Clarkes Lane Project

Clarkes Lane, Wangaratta

Integrated Water Management and Sewage Detention – A Sewerage Servicing Strategy

January 2024

Prepared by: Integral Delta with North East Survey Design, Water Technology and Tract

For: Bislake Pty Ltd.

Project Manager: Robert Luxmoore

CONTENTS

Executive Summary

The system will comprise of a Class A wastewater treatment plant, with backwash and solids transferred to sewer, which treats the wastewater from an equivalent The Clarkes Lane Project (CLP) comprises 26.4 Ha of land located in Wangaratta South, adjacent to Targoora Park and Cathedral College, on Wangaratta – Whitfield Road. When developed, it will produce approximately 250 residential allotments of mixed size, comprising 233 residential lots including 3 super lots. Wangaratta's growth has placed considerable stress on the existing sewerage infrastructure, managed by North East Water Authority (NEWA). There is limited capacity in the system to accept any more development, due to surcharging of the sewerage network during wet weather events. Consequently, housing affordability and availability have been negatively impacted.

NEWA's Strategic Plan identified that innovation and alternate approaches to servicing are required. The North East Strategic Directions Statement (NESDS) also supports innovation in addressing issues around Climate Change and Integrated Water Management.

Integrated Water Management (IWM) utilises the available water resources and infrastructure, to deliver solutions that address the needs of the community and the environment. Integral with that approach is a change in approach and innovation in the implementation of servicing solutions.

The CLP has approached NEWA and the Rural City of Wangaratta (RCoW) with a proposal to remove wet weather flows from the sewerage network, treat the wastewater and deliver an alternate water resource to support climate change mitigation. This releases existing zoned residential land at Wangaratta South and reduces demand on NEWA infrastructure. In developing these approaches, CLP has engaged with NEWA, RCoW, EPA and NECMA.

A system has been designed to enable wastewater to be detained – not in raw state, but in a treated state – to allow for recycling, when required, or discharged to One Mile Creek, when possible. A treated water storage is cheaper and more flexible in operation, allowing NEWA to utilise the capacity created to its advantage.

350 lots, of which the CLP will consume an equivalent 250 lots comprising 233 residential lots and 3 super lots. The Class A water is stored in an open storage of on Targoora Park. When capacity is available, post wet weather events, the Class A water can be discharged to sewer. When required, the Class A water can be directed to irrigation of open space. If acceptable to EPA, Class A water can discharge to One Mile Creek, during wet periods, to further increase the flexibility of the NEWA infrastructure.

The treated water used for irrigation creates green open space, which has been shown to have significant health benefits to the community, mitigates global warming by creating cooler green spaces and acts as a carbon sink. The CLP project will provide to both NEWA and the community of the RCoW, an ongoing water resource to replace high value and at risk water sources – potable and ground water. Cooperation between agencies is a cornerstone of the IWM approach to urban development and letters of support have been provided by both NEWA and RCoW.

This is a strategically important opportunity that enables the early release of existing zoned land and additional land for urban development, by reducing the demand on the existing sewerage network through sewer mining and greening of community open space.

This report sets out the basis of the IWM approach to obtain approval from NEWA to this IWM solution to enable the development approval process to continue with the RCoW.

Clarkes Lane Wangaratta – Sewerage Services Strategy Using Integrated Water Management

Rapid growth in housing demand within Wangaratta has impacted the capacity of the existing sewerage network to accommodate additional flows. As a result, any additional land release will need to reduce its impact upon a sewerage system that is under stress during wet weather events and meets the requirements of all relevant agencies.

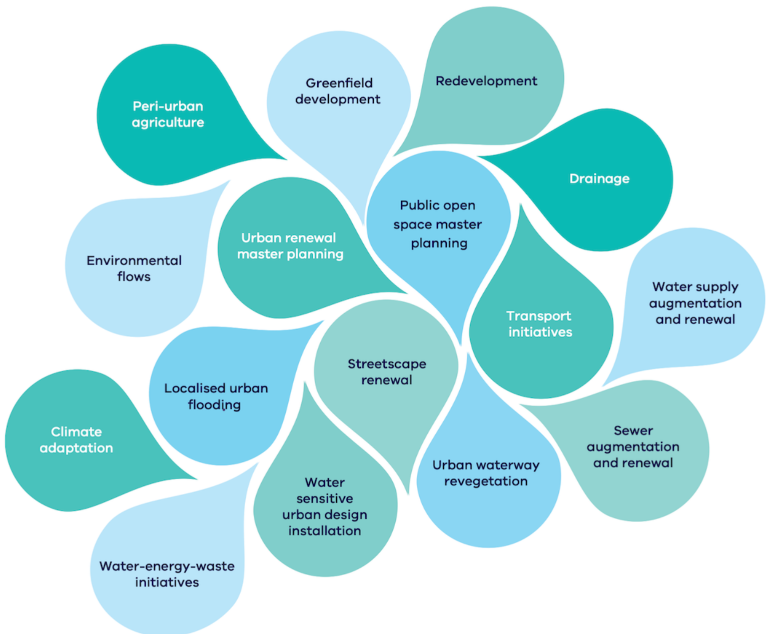
Wastewater from Wangaratta is transferred by pumped network to the treatment plant at North Wangaratta. It is understood that limitations in the transfer infrastructure is constraining housing growth. A substantial upgrade of infrastructure is required to enable housing land to be released. That upgrade is expected to be costly and will be some time before it becomes available. Any independent infrastructure will need to be able to support development for at least a 5 year horizon.

