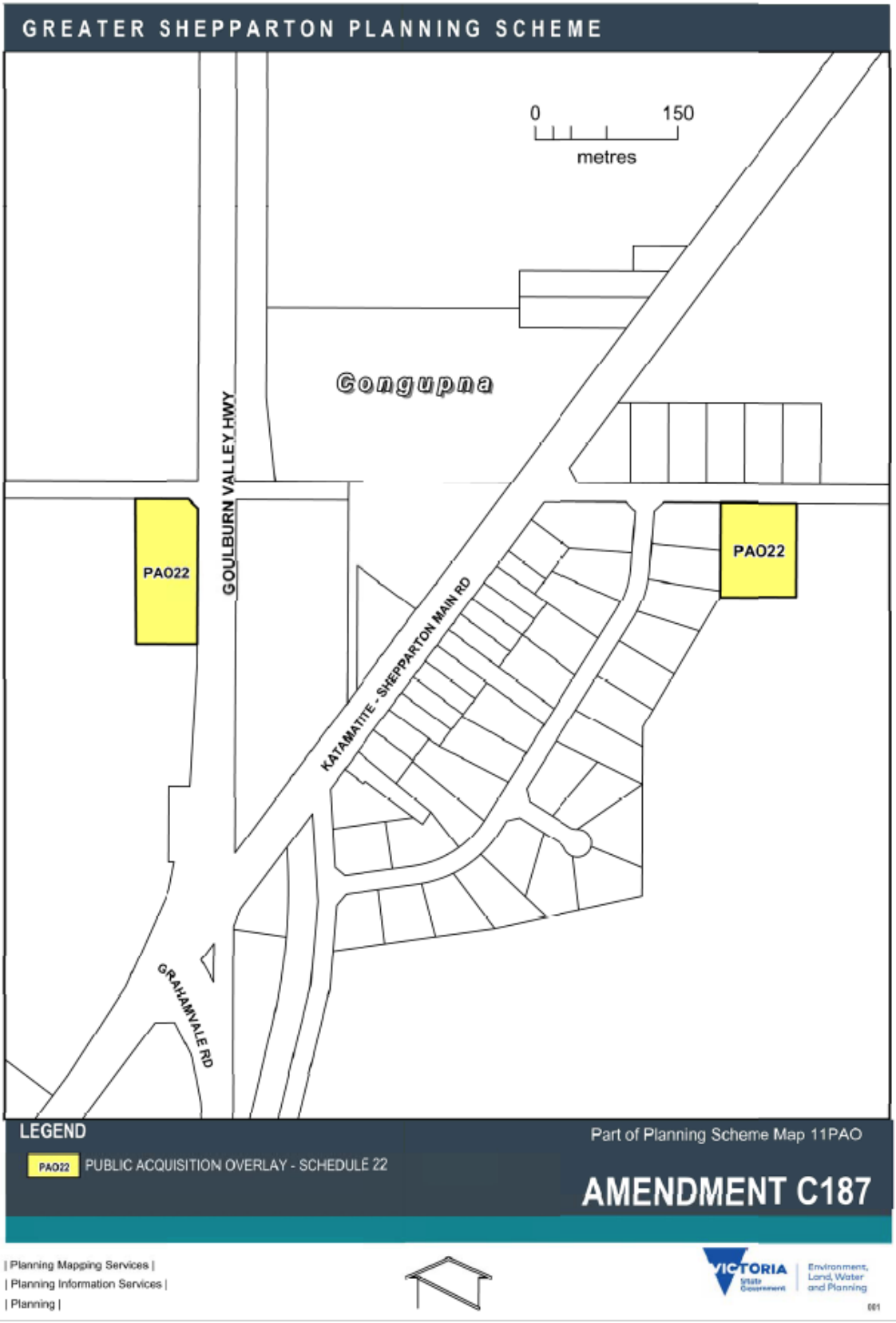
V. Crifo

Vincenzo Crifo

D. Crifo

Dominica Crifo

Proposed Post-Exhibition Changes



APPENDIX F – Expert Witness Report

Greater Shepparton City Council

Report on the Congupna Urban Drainage Strategy

Evidence for Panel Hearing

September 2016

Contents

Figure Index

Appendices

1. Introduction

I Uwe Paffrath, Principal Civil Engineer with Paffrath Consulting, have been asked by the Greater Shepparton City Council to provide a report for the Amendment C187 Panel. This 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.

Previously I was also commissioned by the Greater Shepparton City Council to undertake an Urban Drainage Strategy to review the number of site specific and municipal wide drainage strategies. The report presents the proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment. This report identified that 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.

I acknowledge that I have read the Victorian Civil & Administrative Tribunal Practice Note 2: Expert Evidence and agree to be bound by it.

As a Principal Civil Engineer, I have had wide-ranging practical and project management experience through over 30 years working on rural and urban drainage projects, including condition assessments, contract administration and supervision.

Other experiences include civil engineering design, tender documentation, contract administration and supervision, and I have specific knowledge in Infrastructure Quality procedures, Asset Management planning as well as environmental and maintenance management systems.

Some of the projects that I have worked on ranges from the Provision of services for the investigations and design solutions to a number of drainage issues for both urban and rural sites, including retention basins, pump stations, underground pipelines, open channels and flood mitigation works, development of Storm Water Management Plans, project managed rural drainage schemes and general drainage engineering projects. The range of clients I worked for includes State Departments, Local Government and private clients, and have previously worked in Local Government and I understand the drainage issues within an urban/rural municipality.

2. Brief

I have been asked to report on the following: -

- analyse the existing drainage conditions and catchment area 2 and confirm the required retardation for varying storm durations;
- review of the functionality of the existing swale drain and determine the shutdown storage requirements; and
- consider the three potential drainage solutions prepared by Council titled Congupna Stage 3 Drainage Alignment Evaluation Options 1, 2 & 3, discuss the alternative options and provide a recommendation on the preferred option.

3. Background

3.1 Existing Site

Congupna is a rural village and district on the Goulburn Valley Highway in central north Victoria, 10 km north-east of Shepparton.

Following the flooding event in early March 2012, which was considered to be around a 1% (1 in 100-year 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.

3.2 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. Catchment area 1 consists of the area highlighted as "Congupna Village Subdivision Stage 1", and Catchment area 2 consists of the area highlighted as the "Congupna Village Subdivision Stage 2" (northern half of Wallace Street). The proposed stage 3 drainage upgrade works are to address the drainage issues within the north half of Wallace Street located within the Congupna catchment area 2.

Catchment area 2 consists of approximately 4.3ha of developed residential land located on Wallace Street in Congupna. The residential catchment area comprises of wide grassed/ vegetated swale drains along both sides of the street, directing stormwater flows towards the existing Goulburn-Murray Water (G-MW) drain located on Congupna East Road. Stormwater is discharged via gravity into the G-MW drain through a 225 diameter outfall structure.

Council have indicated that the structure has to be manually opened and closed by the residents, depending on how full the G-MW drain 1/5/11 is flowing. This leads to the nature strips being frequently inundated with water, allowing the breeding mosquitoes and making the nature strips difficult to maintain.

3.3 Preferred Options

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.

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 design solution 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.

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 2 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. Drainage 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.

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

4.1 Design Considerations

Effective stormwater systems must be able to adequately manage small, minor and major storm events. They can be designed to do this by considering the management objectives of each design event and the scale at which the solution (usually a single or series of best management practices) is to apply.

Runoff from the whole catchment generated by the 5-year ARI event should be managed within landscaped areas in road reserves, public open space or linear multiple use corridors.

During major storm events (in excess of 5-year and up to 100-year), structural controls, roads, public open space and natural waterways and wetlands may all be inundated to varying levels. Flows from 100-year events will use the retention and detention capacities of 5-year sized systems before they flow into 100-year sized systems. This will reduce the detention volume required in 100-year sized systems.

Flow calculations for the total drainage system must take into account the different flow paths taken by the minor and major systems, any overflows from other drainage systems, and the interaction between minor and major system flows.

Storm water run-off occurs when: -

- The ground or land surfaces becomes saturated and unable to accept the further infiltration or surface storage of rainwater; or

- The intensity of rainfall exceeds the soil's infiltration rate, even though the ground is not yet saturated.