NEWA's 2017 Strategic Plan includes the following reference:

> *The North Wangaratta WWTP exceeds projected capacity requirements at 2030 and there are concerns about the WWTP's condition and the nutrient load to the environment. To accommodate new customers with high water demands requires detailed investigation on how to service beyond 2030. P 16.*
> *... pursue innovation in urban water supply and wastewater treatment and disposal by undertaking Whole of Water Cycle planning, encouraging the use of new technology in order to minimise the impact of our operations and any changes we make to it, on the environment." P.19*

Addressing the urgent need for sewerage infrastructure will require the use of Whole of Water Cycle planning and Integrated Water Management (IWM).

Victoria's Integrated Water Management Framework, 2017, sets out the principles that should be adopted in developing an IWM outcome, whether it be regional or site specific.



In preparing an approach to IWM, engagement with the relevant agencies – Rural City of Wangaratta (RCoW), North East Water Authority (NEWA), North East Catchment Management Authority (NECMA) and Environment Protection Authority (EPA) – has commenced to arrive at a site-specific solution that meets the requirements set by the agencies.

The respective accountabilities under the IWM Framework, 2017 are:

Agency	Accountability
Victorian Government and Departments	Legislation Policy Regulation
Environment Protection Agency	Environmental regulation (including best practice guidelines and protection policies)
Essential Services Commission	Economic regulation
Water corporations	Water supply Wastewater man'agement (including sewerage and sewage treatment) and trade waste management Waterway and major drainage systems (Melbourne Water only)
Catchment management authorities	Waterway health Floodplain management Environmental water
Local government	Urban stormwater management Parks and gardens management Onsite domestic wastewater management Urban planning Building and planning approvals
Property owners, residents and businesses	Meeting terms and conditions of services provided Following permit conditions Onsite water management, e.g. rainwater, stormwater
Victorian Planning Authority	Urban growth structure planning for Melbourne and (where invited) regional Victoria
Developers	Construction of development scale water infrastructure

For this project, the Developer has initiated an approach to servicing through IWM, that addresses the need for innovation and the urgent need for housing releases in Wangaratta. The key stakeholders in this site-specific approach share similar values and outcome expectations.

Shared values and outcomes

The North East Strategic Directions Statement (NE SDS)

The NE SDS was prepared in 2019. It sets out the strategic objectives that have been agreed to by the stakeholders, which includes the Rural City of Wangaratta, North East Water and North East Catchment Management Authority. The key findings from the NE SDS are:

P.12, NE Strategic Directions Statement - extracts

> *Ensuring the provision of fit for purpose water for the region's urban green spaces will be a key priority for enhancing liveability and resilience for the community and environment. Average annual rainfall is projected to decrease by up to 3.7 per cent by 2065 (median value), primarily impacting the 'cool' season. This presents a challenge for the region, as there will be an increased demand for urban water supply due to population growth together with a hotter, drier climate.*
>
> *From a water supply perspective, North East Water's Urban Water Strategy demonstrates that in particular there will be higher risks to water resource availability during drought conditions on unregulated streams such as the Upper Ovens and other smaller streams. By way of example, runoff into streams above North East Water's offtakes in the Ovens River Basin could decrease by as much as 43.9 per cent by 2065 under a high emissions scenario, while a low climate change scenario could see the region experience an increase in inflows by up to 1.2 per cent. IWM can provide solutions that aids preparedness for climate change impacts and supports the liveability of towns in the region. In particular by increasing local water supply diversity, reducing flood risk and providing heat wave relief by integrating and irrigating more green areas.*

P15. Strategic Objectives have been identified and are set out below.

1. *North East IWM objectives: Traditional owner and community values reflected in place based planning*

- *Traditional Owner values are integrated into water and land planning*
- *Communities are involved in decisions that affect them*

2. *North East IWM objective: Healthy and valued urban landscapes*

- *Communities learn about water scarcity in a changing climate*

3. *North East IWM objective: Healthy and valued waterways*

- *Healthy urban waterways and green spaces provide lifestyle opportunities*

4. *North East IWM objectives: Safe and secure water supplies in an uncertain future*

- *Our planning will maximise IWM for the use and re-use of water resources*
- *IWM enhances our systems to achieve climate resilience, innovation and cost effectiveness*

5. *North East IWM objective: Effective, affordable wastewater systems*

- *Our planning will maximise IWM for the use and re-use of water resources*

6. *North East IWM objective: Avoided or minimised existing flood risk*

- *Landscape and waterways planning addresses the impacts of flooding and stormwater*

7. *North East IWM objective: Jobs, economic growth and innovation*

- *Supporting the prosperity of business, big and small, is beneficial for our region*

These objectives frame the approach taken for this project and responds to their intent.

The Clarkes Lane Project

Located adjacent to Clarkes Lane, Targoora Park and Cathedral College, the project site has the potential to provide 233 lots and 3 super lots, equivalent to approximately 250 lots for housing. A concept development has been prepared to place the IWM approach in context with the opportunity.

The primary objective of this project is to improve the immediate availability of housing in Wangaratta to alleviate the current housing crisis. This will require a cooperative approach by the key stakeholders to meet the broad objectives of the relevant guidelines for water quality, environmental outcomes and community expectations.