The factors that affect the volume of storm water run-off include: -

- The size of the drainage catchment
- The extent, intensity and duration of rainfall across the catchment
- The ability of the ground to absorb water, which is influenced by land slope, the depth of soil above rock, the type of rock and the type of vegetation cover
- The percentage of the land area covered by impervious surfaces (e.g. roads & roofs)
- Water retention on the lands surface.

The factors that influence the height of flooding at a particular location include: -

- The peak discharge passing down a drainage system, be it a pipe, channel, road network or watercourse.
- The hydraulic capacity of the drainage system.
- The extent of blockages within the floodway, be it from flood debris, fences, structures or fallen trees.

4.2 Basis of Design

The conventional approach to storm water drainage design is to intercept, collect and dispose of storm water as quickly as possible, generally in pipelines and/or lined channels.

As water flowing in piped and lined channels reaches higher velocities than water flowing overland and in natural channels, the time of concentration to points at the downstream end of a catchment is reduced. This reduced time of concentration and the increase in the impervious area that normally accompanies development, leads to increased peak discharges in areas downstream of developed areas.

Increases in peak discharge can in turn result in increased downstream flooding and/or in the scouring of natural watercourses. Scoured material is later deposited in rivers and estuaries, causing siltation.

Because of the problems associated with drainage systems that reduce the time of concentration, there has been a significant change in the approach to storm water drainage design in recent years.

Where possible, measures are taken to ensure that the peak discharge is unaltered by development. This is generally achieved at the land use planning stage by providing for the incorporation of retention basins in drainage systems and by making use of natural drainage features wherever possible. Floodways are also provided to ensure that damage resulting from storms of greater intensity than that of the design storm is minimised.

Existing land use zonings in the older developed areas of Greater Shepparton rarely provide adequate open space in suitable locations and so limit the scope for application of modern techniques in storm water drainage management. In these areas there is no alternative to the construction of conventional drainage systems designed to dispose of peak discharges in the most efficient way possible.

However, even in older developed areas, floodways should be progressively provided as land is redeveloped and consideration should be given to the construction of retention basins wherever possible. Suitable areas for the location of retention basins include playing fields, golf courses and open space reserves.

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.

To design a whole pipe network to take a major storm (1 in 100-year 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: -

- 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.

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-year ARI and for the whole network to achieve a 1 in 100-year ARI through the pipe network and overland flows.

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.

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-year ARI event,
- the proposed residential drainage infrastructure shall be designed for a 1 in 5-year ARI event, and
- for the whole network to accommodate a 1 in 100-year ARI capacity through offsite flood storage facility.

4.3 Overlays

An overlay is a map in a council planning scheme showing the location and extent of special features, such as where land may be subject to flooding.

Their key purpose is to: -

- minimise the effects of overland flows and flooding on new buildings
- ensure new developments do not adversely affect existing properties

Overlays are based on the extent of flooding resulting from a 1 in 100-year storm. This relates to a storm event of such intensity, based on historical rainfall data, which has a one per cent chance of occurring in any given year.

Having this information means drainage issues can be addressed at the start of the development process and proposals are properly designed.

4.3.1 Land Subject to Inundation Overlays (LSIO)

These are planning scheme controls that apply to land affected by flooding associated with waterways and open drainage systems. Such areas are commonly known as floodplains. These overlays require a planning permit for buildings and works.

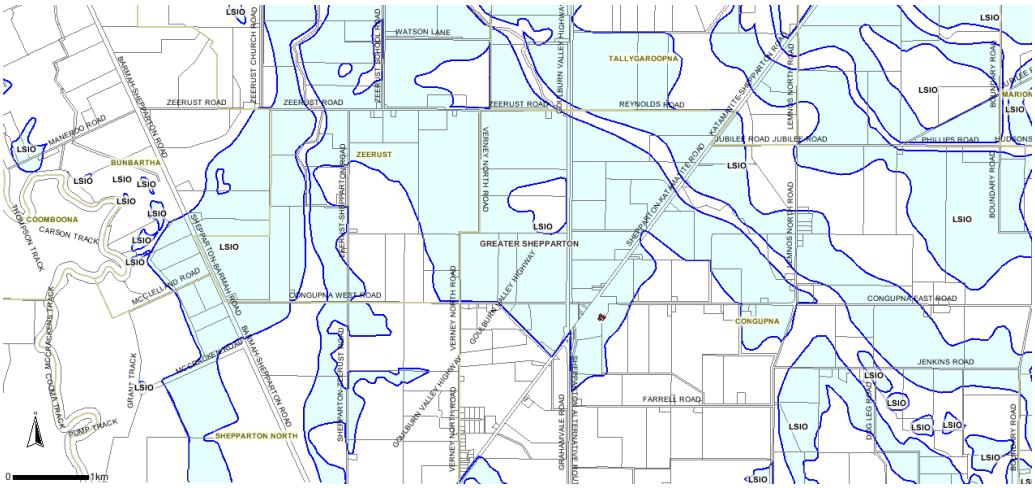
The purpose of the LSIO is to ensure that future developments maintain the free passage and temporary storage of floodwaters, minimise flood damage, are compatible with the flood hazard and local drainage conditions, and will not cause a significant rise in flood level or flow velocity.

Identification of the extent of the flood plain is based on years of scientific, spatial referencing and ground truthing. Unidentified changes can have serious implications for emergency agencies in managing any flood situation, compromise the safety of community members and place community assets at risk. Ultimately any changes to the flood plain seriously reduce our ability to predict where the flood water will flow and its impact during times of emergency.

An overland flow path is an above ground section of the drainage system and generally affects low lying and natural drainage path areas. Overland flows occur when the maximum capacity of the underground piped drains has been reached and the

drainage system can no longer cope with excess run off from heavy rainfall. The excess run off then travels along the overland flow paths.

Figure 1 Land Subject to Inundation Overlay Map



4.3.2 Purpose

To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.

To identify land in a flood storage or flood fringe area affected by the 1 in 100-year flood or any other area determined by the floodplain management authority.

To ensure that development maintains the free passage and temporary storage of floodwaters, minimises flood damage, is compatible with the flood hazard and local drainage conditions and will not cause any significant rise in flood level or flow velocity.

- maintains the free passage and temporary storage of floodwater;
- minimises flood damage;
- is compatible with flood hazards, local drainage conditions and the minimisation of soil erosion, sedimentation and silting.

4.4 Catchment 2

4.4.1 Drainage Catchment Area Analysis

Catchment area 2, consisting of low density residential areas and Wallace Street road reserve, commencing from Lot 9 on the eastern side and Lot 14 on the western side of Wallace Street is approximately 4.3ha.

The detailed catchment analysis is summarised below: -

- Low density Residential Area – 3.8ha (IDM 100yr ARI Runoff Coefficient ≈ 0.4)
- Wallace Street Road Reserve – 0.5ha (IDM 100yr ARI Runoff Coefficient ≈ 0.75)
- Total Catchment Area – 4.3ha (weighted runoff coefficient ≈ 0.44)

4.4.2 Existing Minor Flow System

Based on detailed design calculations, the peak minor flow will be as follows: -

- Minor Flow (5yr ARI):
- Development Catchment Area: 4.3 ha
- C: 0.44 (Refer Congupna Urban Drainage Strategy Appendix D)
- $I_{20,5}$: 47.6 mm/hr
- Q_5 = 0.250 m^3/sec

4.4.3 Existing Major Flow System

Based on detailed design calculations, the peak major flow of the existing catchment area will be as follows: -

- Major Flow (100yr ARI):
- Area: 4.3 ha
- C: 0.44 (Refer Congupna Urban Drainage Strategy Appendix D)
- $I_{20,100}$: 89.3 mm/hr
- Q_{100} = 0.47 m^3/sec

4.5 Confirmation of Adopted Design

The current IDM requires the whole drainage network to cater for a 1 in 100-year ARI storm event through the combined pipe network and overland flows. With this being a brownfield site, it is acknowledged that the design does not deal with the 1 in 100-year ARI due to overland flow (no regional catchment analysis undertaken to date) being affected by existing crossing roads, drains, rail reserve and having water backing up from G-MW drains. During a 1 in 100-year ARI event, stormwater will be retained within the swale and road networks temporarily during the peak of the storm until the underground pipe network has capacity to deliver the stormwater to the retention basin where there is design capacity for the 1 in 100-year ARI event.