Letters of support for an IWM outcome have been received from Rural City of Wangaratta and NEWA.

There are many opportunities that evolve from an IWM approach to development and respond to the NE SDS. These have been identified as:

- Public Open Space master planning – healthy and valued landscapes and community engagement; opportunity exists to masterplan Targoora Park to optimise the outcomes from IWM.
- Water and waste initiatives – efficient affordable wastewater systems; using a resource that has been undervalued and reduce demand on existing limited resources.
- Water Supply augmentation and substitution - safe and secure supplies in an uncertain future
- Sewer augmentation – jobs, economic growth and innovation; bringing innovation to urban development
- Environmental flows – healthy and valued waterways; improving waterway health by avoiding uncontrolled sewage spillage to environment.
- Climate adaptation – building resilience and learning about climate change; creating green open space for community use and benefit.

For Clarkes Lane, the outcomes are influenced by the site's proximity to public open space and school grounds and the potential to achieve the following objectives.

- Public Open Space master planning – the opportunity exists to masterplan Targoora Park to optimise the outcomes from IWM.
- Water and waste initiatives – incorporate local treatment and reuse of wastewater leading to substitution of potable and ground water with recycled water for irrigation.
- Water and Sewer augmentation – demonstrate innovation in the delivery of sewerage infrastructure to reduce impact on the network
- Climate Adaptation – irrigation of green open space and supporting sustainable landscaping
- Environmental Management – avoiding uncontrolled discharge of wastewater to the environment and improving waterway health.

Assessment of Opportunities

Opportunities for IWM have been identified based on the principles set out above. The proposals have been developed on the following basses:

- Technically feasible – using known technology and systems,
- Environmentally possible – can be constructed with no net environmental impact
- Agency expectations are met – consultation and demonstration of systems and benefits
- Community expectation – addressing the housing crisis and site outcomes
- Community benefits – demonstrating the net community benefit of IWM
- Capital and recurrent costs – reflect the importance of IWM and innovation in service delivery

The project is site specific but has wider system benefits for NEWA. The IWM Framework, 2017, acknowledges that all parties must be flexible and respond to the site opportunities and the broader objectives, which in this case, is relieving the housing crisis in Wangaratta by addressing the sewerage infrastructure limitations. Place based outcome settings are appropriate for this project

Place-based outcome setting

Minimum service levels are often established by regulations, such as State Environment Protection Policies and Victoria Planning Provisions, however, IWM can enable communities to set service levels suited to their unique environments.

Place-based levels of service can be set or tested through other strategies, such as an urban water strategy or waterway management strategy, but can also be tested through local scale IWM Plans, depending on the scale of analysis and the appropriate cost recovery mechanisms. For example, this could include managing priority waterways (or reaches of them) and localised flooding issues, or to address specific threats and constraints.

Communication and education on the possible options and service levels should be explored at the IWM Plan stage, and organisations should be willing to evaluate the costs and benefits.

IWM Framework - 2017

Integrated Water Management Approach

The basic principle of IWM is to manage the water cycle and water sources to reduce waste and optimise the water resources available – identifying water sources as fit-for-purpose to substitute lower quality water for high quality or at-risk sources. Water sources available to the site are potable water, ground water, recycled water, and stormwater. The proximity of open space and recreation areas, provides ample opportunity to utilise the available water resources to displace current high value / at-risk water sources and create community benefit.

Preliminary Assessment of an IWM Model

The assessment of the IWM model involves identifying and allocating water sources to particular uses, based on the highest and best use. The water sources available can be summarised as follows.

Water Source	Treatment and Status	Possible Uses / Observations
Potable water	Filtration and disinfection, high cost water source from Ovens River and limited resource. (at risk supply)	All domestic uses, irrigation. (**Note**: potable water is currently used to irrigate part of Targoora Park)
Stormwater	Wetland treatment and sediment control. Becoming less reliable as a water source due to climate change.	Irrigation and landscape features if the source is captured and stored. Topography is not suited to surface capture and storage.
Groundwater	Generally acceptable for irrigation with some elevated TDS. Long term use has degraded this resource. (At risk)	Irrigation and landscape features. (**Note**: ground water being used to irrigate part of Cathedral College sport fields – unreliable source, application for a bore supply rejected by GMW.)
Wastewater (Low Treatment Class B & C)	Local treatment with disinfection, irrigation water substitution option.	Subsurface Irrigation, landscape features, spray irrigation with constraints (and additional treatment)
Wastewater (High Treatment – Class A)	Local treatment to allow spray irrigation, potable water substitution option.	Toilet flushing, spray irrigation, landscape features, environmental flows.

In this project scenario, the scale, and the unique location of the site, suggests that the application of recycled water for toilet flushing is not viable for the following reasons.

- The use would be isolated in a larger urban context, which poses risks for long term management
- NEWA have no other domestic recycled water systems

Developing the Model

Integrating water resources into a development, involves the allocation of water resources where they have the most impact on higher quality or at-risk resources, by substituting those with an appropriate alternate source. In this project, the models investigated are developed around the substitution of the at-risk sources of potable water and ground water. The primary water substitution option is recycled water for potable water and ground water, which are both currently used for irrigation at Targoora Reserve and Cathedral College respectively. The community benefit is the maintenance of green open space for community wellbeing. Capture and storage of stormwater has limited potential because of topography.