To upsize the proposed drainage pipes from a 1 in 10-year to a 1 in 100-year ARI will double the costs, hence it is an acceptable design solution to allow the time taken for the draining of the site to increase and utilise the road reserve to temporarily store the stormwater run-off.

With this land being subject to inundation, the site may be affected by other catchments within the floodplain and structures located in the path of local overland flow could cause the water to be redirected or deflected to other adjoining properties. Such impacts have to be mitigated in the design of proposed developments.

Council has investigated and put forward designs that have taken into consideration the extent of the floodwater and the location of structures within the flood paths which can alter the flow regime to the detriment of adjoining properties. Structures in the path of overland flow would cause the water to be redirected or deflected to other

adjoining properties. The flood water could also cause “afflux” (a rise in water level) upstream of the structure.

The proposed stormwater collection, detention, treatment and discharge layout for the Congupna Township catchment satisfies 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 IDM and Greater Shepparton City Council requirements.

5. Existing Swale Drains

Existing drainage infrastructure within Wallace Street currently consists of wide grassed/vegetated swale drains along both sides of the street. From desktop studies it has been assumed that the north half of Wallace Street (Congupna Village Subdivision Stage 2) directs storm water flows towards the existing G-MW drain located on Congupna East Road and the southern half of Wallace Street (Congupna Village Subdivision Stage 1) directs flows towards Old Grahamvale Road.

A standard swale has been assumed for the purpose of preparing indicative storage volumes with the following characteristics: -

- Top of bank width 5m
- Swale base width 1m
- Maximum depth 600mm
- Cross-sectional area ≈1.8m^2

Indicative calculations suggest that the swale drains within Wallace Street offer the following storm water retardation properties: -

- Congupna Village Subdivision Stage 2 (North half of Wallace Street)
  - Total swale length – 500m (approximately)
  - Effective Swale Length (length subject to inundation) – 50% due driveways, build-up of sediments etc.
  - Estimated swale capacity – 450m^3 (approximately)

- Congupna Village Subdivision Stage 1 (South half of Wallace Street)
  - Total swale length – 750m (approximately)
  - Effective Swale Length (length subject to inundation) – 50% due driveways, build-up of sediments etc.
  - Estimated swale capacity – 675m^3 (approximately)

The above values are indicative only for the purpose of discussion. The values and estimates are subject to detailed investigation including site inspection, feature survey and detailed design.

Therefore, the total estimated storage available within the swale drains in both Congupna Village Stage1 and Stage 2 equals approximately 1,125m^3.

Based on the above volumes for the Congupna Village Subdivision Stage 2, the swale drain does not meet either the 1 in 5 nor the 1 in 100-year shut down storage capacity, being approximately 37% and 20% of the required volumes respectively.

6. Drainage Alignment Evaluation of Council Options

6.1 Option 1 (Adopted Option)

Drainage Upgrade Works Option 1, refer plan titled Congupna Stage 3 Drainage Alignment Evaluation – Option 1

- Is in accordance with the Congupna Drainage Strategy
- Option 1 has been fully investigated and designed and meets the objectives of the Infrastructure Design Manual
- Maintain Wallace Street swale drain arrangement.
- Installation of approximately 70m of 450mm dia. RCP to relieve swale drain flows. Pipe sized and graded to cater for 100-year flows.
- Construction of a storm water retardation basin with appropriate capacity to cater for a 100-year storm event assuming blocked outfall conditions.
- WSUD systems included with the basin floor to provide adequate treatment prior to discharging into the G-MW drain.
- Installation of a new pump station and rising main to discharge storm water into the existing G-MW drain at the allowable rate.
- Basin located at an adequate distance from residential areas to accord with EPA guidelines.

6.1.1 Benefits:

- Proposed drainage system maintains the existing drainage characteristics of the Wallace Street catchment area including natural overland flow paths.
- Separates catchment areas and provides adequate retardation capacities for individual catchments reducing the risk of flooding issues.
- Improves the existing drainage system and ensures adequate drainage of the existing swale drains fronting the residential properties. Reduces the impact of inundation and retention of storm water within swale drains.
- Minimal impact on any existing drainage infrastructure and residential areas.
- Construction of an additional retardation basin with potential to utilise for any future development within the nearby area.
- Major (1%) flows will be efficiently directed to the proposed retention basin via existing overland flow paths and underground drains without requiring significant modification to existing nature strips and infrastructure as the retention basin is in close proximity to Catchment 2.

6.2 Council Option 2

Drainage Upgrade Works Option 2, refer plan titled Congupna Stage 3 Drainage Alignment Evaluation – Option 2

- Reshaping and profiling of existing swale drains through the length of Wallace Street to direct all storm water towards Old Grahamvale Road. Includes the modification and replacement of approximately 25 occupation culverts and 2 road culverts to suit revised swale levels.
- Supply and installation of approximately 70m of additional drainage infrastructure along Old Grahamvale Road to service Wallace Street swale drains and discharge into proposed drainage infrastructure undertaken as Congupna Drainage Upgrade Stage 1 works.
- Upsize of approximately 415m of drainage infrastructure currently proposed as part of the Stage 1 works.
- Expand proposed Stage 1 retardation basin that is currently designed to cater for Catchment 1 to ensure an adequate capacity to cater for Catchment Area 2 (approximately 2,200m^3)

6.2.1 Benefits:

- Utilises existing / proposed drainage infrastructure and retardation basin undertaken as Stage 1 works.
- Reduced operating costs associated with the proposed pump station and rising main proposed in Option 1.
- Removes the requirement of acquiring land behind the properties located at the north eastern end of Wallace Street.

6.2.2 Areas of Concern:

- Revised drainage arrangements subject to detailed site investigations, feature survey, service location and detailed design services.
- Potential for major disturbance to nature strips associated with reshaping swale drains to include one way crossfall for the extent of Wallace Street towards Old Grahamvale Road. Ensuring adequate swale grades over this length may result in swale drains becoming quite deep at the Old Grahamvale Road end.
- Swale drain capacities will need to be increased to cater for 5-year ARI flows for the Wallace Street residential catchment area (10.5ha).
- Generally, road reserves act as conduits to transport the 100-year ARI flows toward the retention basin, therefore as this option proposes to drain Catchment 2 via Catchment 1, further investigation is required to determine the risk and measures required to mitigate flooding and damage to properties as a result modifying the

major overland flow paths through the catchment 1 and 2 as proposed under this option.

- Increased catchment area and length of swale drains increases risk of ponding within the swales resulting in maintenance issues, stagnant water and potential seepage into road subgrade materials.
- Increased costs associated with the upgrade of proposed drainage infrastructure in Stage 1 works.
- Wallace Street swale drains may be graded against the natural overland flow path.
- Potential design and construction constraints with existing authority assets as a result of additional drainage infrastructure and increased drainage pipe diameters, subject to detailed investigation.
- Additional land acquisition as a result of increased basin footprint and capacities.
- Risks associated with combining the entire Congupna catchment area to one proposed discharge point as a result of potential blockages.

6.3 Council Option 3

Drainage Upgrade Works Option 3, refer plan titled Congupna Stage 3 Drainage Alignment Evaluation – Option 3

- Maintain Wallace Street swale drain arrangement.
- Supply and installation of approximately 230m of additional drainage infrastructure along Congupna East Road and Katamatite-Shepparton Road to service Wallace Street swale drains and discharge into proposed drainage infrastructure undertaken as Congupna Drainage Upgrade Stage 2 works.
- Upsize approximately 260m of drainage infrastructure proposed as part of Stage 2 works.
- Upsize of approximately 415m of drainage infrastructure proposed as part of Stage 1 works.
- Expand proposed Stage 1 retardation basin to ensure adequate capacities to cater for Stage 2 catchment area (approx. 2,200m^3)

6.3.1 Benefits:

- Proposed drainage system maintains the existing drainage characteristics of the Wallace Street catchment area including natural overland flow paths and swale drains.
- Utilises existing / proposed drainage infrastructure and retardation basin proposed within Stage 1 and Stage 2 works.

- Improves the existing drainage system and ensures adequate drainage of the existing swale drains fronting the residential properties in Wallace Street. Reduces the impact of inundation and retention of storm water within swale drains.
- Minimal impact on any existing drainage infrastructure and residential areas.
- Reduced infrastructure costs associated with the proposed pump station and rising main proposed in Option 1.
- Removes the requirement of acquiring land behind the properties located at the north eastern end of Wallace Street.

6.3.2 Areas of Concern:

- Revised drainage arrangements subject to detailed site investigations, feature survey, service location and detailed design services.
- Increased costs associated with the upgrade of proposed drainage infrastructure in Stage 1 and Stage 2 works.
- Potential design and construction constraints with existing authority assets as a result of additional drainage infrastructure and increased drainage pipe diameters. Subject to detailed investigation.
- Additional land acquisition as a result of increased basin footprint and capacities.
- Risks associated with combining entire Congupna catchment area to one proposed discharge point.

6.4 Costings

A general review of the submitted costing has been undertaken and the following comments provided.

It is suggested that all estimates be updated to reflect current market rates, as these rates appear to be based on cost estimates that are in excess of 12 months old.

6.4.1 Option 1:

- Option 1 costing are based on a thorough investigation and full detailed design.
- The estimates do not appear to include land acquisition costs and authority fees that may be applicable for works within the VicRoads Road Reserve.

6.4.2 Option 2:

- These cost estimates are subject to further investigation and design to determine cost associated with the modification of existing authority assets as a result of upsized drainage infrastructure and swale modifications and to fully explore the level of service that can be achieved given the existing site constraints.

- The estimates do not appear to include consultancy fees, land acquisition costs and authority fees that may be applicable for works within the VicRoads Road Reserve.

6.4.3 Option 3:

- These cost estimates are subject to further investigation and design to determine cost associated with the modification of existing authority assets as a result of upsized drainage infrastructure and swale modifications and to fully explore the level of service that can be achieved given the existing site constraints.
- The estimates do not appear to include consultancy fees, land acquisition costs and authority fees that may be applicable for works within the VicRoads Road Reserve.

7. Response to Brief

The proposed Congupna Stage 3 (Option 1) drainage works provides the best most cost effective option as the design has the ability to: -

- preserve existing valuable elements of the stormwater system, such as natural channels, swales and roadside 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,
- Mitigation of run-off and peak flows has been demonstrated via modelling for catchment treatments,
- Minimises risk of flood damage to properties and infrastructure
- 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.
- Option 1 has been prepared in accordance with the Congupna Drainage Strategy and the IDM and has been fully investigated and designed.
- Option 1 includes the construction of independent storm water retention basins to manage major storm events for each independent catchment. This ensures that drainage is safely and efficiently managed and directed to the stormwater retention basins without putting pressure of the on the adjacent catchment. This also reduces the risk of the Congupna Township being effected by potential underground drainage blockages as Catchment 2 is serviced by an independent drainage system and overland flow paths.
- Option 1 is the most cost effective of the three options.
- Catchment 1 and 2 are managed independently, therefore Catchment 1 will not be affected by major flows generated from Catchment 2.
- Impacts on existing servicing has been identified and fully costed for Option 1 during the design phase and measures have been put in place to manage these effected assets. Where Options 2 and 3 require the proposed drainage system to be upsized significantly, which would likely increase the risk and cost associated with asset diversions and infrastructure upgrades.
- The existing swale systems through Catchments 1 and 2 play an important role as they provide local drainage for the street network during a minor event and act as flow path during a major event. However, there is limited capacity within the swale network to retain the 100-year ARI event. Therefore, retentions basin are required in close proximity to the catchment boundary to reduce the risk of property damage and flooding during a 20% or 1% storm event.

- A full risk analysis and investigation would be required for options 2 and 3 to confirm the extent of works required, costs associated with additional drainage works, swale modification works, impacts on existing services and existing infrastructure and to determine the level of service that can be achieved given existing site constraints. Where option 1 has been fully investigated and designed to meet the IDM.

8. Declaration

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

In the collation of this advice the following sources of information were used: -

- Congupna Urban Drainage Strategy
- Greater Shepparton City Council, Consultancy Brief – Congupna Urban Drainage Design (Stage 3)
- Greater Shepparton City Council, Congupna Stage 3 Drainage Alignment Evaluation Options 1, 2 & 3 (Conceptual Plans)

Uwe Paffrath

Principal Civil Engineer

Appendix A

Qualifications

Uwe Paffrath

Career History

- 2009 to Present: Paffrath Consulting – Principal Civil Engineer

  Survey and Design of drainage solutions for an alternate outfall pipeline and retardation basin for the township of Congupna and for the Tallygaroopna urban drainage upgrades – Greater Shepparton City Council

  Undertaking the role of Superintendent on behalf of Public Transport Victoria, for construction projects.

  Provision of services for the review of detailed design for the reconstruction of major road infrastructure projects (Vaughan Street Redevelopment; Verney Road) – Greater Shepparton City Council

  The provision of project and contract management services for the Cairn Curran Reservoir and Lake Eppalock projects – Goulburn-Murray Water.

  Provision of services for the investigations and design solutions to a number of drainage issues for both urban and rural sites, including retention basins, pump stations, underground pipelines, open channels and flood mitigation works – Greater Shepparton City Council.

  Development of Risk Management Guidelines that set out design information and procedures for the compliance of bus routes and stops for employees of the Public Transport Victoria involved within the Public Transport, Bus and Regional Services Directorate.

  Assisting with the development of Project Management Guidelines and reviews of the processes – Greater Shepparton City Council.

  Construction surveillance officer for the Euroa-Mansfield / Quarry Road intersection Access Upgrade, Gooram – Rural Works Pty Ltd.

  Lectured at Goulburn Ovens Institute of TAFE the following subjects for the Diploma of Engineering Drafting: Geometric Road Design, Applied Engineering Hydrology Principles, Design Underground Piping Drainage Systems and Minor Culverts, and Project Management.

  Survey and Design of Railway Station Car Parks – Public Transport Victoria.

  Provision of guidance and undertaking of audits for Roadworks Traffic Schemes on the M80 and Tullamarine Freeway construction projects – Leighton Contractors & McConnell Dowell Constructors.

  Undertake Traffic Impact Assessments for new developments where it is required to determine traffic volumes from site investigations, client and relevant road authority supplied information, impact of the developments on surrounding intersections and roads and any required traffic management devices, including pedestrian and cyclist infrastructures.

  Undertaken a number of Road Safety Audits, Stages 1, 2, 3, 4, 5 & 6 for a number of different clients – State Road Authorities, Design and Construction companies.

  Construction Management of the Victoria Park Lake Redevelopment (construction of wetland and reconstruction of lake) – including the review of detailed designs, development and preparation of tender documentations for the construction activities – Greater Shepparton City Council.

Investigate and determination of the road approach radii for the repositioning of a major intersection – Chris Smith & Associates.

Investigate the impact of the altering of a Developments Staging will have on the capacity (Level of Service) of the intersection – Chris Smith & Associates.

Project Management for the rehabilitation works along the Colac-Lavers Hill Road, south of Colac – VicRoads Program Delivery Department, Geelong.

- 2004 to 2009: GHD Shepparton – Senior Civil Engineer

  Design & Construction of the Tarago Water Treatment Plant for Melbourne Water – Role is of Team Leader for Site Works, where my responsibilities are to liaise directly with the design and construction teams and establish two-way communication with relevant personnel; provide design/technical support input for the earthwork, roadworks, site drainage, landscaping and security components of the project; enure design requirements and construction methodology complement each other; assist in developing construction methodology to suit changes in designs; and monitor quality, safety & environmental requirements from both the design & construction side of works.

  Deer Park Bypass Projects – as Lead Senior Road Safety Auditor regularly undertake Roadwork Traffic Scheme Audits, site safety reviews and checking of traffic management plans, during the construction of the Bypass.

  For VicRoads Program Development Department – identifying the types and causes of crashes by using information from RCIS and other sources, undertake site inspections and other investigations to identify deficiencies or features of the identified intersection or section of road, undertake a road safety review that considers the needs of all road users and prepare a Scope Approval Report.

  Conducting assessment of the current status of existing traffic control devices, providing recommendations for any modifications/additions to obtain a balance between providing for traffic and providing for activities that occur beside and across roads.

  Project Management for a number of Road Safety Projects from pre-construction activities to contract supervision.

  Investigate and determination of the reclassification of existing road network once former section of main road is bypassed by a new Freeway.

  Determination of emergency detour routes, for the safe passage of freeway traffic around hazardous sites along the Calder Freeway

  Manage the detailed design of major intersections.