Many studies support the contribution that recreational open space makes to community wellbeing, particularly green irrigated open space. Targoora Park, with appropriate planning, can be the beneficiary of an IWM approach, with a full scope of recreational and open space features.

> *Many of the positive health benefits described above are not derived through physical access to green open space alone but are influenced strongly by the quality of the space. The quality of green open space is usually characterised by the diversity of facilities such as sporting fields or playgrounds, maintenance levels, shade availability, walking tracks, access to water, general amenity including safety (Broomhall 1996; Giles --Corti et al. 2005 Francis et al. 2012). Using these characteristics of quality, Francis et al. (2012) found in their Perth, Australia, study that residents living in close proximity to high quality green open space were more likely to have low levels of psychological stress than those with low quality green open space, regardless of whether they used the green open space or not.*[1]

Irrigation supply for Cathedral College is drawn from groundwater. Demand on groundwater for irrigation of open space, in preference to agriculture, potentially impacts on a reliable resource, as climate change reduces the volume of rainfall available to recharge aquifers. Substituting recycled water for groundwater has a net benefit to agriculture.

Potable water is used to irrigate Targoora Park. This resource is high value and drawn from a source that is also subject to climate change impact – the Ovens River. Substituting potable and ground water sources with recycled wastewater is an appropriate approach.

NEWA has asked for detention of wet weather flows for development in Wangaratta. In this case, the detention period was weeks rather than days. In preference to storing raw sewage, CLP has proposed storing treated water to avoid operation problems with odour and cleaning.   This wil alleviate the pressure on the NEWA sewerage network by removing existing wastewater flows during wet weather events, from nearby sewers, using sewer mining.

Recycled water use is becoming common with new developments in urban areas supplied with recycled water for toilet flushing, laundry use and irrigation. The standards for recycled water are very high and supplies are regularly monitored. The uses for the different classes can be summarised as:

Class	Uses and Constraints
A	Suitable for reticulation to households for toilet flushing, laundry use and unrestricted irrigation / car washing; public open space irrigation without restriction
B	Suitable for irrigation of horticulture and agricultural land, washdown water, controlled spray irrigation of public open space (access restricted)
C	Suitable for irrigation of agricultural land, process water with no exposure, controlled irrigation of public open space (access restricted and withholding period)

Class A can be provided to households. The requirements and uses are set out in Appendix 1.

[1] https://www.environment.gov.au/system/files/pages/25570c73-a276-4efb-82f4-16f802320e62/files/planning-green-open-space-report.pdf

Sewage Detention Option and IWM

NEWA has reviewed its network operations and resolved that the wet weather capacity constraint in their sewerage network, could be alleviated using detention tanks, where sewage is held in sealed tanks and then released when capacity is available in the network, for example at night or after rain events. The sewerage network is currently impacted during rain events, resulting in spillage of sewage to waterways. Sewage detention systems have been used in many areas to address capacity constraints and their application in Wangaratta to address an immediate problem is a reasonable solution where the scale and location makes them feasible.

Climate change is likely to result in rainfall events increasing in intensity as well as duration. As a result, larger and more flexible detention systems may be appropriate. The CLP has considered this approach and resolved that there is potential to incorporate detention as part of the IWM approach.

Wet weather capacity in the sewerage network is the constraint to be addressed by this approach. Management of wet weather events, when infiltration to the network is at its greatest, can be addressed by determining how long the detention period should be, to enable the network to recover to lower flows. Analysis of historical rainfall records (BOM 1987 to 2022) shows that the mean number of rain days in Wangaratta is 16.4 in June. However, the rainfall volume is relatively low, that is less than 1mm.

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Highest daily rainfall (mm)	69.2	91.6	78.6	56.8	49.2	44.8	44.0	35.6	43.2	88.8	91.0	61.4	91.6	35	1987 2022
Date	28 Jan 2018	28 Feb 2012	01 Mar 2012	21 Apr 1990	17 May 1990	23 Jun 1996	24 Jul 2003	12 Aug 1997	04 Sep 2021	04 Oct 1993	12 Nov 1998	07 Dec 2014	28 Feb 2012		
Mean number of days of rain	5.8	5.4	5.8	6.9	10.8	14.4	16.4	14.4	11.5	9.3	7.9	7.1	115.7	35	1987 2022
Mean number of days of rain ≥ 1 mm	4.3	3.5	3.9	4.5	6.7	9.0	10.2	9.5	7.4	6.0	5.3	5.0	75.3	35	1987 2022
Mean number of days of rain ≥ 10 mm	1.6	1.2	1.3	1.3	1.7	2.3	1.9	1.4	1.8	1.6	1.6	1.1	18.8	35	1987 2022
Mean number of days of rain ≥ 25 mm	0.4	0.5	0.3	0.4	0.4	0.3	0.1	0.3	0.3	0.3	0.5	0.5	4.3	35	1987 2022

Records from 1987 to 2022 have been used as these will be most impacted by Climate Change.