  Project Management for the construction of Wastewater Reuse projects ranging from 100 ML to 650 ML, including the construction and commissioning of pipelines, pump station and associated works, and the installation of the necessary electrics and controls to transfer treated wastewater from the new winter storage to farmers for pasture irrigation.

  To identify, record assets and operational responsibilities on declared roads in accordance with relevant code of practice in the road management bill, for resolution by VicRoads and various municipalities, areas of demarcation on all arterial roads within the municipality.

Conducting assessment of the current status of existing traffic control devices, providing recommendations for any modifications/additions to obtain a balance between providing for traffic and providing for activities that occur beside and across roads.

Investigate the impact of the impeding closure of the Yarrawonga Weir Bridge on traffic movements between Yarrawonga and Mulwala. This project required the undertaking of traffic surveys, with use of the results to estimate future traffic demands, and the investigation of future crossing options for the Murray River, providing assessment of positive benefits and impacts of the proposed options.

Responsible for the project management / contract administration of major civil engineering projects.

Undertake Traffic Impact Assessments for new developments where it is required to determine traffic volumes from client and relevant road authority supplied information, impact of the developments on surrounding intersections and roads and any required traffic management devices, including pedestrian and cyclist infrastructures

Development of Traffic Management Plans and undertaking of Road Safety Audits.

- 1999 to 2004: Earth Tech Engineering Shepparton – Project Manager Infrastructure

Responsible for design, supervision and contract administration of major civil engineering projects in both NSW and Victoria, which include multi-lot residential subdivisions and structural works.

Development of Stormwater Management Plans, Engineering Development Manuals, Pedestrian / Cyclist Access Mobility Plans.

Project Management for design and construction of pavements, drainage structures, water resource and wastewater treatments.

Project Management for the survey and design of fibre optic installations within southern NSW.

Development of Quality Systems for civil contractors including the preparation of quality, occupational health & safety, environmental, site safety and traffic management plans.

Preparation of detailed designs, tender documentations and environmental management plans/statements.

Conducting audits on Contractor’s quality, safety and environmental management plans and field activities.

The development of asset management strategies, conducting asset classifications and condition assessments, including the utilisation of CAD and GIS.

Qualified Senior Road Safety Auditor and has undertaken a number of safety strategy assessments which include heavy vehicle, pedestrian and cycle management plans.

Development and preparation of Contractor’s environmental management induction program for Alpine construction activities.

Managed environmental impact studies which included planning, community consultation, workshops, liaison with utility services and authorities, design reporting and presentation, project evaluation, asset risk management and optimisation of asset lives, long-term strategy development, and business planning.

Examinations of existing and investigations into future over sized /extra mass vehicle routes.

Community consultation into strategic bicycle route selection and development of solutions to areas of conflict between traffic and cyclists.

- 1994 to 1999: Greater Shepparton City Council – Project Manager Construction & Assets

  Project managed the design, planning, community consultation, workshops, liaison with utility services and authorities, development of tender documentation and contract specifications, contract administration and supervision for rural drainage schemes.

  Development of a strategy for the management of Council owned transport assets.

  Development of an Infrastructure quality Procedures and Asset Management Manual.

  Implementation of a new cross-functional Capital Works Budget so as to minimise the review process and to maximise its tractability within departments.

  Implementation of a maintenance management system and ensure its use is maximised by both the Council and its maintenance contractor.

  Project managed all construction and annual supply projects as allocated, including $1.1 Million resealing contract.

  Improving techniques for measuring the impact of trade-offs between maintenance and replacement, including critical analysis and risk management.

  Managing the demand for asset through better utilisation, risk management, alternatives to asset use and more accurate service demand forecasting.

- 1994 to 1994: Shire of Rodney Shepparton – Works Engineer (10 months)

  Manage all construction and bituminous works, special projects (construction of recreational facilities, landscaping, swimming pools) and other civil works.

  To lead and supervise contractors and operations group personnel.

  To administer the Works Program including preparation of written and statistical reports, submissions and correspondence ensuring that information, advice and recommendations are provided to senior offices in a timely manner.

  Liaise with service authorities.

- 1985 to 1994: Shire of Rodney Shepparton – Engineer

  Carry out surveys, undertake design and prepare plans and specifications for civil works programmed by Council and the Rodney Water Board.

  Responsible for the implementation of Traffic Calming designs.

  To initiate “Black Spot” intersection treatments.

  Management of swimming pools (policy development, maintenance, operational, risk & health procedures)

Undertake field surveys and prepare layout plans for landscaping and general parks and garden works.

Prepare cost estimates and assist with budget control.

Check structural computations for building approvals and Council building projects, undertake site structural assessments/supervision and provide technical advice to the building department.

Assist and relieve during periods of annual leave the Planning Officer with technical matters relating to planning applications as required.

Qualifications and Affiliations

- Bachelor of Engineering (Civil)
- Senior Road Safety Auditor (Accredited – VicRoads)
- Internal Auditor (Quality Assurance)
- Mine Manager – Trenches
- Industry Induction in OHS (NSW White Card & Victorian Red Card)
- Aquatic Facility Operators Certificate – Technical & Human Resources

Appendix B

Congupna Stage 3 Drainage

Options 1 to 3 – Alignment and Cost Estimates

CONGUPNA WEST ROAD

CONGUPNA EAST ROAD

EXISTING DRAINAGE OUTFALL ABANDONNED

GMW DRAIN 1/5/11

122m LENGTH OF Ø450 PIPELINE TO RETARDATION BASIN

SECTION OF ROADSIDE DRAIN REGRADED TO NEW 450 DIA PIPELINE

WALLACE STREET SWALE DRAINS REMAIN UNCHANGED

STAGE 3 RETARDATION BASIN AND PUMP STATION, DISCHARGING INTO GMW DRAIN 1/5/11

STAGE 1 RETARDATION BASIN AND PUMP STATION, DISCHARGING INTO GMW DRAIN 5/11

GOULBURN VALLEY HIGHWAY

RAILWAY

KATAMATITE - SHEPPARTON ROAD

FARRELL PARK

WALLACE STREET

ROE COURT

OLD GRAHAMVALE ROAD

EX 375

375

450

525

600

750

CONGUPNA VILLAGE SUBDIVISION STAGE 2

CONGUPNA VILLAGE SUBDIVISION STAGE 1

1:1000 (A1 SIZE) 0 10 20 40 60 80m

NOT TO SCALE
REDUCED TO A3

CONCEPT ONLY

Greater Shepparton City Council
90 Welsford St, Shepparton VIC 3630
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W: www.greatershepparton.com.au

GREATER SHEPPARTON

CONGUPNA STAGE 3 DRAINAGE ALIGNMENT EVALUATION OPTION 1

TRIM REFERENCE: M16/56710

Congupna Urban Drainage Upgrade - Option 1 (Council preferred option)

		Estimated construction cost
Congupna Stage 1	$	596,395.00
Congupna Stage 2	$	206,195.00
Congupna Stage 3	$	295,306.75
Total exl GST (no contingency)	**$**	**1,097,896.75**

If completed as one Stage		
Total exl GST (no contingency)	**$**	**1,060,896.75**

CONGUPNA STAGE 1 - OPTION 1

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$20,000.00	$20,000.00
1.3	Traffic Management	1	Item	$1,000.00	$1,000.00
1.4	Construction setout and level control	1	Item	$5,000.00	$5,000.00
2	**RETARDATION BASIN WORKS**				
2.1	Stripping and stockpiling of 100mm of topsoil. Stockpile location to be nominated by the Superintendent	6900	m^2	$0.50	$3,450.00
2.2	Formation and earthworks in construction of the basin including formation of access tracks where required and	7900	m^3	$7.50	$59,250.00
2.3	Formation and construction of access tracks consisting of 150mm thick layer of Class 3 FCR compacted to 98%	514	m^2	$35.00	$17,990.00
2.4	Loading, carting and spreading topsoil from stockpiles on site to top dress the basin floor and batters.	6900	m^2	$0.50	$3,450.00
2.5	Supply and placement of basin clay lining	1800	m^3	$15.00	$27,000.00
2.6	Perimeter chain mesh fencing and gate	465	m	$15.00	$6,975.00
2.7	Tree planting	1	Item	$7,500.00	$7,500.00
2.8	Supply and planting of basin floor vegitation (WSUD measures)	1	Item	$5,000.00	$5,000.00
2.9	Supply and placement of Type 3 (300mm) beaching including A44 geotextile or equivalent.	171	m^2	$150.00	$25,650.00
2.10	Stormwater Pump Station including suction inlet, uPVC rising main and structure	1	Item	$100,000.00	$100,000.00
2.11	3 phase power supply to new pumps station	1	Item	$10,000.00	$10,000.00
3.0	**DRAINAGE WORKS**				
3.1	**Trenched Pipework** Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	750mm diameter	194	m	$400.00	$77,600.00
3.1.2	600mm diameter	44	m	$300.00	$13,200.00
3.1.4	375mm diameter	14	m	$200.00	$2,800.00
3.1.5	300mm diameter	29	m	$170.00	$4,930.00
3.2	Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.2.1	750mm diameter	67	m	$600.00	$40,200.00
3.2.2	600mm diameter	14	m	$450.00	$6,300.00
3.3	**Bored Pipework** Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.3.1	750mm diameter	86	m	$1,100.00	$94,600.00
3.3.2	600mm diameter	10	m	$950.00	$9,500.00
3.4	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.4.1	1250 x 1250 junction pit	9	No.	$3,000.00	$27,000.00
3.4.2	600 x 600 junction pit	1	No.	$2,200.00	$2,200.00
3.4.3	1250 x 1250 grated top entry pit	2	No.	$3,000.00	$6,000.00
3.4.4	900 x 900 grated top entry pit	2	No.	$2,800.00	$5,600.00
3.4.5	450 x 450 grated top entry pit & oriface plate (Pit C2)	1	No.	$2,200.00	$2,200.00
3.4.6	Remove and dispose of existing pit and construct a new 1200 x 900 side entry pit (haunched) - (Pit K1)	1	No.	$2,500.00	$2,500.00
3.4.7	Precast Concrete Endwall (OUTLET)	1	No.	$1,500.00	$1,500.00
3.4.8	Drivable endwalls to suit 375mm culvert	2	No.	$1,500.00	$3,000.00
				TOTAL	**$596,395.00**

CONGUPNA STAGE 2 - OPTION 1

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$15,000.00	$15,000.00
1.3	Traffic Management	1	Item	$10,000.00	$10,000.00
1.4	Service location and identification including DBYD and non destructive depthing as required including protection of services at all times.	1	Item	$5,000.00	$5,000.00
1.5	Construction setout and level control	1	Item	$4,000.00	$4,000.00
1.6	Removal and reinstatement of existing road signage and bollards	1	Item	$2,500.00	$2,500.00
1.7	Replacement of existimg undermined 100mm dia. uPVC water main with DICL pipework in accordance with GV Water Standard Drawing W-11(b).	1	Item	$3,000.00	$3,000.00
2	DRAINAGE WORKS				
2.1	Demolition and disposal of redundant drainage infrastructure	30	m	$150.00	$4,500.00
2.2	Earthworks and re-shaping of existing roadside table drain	560	m^2	$10.00	$5,600.00
2.3	Trenched Pipework				
2.3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.1.1	525mm diameter	107	m	$280.00	$29,960.00
2.3.1.2	450mm diameter	9	m	$250.00	$2,250.00
2.3.1.3	375mm diameter	338	m	$200.00	$67,600.00
2.3.2	Supply of materials and installation of Class 4 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.2.1	300mm diameter	3	m	$220.00	$660.00
2.4	Bored Pipework Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
2.4.1	450mm diameter	23	m	$875.00	$20,125.00
2.5	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
2.5.1	900 x 1200 side entry pit	3	No.	$2,600.00	$7,800.00
2.5.2	900 x 900 junction pit	6	No.	$2,200.00	$13,200.00
2.5.3	900 x 900 grated top entry pit	3	No.	$2,000.00	$6,000.00
2.5.4	1250 x 900 junction pit with batescrew valve (Pit 11)	1	No.	$4,000.00	$4,000.00
3.0	**BORING WORKS**				
3.1	Supply of all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.1.1	450mm dia. Under Katamitite - Shepparton Road	1	Item		
				TOTAL	$206,195.00

CONGUPNA STAGE 3 - OPTION 1

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$15,000.00	$15,000.00
1.3	Traffic Management	1	Item	$5,000.00	$5,000.00
1.5	Construction setout and level control	1	Item	$2,500.00	$2,500.00
2	**RETARDATION BASIN**				
2.1	Stripping and stockpiling of 100mm of topsoil. Stockpile location to be nominated by the Superintendent	6500	m^2	$0.50	$3,250.00
2.2	Formation and earthworks in construction of the basin including formation of access tracks where required	4500	m^3	$10.00	$45,000.00
2.3	Formation and construction of access tracks consisting of 150mm thick layer of Class 3 FCR compacted to 98%	290	m^2	$25.00	$7,250.00
2.4	Loading, carting and spreading topsoil from stockpiles on site to top dress the basin floor and batters.	6900	m^2	$0.50	$3,450.00
2.5	Reworking and compaction of 300mm basin lining layer.	1950	m^3	$10.00	$19,500.00
2.6	Perimeter rural post & wire fencing and gate	180.5	m	$13.50	$2,436.75
2.8	Supply and planting of basin floor vegitation (WSUD measures)	1	Item	$2,500.00	$2,500.00
2.9	Supply and placement of Type 1 (300mm) beaching including A44 geotextile or equivalent.	65	m^2	$70.00	$4,550.00
2.10	Stormwater Pump Station including suction pipeline, delivery pipeline and structures	1	Item	$100,000.00	$100,000.00
2.11	3 phase power supply to new pumps station	1	Item	$10,000.00	$10,000.00
3.0	**DRAINAGE**				
3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	450mm diameter	155	m	$250.00	$38,750.00
3.1.2	300mm diameter	27	m	$200.00	$5,400.00
3.2	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.2.1	900 x 900 junction pit	3	No.	$2,500.00	$7,500.00
3.2.2	600 x 600 junction pit	1	No.	$2,200.00	$2,200.00
3.2.3	900 x 900 grated top entry pit	2	No.	$2,600.00	$5,200.00
3.2.4	450 x 450 grated top entry pit & oriface plate	1	No.	$2,220.00	$2,220.00
3.2.5	Pit A5 - GMW Fram drain inlet pit	1	No.	$2,500.00	$2,500.00
3.2.6	Precast Concrete Endwall	1	No.	$1,500.00	$1,500.00
3.3	Formation and earthworks in construction of catch drain within adjacent farming land around the perimeter of the retardation basin	160	m	$10.00	$1,600.00
3.4	Decommissioning, plugging of pipework, removal of endwall and reshaping of batter of existing cilvert on Wallace Street.	1	No.	$1,500.00	$1,500.00
3.5	Repair the GMW drain as and where required to the satisfaction of the resposible authority	1	No.	$1,500.00	$1,500.00
				TOTAL	$295,306.75

CONGUPNA WEST ROAD

GOULBURN VALLEY HIGHWAY

RAILWAY

CONGUPNA EAST ROAD

GMW DRAIN 1/5/11

EXISTING DRAINAGE OUTFALL ABANDONNED

EX 375

375

KATAMATITE - SHEPPARTON ROAD

FARRELL PARK

WALLACE STREET

ROE COURT

OLD GRAHAMVALE ROAD

900

900

900

900

900

900

900

900

375

375

375

375

375

450

450

525

600

600

600

600

600

STAGE 1 RETARDATION BASIN ENLARGED FROM OPTION 1 TO ACCOMMODATE DRAINAGE FROM CONGUPNA VILLAGE STAGE 2

INCREASE IN DIAMETER FROM OPTION 1

CONGUPNA STAGE 2 PIPELINE REMAINS AS PER OPTION 1

SECTION OF CONGUPNA STAGE 1 PIPELINE REMAINS AS PER OPTION 1

45m LENGTH OF NEW PIPELINE

25 OCCUPATION CULVERTS AND 2 ROAD CULVERTS TO BE REMOVED AND REPLACED TO MATCH NEW SWALE LEVELS

COMBINED TOTAL LENGTH OF 1.1km OF WALLACE STREET ROADSIDE DRAINS TO BE REGRADED AND RESHAPED SO THAT THEY ALL FLOW TOWARDS OLD GRAHAMVALE ROAD