In discussion with NEWA, it has been agreed that the IWM approach could be adapted to provide a sewage detention capacity of 18 days, creating capacity within the existing network to allow other areas to be released for development. An 18 day detention period will require that the system manages odour generation due to anerobic reactions where wastewater is held for some time. These operational constraints suggest that a preferrable approach is to treat the wastewater to avoid any undesirable outcomes and store treated water. On that basis it is possible to incorporate IWM into the detention option. As a result, a modified approach to detention, utilising IWM, has been developed. This incorporates the requirement for detention, as well as providing longer term flexibility to NEWA in managing their sewerage network.

To support the detention option and local treatment, to avoid discharge to the NEWA sewerage network during wet weather, it will be necessary to store treated wastewater in winter as well as provide for irrigation in summer. Any detention requirement during wet years can be treated to Class A standard, stored for the 18 day period and released back to sewer to provide more capacity for another detention event. In summer, the storage needs to meet irrigation demand.

An additional opportunity to create more capacity in the detention option, is to treat the water to sufficient quality to enable discharge to surface waters, where such discharge can be shown to not be detrimental. This approach is supported by the Place Based Outcome Settings of the IMW Framework.

Options for an effective IWM model, incorporating detention, have been prepared and are listed below. The principals of IWM will deliver a solution where substitution and management of water flows is effectively managed within the IWM Framework, as well as providing NEWA with flexible detention capacity in their sewerage network. Dialogue with NEWA, RCoW, NECMA, EPA and DELWP is underway to resolve any outstanding issues.

Critical Assumptions:

- Sewerage capacity will not be available for 5+ years
- Wangaratta has an immediate housing crisis
- Solving the housing crisis requires early solutions to sewerage capacity
- Innovation in servicing is required
- Enable housing construction and avoid wet weather discharge to existing sewers for 5+ years

Adopting one or more models would enable the planning process for the land release to progress as the technical details are resolved, through preliminary design and engagement with all relevant stakeholders.

Options for consideration which support IWM principles involve the use of water recycling and applying the recycled water to a higher and better use. That use is most likely the irrigation of open space areas to mitigate climate change and create green open spaces for the community.

Assumptions for preliminary design purposes are.

Assumptions	**Detail**	**Comment**
Lots Served with Detention	350 approximately	Includes more than CLP land to release zoned land.
Wastewater per person	150 L per day	
Occupancy	3.5 people per lot	ABS data is 2.3 p/lot
Solids from processing	5% of total inflows	Solids not dealt with on-site. Solids to sewer to NEWA approval
Irrigation rate	6 ML / Ha / yr	Typical for good quality recreation surfaces.
Area available for irrigation	7.7 Ha	Includes Council reserve and Cathedral College land, fully developed
Decile 9 Wet Year for irrigation	Assume wet year to address climate change	If Decile 9 is adopted, then flows in One Mile Creek will also be regular, supporting environmental flows.
Evaporation	1400 mm / m^2 / yr	No direct pan data available, adopt average for Wangaratta.

It should be noted that the topography of the site will limit the potential for stormwater harvesting. It is also known that there are no confined aquifers in the vicinity and therefore groundwater injection and recovery is not considered. Dry weather irrigation storage is a priority, as is the avoidance of uncontrolled discharge of untreated wastewater to the environment.

With the need to avoid discharge to NEWA's sewer network during wet events, the models considered have to be site specific and respond to the site opportunities. One Mile Creek has high passing flows and may be an option for discharge if approval can be obtained. The adjacent open spaces are an invitation to supply irrigation water to support active and passive recreation. Climate change mitigation also supports the irrigation of open spaces, which also act as a carbon sink as vegetation grows.

With wastewater detention, the model options take on a different approach, but still respond to IWM principles.

Options for IWM, incorporating Detention, at Clarkes Lane, Wangaratta.

Note: Irrigation supply for Targoora Park is from potable water. Irrigation supply for the school recreation areas is ground water supply.

Possible solutions to avoid uncontrolled discharge to sewer include wastewater treatment and reuse, treatment and discharge to environment (adjacent waterways), treatment and discharge to aquifer, detention and controlled release to sewer.

Option	Description	Comments	Community and Costs
1	**Local Treatment and discharge to environment (One Mile Creek or aquifer).** Involves the treatment of wastewater to a suitable standard in a package STP to enable discharge to the adjacent waterway or aquifer. Requires approval from EPA and needs to meet required water quality determined from research of receiving waters and aquifers. Discharge to aquifer will require knowledge of adjacent beneficial uses that may be impacted, quality of ground water and ability to take flows. No local reuse of water by irrigation of POS or potable water substitution. No ground water substitution. Solids discharged to existing sewer. Discharge managed to meet NEWA requirements. Stormwater captured at lot scale and used for toilet flushing and irrigation (BAU). WSUD used for surface flows. Stormwater to infiltration and water quality controls.	Need to demonstrate that surface water discharge has a net community benefit. May impact the ecology of surface waters if not managed appropriately. Ground water discharge would be by injection to suitable level. Desk top analysis confirms no confined aquifer. One Mile Creek entry to Ovens River is below the Wangaratta water supply offtake on Ovens River (not in Declared Catchment) Aquifer recharge may be of benefit but not supported. Community response to discharge will need to be understood.	No direct community benefit through irrigation of community POS. No potable water substitution and ground water substitution – no community benefit. No cost recovery from product. Community bears full cost. Discharge to waterway may have operational and net community benefit through improved landscape values and support climate adaptation in dry periods. Any discharge is subject to EPA approvals and further research. Aquifer recharge not feasible as no confined aquifer so no control over extraction. Capex: treatment plant: $3M (includes nutrient removal) Ground water Injection bore: $1M