CONGUPNA VILLAGE SUBDIVISION STAGE 2

CONGUPNA VILLAGE SUBDIVISION STAGE 1

1:1000 (A1 SIZE) 0 10 20 40 60 80m

NOT TO SCALE
REDUCED TO A3

CONCEPT ONLY

Greater Shepparton City Council
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GREATER SHEPPARTON

CONGUPNA STAGE 3 DRAINAGE ALIGNMENT EVALUATION OPTION 2

TRIM REFERENCE: M16/56710

Congupna Urban Drainage Upgrade - Option 2

		Estimated construction cost
Congupna Stage 1	$	760,290.00
Congupna Stage 2	$	196,195.00
Congupna Stage 3	$	229,750.00
Total exl GST (no contingency)	**$**	**1,186,235.00**

CONGUPNA STAGE 1 - OPTION 2

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$30,000.00	$30,000.00
1.3	Traffic Management	1	Item	$1,000.00	$1,000.00
1.4	Construction setout and level control	1	Item	$10,000.00	$10,000.00
2	**RETARDATION BASIN WORKS**				
2.1	Stripping and stockpiling of 100mm of topsoil. Stockpile location to be nominated by the Superintendent	13400	m^2	$0.50	$6,700.00
2.2	Formation and earthworks in construction of the basin including formation of access tracks where required and	12400	m^3	$7.50	$93,000.00
2.3	Formation and construction of access tracks consisting of 150mm thick layer of Class 3 FCR compacted to 98%	804	m^2	$35.00	$28,140.00
2.4	Loading, carting and spreading topsoil from stockpiles on site to top dress the basin floor and batters.	13400	m^2	$0.50	$6,700.00
2.5	Supply and placement of basin clay lining	2800	m^3	$15.00	$42,000.00
2.6	Perimeter chain mesh fencing and gate	520	m	$15.00	$7,800.00
2.7	Tree planting	1	Item	$9,000.00	$9,000.00
2.8	Supply and planting of basin floor vegitation (WSUD measures)	1	Item	$7,000.00	$7,000.00
2.9	Supply and placement of Type 3 (300mm) beaching including A44 geotextile or equivalent.	171	m^2	$150.00	$25,650.00
2.10	Stormwater Pump Station including suction inlet, uPVC rising main and structure	1	Item	$100,000.00	$100,000.00
2.11	3 phase power supply to new pumps station	1	Item	$10,000.00	$10,000.00
3.0	**DRAINAGE WORKS**				
3.1	**Trenched Pipework** Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	900mm diameter	154	m	$710.00	$109,340.00
3.1.2	600mm diameter	44	m	$300.00	$13,200.00
3.1.4	375mm diameter	14	m	$200.00	$2,800.00
3.1.5	300mm diameter	29	m	$170.00	$4,930.00
3.2	Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.2.1	900mm diameter	67	m	$910.00	$60,970.00
3.2.2	600mm diameter	14	m	$450.00	$6,300.00
3.3	**Bored Pipework** Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.3.1	900mm diameter	86	m	$1,410.00	$121,260.00
3.3.2	600mm diameter	10	m	$950.00	$9,500.00
3.4	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.4.1	1250 x 1250 junction pit	9	No.	$3,000.00	$27,000.00
3.4.2	600 x 600 junction pit	1	No.	$2,200.00	$2,200.00
3.4.3	1250 x 1250 grated top entry pit	2	No.	$3,000.00	$6,000.00
3.4.4	900 x 900 grated top entry pit	2	No.	$2,800.00	$5,600.00
3.4.5	450 x 450 grated top entry pit & oriface plate (Pit C2)	1	No.	$2,200.00	$2,200.00
3.4.6	Remove and dispose of existing pit and construct a new 1200 x 900 side entry pit (haunched) - (Pit K1)	1	No.	$2,500.00	$2,500.00
3.4.7	Precast Concrete Endwall (OUTLET)	1	No.	$1,500.00	$1,500.00
3.4.8	Drivable endwalls to suit 375mm culvert	2	No.	$1,500.00	$3,000.00
				TOTAL	**$760,290.00**

CONGUPNA STAGE 2 - OPTION 2

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$10,000.00	$10,000.00
1.3	Traffic Management	1	Item	$5,000.00	$5,000.00
1.4	Service location and identification including DBYD and non destructive depthing as required including protection of services at all times.	1	Item	$5,000.00	$5,000.00
1.5	Construction setout and level control	1	Item	$4,000.00	$4,000.00
1.6	Removal and reinstatement of existing road signage and bollards	1	Item	$2,500.00	$2,500.00
1.7	Replacement of existing undermined 100mm dia. uPVC water main with DICL pipework in accordance with GV Water Standard Drawing W-11(b).	1	Item	$3,000.00	$3,000.00
2	DRAINAGE WORKS				
2.1	Demolition and disposal of redundant drainage infrastructure	30	m	$150.00	$4,500.00
2.2	Earthworks and re-shaping of existing roadside table drain	560	m^2	$10.00	$5,600.00
2.3	Trenched Pipework				
2.3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.1.1	525mm diameter	107	m	$280.00	$29,960.00
2.3.1.2	450mm diameter	9	m	$250.00	$2,250.00
2.3.1.3	375mm diameter	338	m	$200.00	$67,600.00
2.3.2	Supply of materials and installation of Class 4 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.2.1	300mm diameter	3	m	$220.00	$660.00
2.4	Bored Pipework Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
2.4.1	450mm diameter	23	m	$875.00	$20,125.00
2.5	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
2.5.1	900 x 1200 side entry pit	3	No.	$2,600.00	$7,800.00
2.5.2	900 x 900 junction pit	6	No.	$2,200.00	$13,200.00
2.5.3	900 x 900 grated top entry pit	3	No.	$2,000.00	$6,000.00
2.5.4	1250 x 900 junction pit with batescrew valve (Pit 11)	1	No.	$4,000.00	$4,000.00
3.0	**BORING WORKS**				
3.1	Supply of all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.1.1	450mm dia. Under Katamitite - Shepparton Road	1	Item		
				TOTAL	$196,195.00

CONGUPNA STAGE 3 - OPTION 2

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$15,000.00	$15,000.00
1.3	Traffic Management	1	Item	$5,000.00	$5,000.00
1.5	Construction setout and level control	1	Item	$2,500.00	$2,500.00
3.0	**DRAINAGE**				
3.1	Regrading and reshaping of Wallace Street roadside drains	1100	m	$12.00	$13,200.00
3.2	Existing concrete access crossovers saw-cut, existing culvert removed, new 300mm diameter culverts installed (3 pipes) at new grades/levels complete with new drivable endwalls and reinstate saw-cut contrete	24	Item	$6,200.00	$148,800.00
3.3	Existing road culvert removed, new 300mm diameter culverts installed (5 pipes) at new grades/levels complete with new drivable endwalls and reinstate road pavement	2	Item	$6,000.00	$12,000.00
3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	600mm diameter (full depth crushed rock backfill)	45	m	$450.00	$20,250.00
3.2	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.2.1	900 x 900 junction pit	2	No.	$2,500.00	$5,000.00
3.4	Decommissioning, plugging of pipework, removal of endwall and reshaping of batter of existing cilvert on Wallace Street.	1	No.	$1,500.00	$1,500.00
3.5	Repair the GMW drain as and where required to the satisfaction of the resposible authority	1	No.	$1,500.00	$1,500.00
				TOTAL	$229,750.00

CONGUPNA WEST ROAD

GOULBURN VALLEY HIGHWAY

RAILWAY

GMW DRAIN 1/5/11

CONGUPNA EAST ROAD

GMW DRAIN 1/5/11

EXISTING DRAINAGE OUTFALL ABANDONNED

EXISTING ROADSIDE DRAINS

STAGE 1 RETARDATION BASIN ENLARGED FROM OPTION 1

INCREASE IN DIAMETER FROM OPTION 1

INCREASE IN DIAMETER FROM OPTION 1

KATAMATITE - SHEPPARTON ROAD

FARRELL PARK

WALLACE STREET

ROE COURT

OLD SHAMVALE ROAD

EXISTING ROADSIDE DRAINS

CONGUPNA VILLAGE SUBDIVISION STAGE 2

CONGUPNA VILLAGE SUBDIVISION STAGE 1

450 450 450 600 600 600 600 375 375 450 750 750 750 750 750 900 900 900 900 900 900 900