2	**Local treatment and reuse for subsurface irrigation.** Involves the treatment of wastewater to a quality suitable for subsurface irrigation (Class C) of the existing recreational areas. Will require winter storage to avoid discharge to environment and to meet summer demand. Additional treatment (to Class A) could see discharge to environment when storage is full with summer demand coming from sewer mining. Stormwater captured at lot scale (tanks) and used for toilet flushing and irrigation (BAU). WSUD used for surface flows. Stormwater to treatment and infiltration to groundwater recharge. Requires large winter storage to avoid discharge to sewer or surface waters in wet years.	Subsurface irrigation can use lower quality treatment (Class C). Still require storage to avoid discharge to surface waters. Sewer mining possible during dry year events to meet demand. Reduces storage requirement. Also removes wet weather sewage flows from existing network. Surface water discharge could be possible to reduce winter storage size, with further treatment (Class A). Adds to cost. Need to assess impact on the ecology of the receiving waterways.	Subsurface irrigation has greater capex and maintenance costs. Specific design required for integration into sports fields. Can be used on landscape as well as playing surfaces. Creates green landscape for net community benefit. Lower demand for irrigation due to low evaporation compared to spray irrigation, which has evaporation loss during operation. Storage for summer demand required. Potable water and ground water substitution has significant community benefit. Cost recovery possible for water used for beneficial uses. Capex: Treatment Plant: $3M Irrigation costs by users.
3	**Local treatment and reuse to allow spray irrigation with optional discharge to waterways.** Involves the treatment of wastewater on site to a high level and the reuse of that water to irrigate POS and school property. Flexible use – could go to surface waters in wet years with appropriate treatment (subject to ecological advice). Use of wetlands for nutrient stripping is possible.	Provides a high-quality water resource that can be used flexibly to improve outcomes for the community with improved waterways and green open space.	Most flexible outcome operationally, large storage required to support irrigation. Significant community benefit through green POS and recreation opportunities and improved waterways.

	Does not remove need for winter storage even if discharge to surface waters available – can use sewer mining to meet summer demand. Storage required to meet summer demand. Stormwater captured at lot scale and used for toilet flushing and irrigation (BAU). WSUD used for surface flows. Stormwater treatment and infiltration.	If discharge to surface waters is available, then storage size is reduced. Require storage to meet dry summer demand. Use sewer mining for summer irrigation demand.	Discharge to waterways, could correspond to wet weather events, or as supplement to support ecological values. Sewer mining of more lots (than Project) supports more irrigation areas and can match dry year irrigation demand. Potable water substitution and ground water substitution achieved – significant community benefit. Cost recovery available for beneficial uses Capex: Treatment Plant: $3M
	Local treatment and reuse to allow spray irrigation without discharge to waterways. Involves the treatment of wastewater on site to a high level and the reuse of that water to irrigate POS and school property. Large winter storage required to meet summer demand and avoid discharge to surface waters. Requires large winter storage to avoid discharge to waterways – meeting 90 percentile wet year for no discharge to environment. Require sewer mining in dry years. Stormwater captured at lot scale and used for toilet flushing and irrigation (BAU). WSUD used for surface flows. Stormwater infiltration to groundwater.	If surface water discharge is not available, then large winter storage required. Seasonal variation impacting on storage volume. Could use sewer mining for summer demand in dry periods. Large winter storage is the main concern to meet expectation of no discharge.	Large storage required to meet expectations of wet year. Potential additional off-site space. Land acquisition required. Community benefit through green POS and ease of irrigation. Larger storage could be used with sewer mining to reduce flows to sewer until overall network resolved in dry years. No advantage in wet years.

			Potable water substitution and ground water substitution, gives significant community benefit. Capex: Treatment Plant: $3M Storage: $2M (includes land)
5	**Detention and Reuse, with option to discharge.** Take wet weather flows from external lots (350). 18 day detention period proposed for wastewater. In preference to storage in tanks, treat the wastewater to Class A and store on site in open storage. Treated water can be released to sewer over several days, as capacity comes available. Retain Class A for irrigation as required. Use sewer mining to meet irrigation demand if required. Allows flexibility in operation of NEWA sewerage network to include external catchments when required. Ability to expand operation of the detention system by treating to a quality that will allow discharge to One Mile Creek in wet weather, further increasing the capacity of NEWA sewerage network. Stormwater captured at lot level and used for toilet flushing and irrigation (BAU). WSUD used for surface flows. Releases existing zoned land for urban development.	Storage level can be managed to allow flexibility in detention within the NEWA network. Predicted weather patterns can be used to either release to sewer or waterway to allow greater detention capacity in wet weather. Storage is smaller and more flexible. Can meet summer irrigation demand from sewer mining.	Community benefit in creating network capacity in NEWA sewers. Community benefit in potable substitution and ground water substitution. Irrigation of POS creating net community benefit. Can be used prior to project completion. Allows early release of land for housing by freeing up network capacity. Capex: Plant: $3M Storage $1M

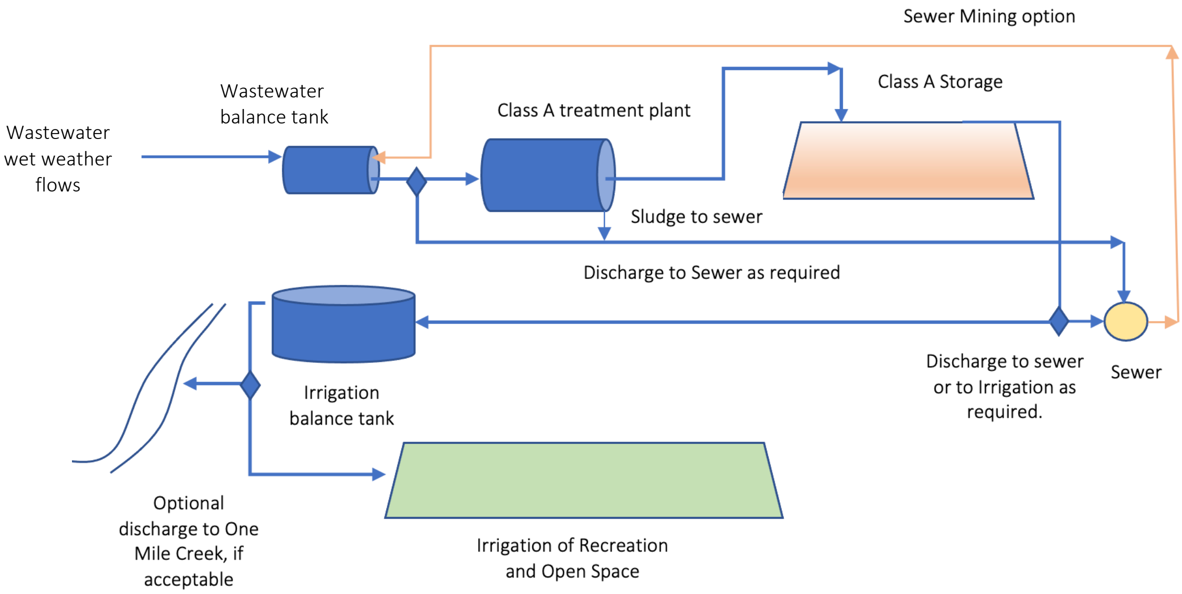
Recommended IWM Model

The recommended model is option 5. This provides the greatest community benefit and flexibility in managing the current (and possibly future) sewerage infrastructure constraints and replaces high value water sources with an alternate water source.

The adopted IWM model could achieve the following.

1. Create immediate capacity in the sewerage network by providing long term sewage detention through treatment and storage on public land, to address limited wet weather capacity in the NEWA sewerage network.
2. Use the treated wastewater to irrigate recreation areas and public open space.
3. Enable release of 100 lots of residential land in the Wangaratta South area.
4. Enable development of the Clarkes Lane project.
5. Utilise "sewer mining" techniques to manage irrigation demand and sewerage network capacity and provide for a long-term irrigation water source for community benefit.

Diagram of Detention and Reuse option



Regulatory and Legislative Issues

The management of wastewater onsite disposal and reuse is regulated through the Environment Protection Act, 2017 and the Water Act.

Water Authority functions under the Act in respect to sewerage services:

> ***173 Functions of Authorities***
> *(1) An Authority that has a sewerage district has the following functions—*
> *(a) to provide, manage and operate systems for the conveyance, treatment and disposal of sewage and, if the Authority so decides, of trade waste;*

(b) to identify community needs relating to sewerage services and to plan for the future needs of the community relating to sewerage services;
(c) to develop and implement programs for the recycling and reuse of treated waste water;
(d) to investigate, promote and conduct research into any matter which relates to its functions, powers and duties in relation to sewerage services;

The Environment Protection Act sets out the principles that apply to environmental management.

18 Principle of waste management hierarchy
Waste should be managed in accordance with the following order of preference, so far as reasonably practicable—
(a) avoidance;
(b) reuse;
(c) recycling;
(d) recovery of energy;
(e) containment;
(f) waste disposal.

The Act defines the treatment and reuse of wastewater as a Prescribed Permit Activity and the establishment of operations as Prescribed Development. The resulting Permission process replaces the old Works Approval process.

The Regulations describe the treatment and reuse of wastewater as "Prescribed Permit Activity".

Clause 16. (3) For the purposes of section 46 of the Act, an activity set out in column 3 of the Table in Schedule 1 is a prescribed permit activity if the corresponding entry in column 4 of that Table specifies that the activity is a prescribed permit activity.

The flow rate from the project will be around 120,000 L/day on average.