1:1000 (A1 SIZE) 0 10 20 40 60 80m

NOT TO SCALE
REDUCED TO A3

CONCEPT ONLY

Greater Shepparton City Council
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GREATER SHEPPARTON

CONGUPNA STAGE 3 DRAINAGE ALIGNMENT EVALUATION OPTION 3

TRIM REFERENCE: M16/56710

Congupna Urban Drainage Upgrade - Option 3

		Estimated construction cost
Congupna Stage 1	$	760,290.00
Congupna Stage 2	$	220,158.00
Congupna Stage 3	$	103,625.00
Total exl GST (no contingency)	**$**	**1,084,073.00**

CONGUPNA STAGE 1 - OPTION 3

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$30,000.00	$30,000.00
1.3	Traffic Management	1	Item	$1,000.00	$1,000.00
1.4	Construction setout and level control	1	Item	$10,000.00	$10,000.00
2	**RETARDATION BASIN WORKS**				
2.1	Stripping and stockpiling of 100mm of topsoil. Stockpile location to be nominated by the Superintendent	13400	m^2	$0.50	$6,700.00
2.2	Formation and earthworks in construction of the basin including formation of access tracks where required and	12400	m^3	$7.50	$93,000.00
2.3	Formation and construction of access tracks consisting of 150mm thick layer of Class 3 FCR compacted to 98%	804	m^2	$35.00	$28,140.00
2.4	Loading, carting and spreading topsoil from stockpiles on site to top dress the basin floor and batters.	13400	m^2	$0.50	$6,700.00
2.5	Supply and placement of basin clay lining	2800	m^3	$15.00	$42,000.00
2.6	Perimeter chain mesh fencing and gate	520	m	$15.00	$7,800.00
2.7	Tree planting	1	Item	$9,000.00	$9,000.00
2.8	Supply and planting of basin floor vegitation (WSUD measures)	1	Item	$7,000.00	$7,000.00
2.9	Supply and placement of Type 3 (300mm) beaching including A44 geotextile or equivalent.	171	m^2	$150.00	$25,650.00
2.10	Stormwater Pump Station including suction inlet, uPVC rising main and structure	1	Item	$100,000.00	$100,000.00
2.11	3 phase power supply to new pumps station	1	Item	$10,000.00	$10,000.00
3.0	**DRAINAGE WORKS**				
3.1	**Trenched Pipework** Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	900mm diameter	154	m	$710.00	$109,340.00
3.1.2	600mm diameter	44	m	$300.00	$13,200.00
3.1.4	375mm diameter	14	m	$200.00	$2,800.00
3.1.5	300mm diameter	29	m	$170.00	$4,930.00
3.2	Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.2.1	900mm diameter	67	m	$910.00	$60,970.00
3.2.2	600mm diameter	14	m	$450.00	$6,300.00
3.3	**Bored Pipework** Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.3.1	900mm diameter	86	m	$1,410.00	$121,260.00
3.3.2	600mm diameter	10	m	$950.00	$9,500.00
3.4	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.4.1	1250 x 1250 junction pit	9	No.	$3,000.00	$27,000.00
3.4.2	600 x 600 junction pit	1	No.	$2,200.00	$2,200.00
3.4.3	1250 x 1250 grated top entry pit	2	No.	$3,000.00	$6,000.00
3.4.4	900 x 900 grated top entry pit	2	No.	$2,800.00	$5,600.00
3.4.5	450 x 450 grated top entry pit & oriface plate (Pit C2)	1	No.	$2,200.00	$2,200.00
3.4.6	Remove and dispose of existing pit and construct a new 1200 x 900 side entry pit (haunched) - (Pit K1)	1	No.	$2,500.00	$2,500.00
3.4.7	Precast Concrete Endwall (OUTLET)	1	No.	$1,500.00	$1,500.00
3.4.8	Drivable endwalls to suit 375mm culvert	2	No.	$1,500.00	$3,000.00
				TOTAL	**$760,290.00**

CONGUPNA STAGE 2 - OPTION 3

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$10,000.00	$10,000.00
1.3	Traffic Management	1	Item	$5,000.00	$5,000.00
1.4	Service location and identification including DBYD and non destructive depthing as required including protection of services at all times.	1	Item	$5,000.00	$5,000.00
1.5	Construction setout and level control	1	Item	$4,000.00	$4,000.00
1.6	Removal and reinstatement of existing road signage and bollards	1	Item	$2,500.00	$2,500.00
1.7	Replacement of existimg undermined 100mm dia. uPVC water main with DICL pipework in accordance with GV Water Standard Drawing W-11(b).	1	Item	$3,000.00	$3,000.00
2	DRAINAGE WORKS				
2.1	Demolition and disposal of redundant drainage infrastructure	30	m	$150.00	$4,500.00
2.2	Earthworks and re-shaping of existing roadside table drain	560	m^2	$10.00	$5,600.00
2.3	Trenched Pipework				
2.3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.1.1	750mm diameter	107	m	$400.00	$42,800.00
2.3.1.1	600mm diameter	143.83	m	$300.00	$43,149.00
2.3.1.3	375mm diameter	189.12	m	$200.00	$37,824.00
2.3.2	Supply of materials and installation of Class 4 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified, and making good of existing surfaces.				
2.3.2.1	300mm diameter	3	m	$220.00	$660.00
2.4	Bored Pipework Supply of materials and installation of Class 4 butt joint jacking stormwater pipes including all materials and equipment associated with the under highway including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
2.4.1	450mm diameter	23	m	$875.00	$20,125.00
2.5	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
2.5.1	900 x 1200 side entry pit	3	No.	$2,600.00	$7,800.00
2.5.2	900 x 900 junction pit	6	No.	$2,200.00	$13,200.00
2.5.3	900 x 900 grated top entry pit	3	No.	$2,000.00	$6,000.00
2.5.4	1250 x 900 junction pit with batescrew valve (Pit 11)	1	No.	$4,000.00	$4,000.00
3.0	**BORING WORKS**				
3.1	Supply of all materials and equipment associated with the under highway and rail bores including provision of all site and traffic management plans that accord with the relevant authorities requirements.				
3.1.1	450mm dia. Under Katamitite - Shepparton Road	1	Item		
				TOTAL	$220,158.00

CONGUPNA STAGE 3 - OPTION 3

Item No.	Description of Work	Estimated Quantity	Unit	Rate $	Extended Amount $ (GST Excl.)
1.0	**GENERAL**				
1.1	Site establishment, permits, and insurances.	1	Item	$5,000.00	$5,000.00
1.2	Site management: preparation of a Management Plan including site management, environmental management and OH&S systems where required.	1	Item	$5,000.00	$5,000.00
1.3	Traffic Management	1	Item	$2,500.00	$2,500.00
1.4	Construction setout and level control	1	Item	$2,500.00	$2,500.00
1.5	Demolition and disposal of redundant drainage infrastructure	55	m	$150.00	$8,250.00
1.6	Sawcut and remove section of concrete footpath	4.5	m^2	$150.00	$675.00
3.0	**DRAINAGE**				
3.1	Supply of materials and installation of Class 2 RRJRC stormwater pipes including excavation of trench, laying of pipes, placing and compaction of backfill as specified.				
3.1.1	600mm diameter	55	m	$300.00	$16,500.00
3.1.2	450mm diameter	165	m	$250.00	$41,250.00
3.2.6	Precast Concrete Endwall	1	No.	$1,500.00	$1,500.00
3.2	Construction of drainage pits including excavation, supply of all materials, formwork, provision of pipe connections and for future pipe connections, including plugging, subsoil drainage, entry and exit points, lids and frames, step irons if required, supply and compaction of backfilling, repair of pavement where required and disposal of surplus excavated material as directed.				
3.2.1	900 x 900 junction pit	4	No.	$2,500.00	$10,000.00
3.2.2	900 x 1200 side entry pit	2	No.	$2,600.00	$5,200.00
3.4	Decommissioning, plugging of pipework, removal of endwall and reshaping of batter of existing cilvert on Wallace Street.	1	No.	$1,500.00	$1,500.00
3.5	Repair the GMW drain as and where required to the satisfaction of the resposible authority	1	No.	$1,500.00	$1,500.00
					$0.00
4.0	New Conc. Footpath with SL72 Mesh & 125mm depth Class 3 20mm FCR	4.5	m^2	$500.00	$2,250.00
				TOTAL	$103,625.00