Environment Protection Regulations 2021
S.R. No. 47/2021

Schedule 1—Prescribed permission activities and fees

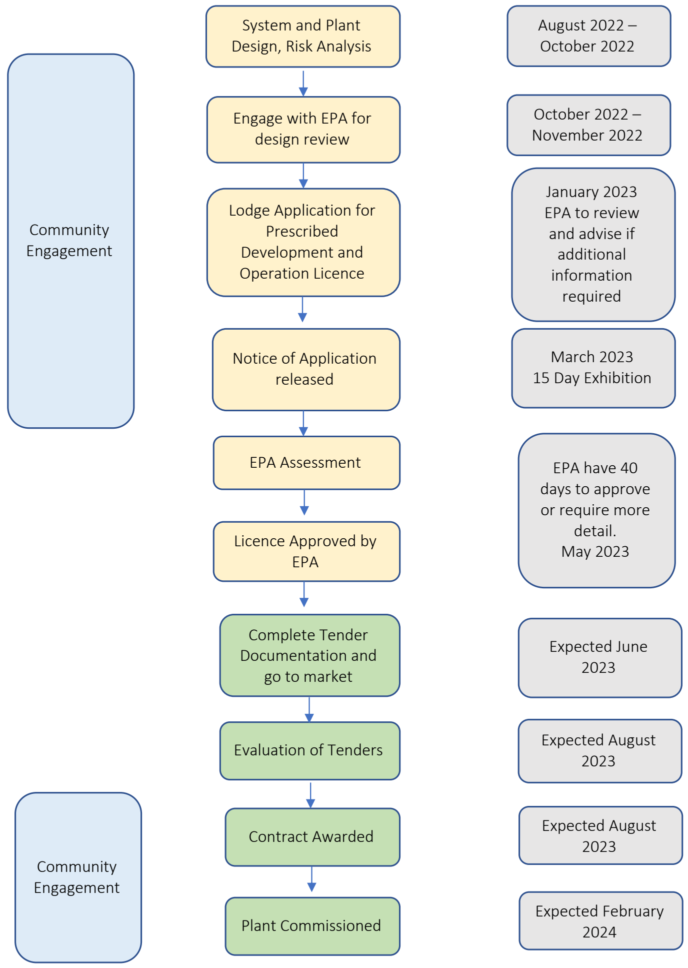
Column 1 *Item*	*Column 2* *Activity type and summary description*	*Column 3* *Description of prescribed permission activity*	*Column 4* *Type of prescribed permission activity*
5	A03 (Sewage treatment)	Treating, discharging or depositing sewage (including sullage), exceeding a design or actual flow rate of 5000 litres per day or on any day	• Prescribed development activity • Prescribed operating activity

The application for Permission for a Prescribed Activity – the wastewater treatment and reuse – will need to be made by NEWA. The documentation and supporting proposal would be provided by the project in conjunction with NEWA.

EPA Permissions Process

The process for licencing the treatment plant and recycling system and construction, is set out below. Application for Permission will be made jointly by CLP and NEWA, with NEWA holding the licence to operate the treatment plant. This process will run in parallel with the rezoning approval process.

Wastewater Treatment Plant Approval Process and Construction Timeline



Community Benefit Outcomes of Green Open Space

Green open space and recreation have been demonstrated to improve community wellbeing[2] and contribute to the mitigation of Climate Change, by providing habitat, cooling and carbon sequestration.[3]

> *Green open space has been shown to be crucial to public health, personal wellbeing and is vital to the provision of urban ecosystem services and the maintenance of biodiversity in cities (Swanwick et al. 2003; CABE 2009; Healthy Spaces and Places 2009; Marshall and Corkery 2011; and Konijnendijk et al. 2013). These spaces offer city residents, workers and visitors benefits such as exercise, socializing, being in contact with nature and connecting with places of rich cultural heritage. The values people assign to green open spaces is reflected tangibly in higher prices of properties located in closer proximity to them (Crompton 2005; Cho et al. 2006; Sarev 2011). Further, they offer habitat for flora and fauna, along with other ecological benefits such as stormwater retention and management and urban heat island mitigation (Jorgensen and Gobster 2010; City of Boroondara 2011; Sports and Recreation Tasmania 2013).*[4]

Open space and recreation providers have little scope for improving water harvesting or recovery in an increasingly difficult environment of water scarcity and increasing temperature. It falls to the providers of water infrastructure to support the community through innovative approaches to IMW, supported by appropriate pricing of recycled water to assist in maintaining cooler and greener spaces for community wellbeing, while contributing to the sequestration of carbon.

A paper from the Clean Air and Urban Landscapes Hub, Universities of Melbourne, RMIT, Western Australia and Wollongong, synthesises the combined benefits of open space.
https://minervaaccess.unimelb.edu.au/bitstream/handle/11343/122914/2016-CAUL-Benefits%20of%20Urban%20Green%20Space.pdf

A study undertaken for government-managed large open spaces in Sydney and Melbourne found that the socially based ‘avoided costs’ of providing and maintaining quality open space could be demonstrated. These avoided costs should be taken into account in pricing of recycled water in recognising the importance that open space plays in the community.

> *Data was obtained from community service agency representatives on program costs with, and without, access to public open space. Avoided costs for the Sydney and Melbourne metropolitan regions as a whole were estimated by adding all the individual additional program costs that would be incurred without access to public open space. Thus, the total avoided cost in the Greater Sydney region was estimated at between $10.6M-$14.6M per year. Avoided costs for the Greater Melbourne Region were estimated as being between $4.4M and $4.5M*. The study suggested that program costs would increase by 55% to 75% if public open space were not provided. [5]

Research also shows that open space contributes to the mitigation of climate change through the sequestration of carbon and nutrients, as well as providing cooling and habitat for flora and fauna.

---

[2] https://www.parliament.vic.gov.au/archive/council/publicland/Submissions/pl-sub128%20att%201.pdf
[3] https://www.environment.vic.gov.au/suburban-parks/open-space-for-everyone ;
[4] https://www.environment.gov.au/system/files/pages/25570c73-a276-4efb-82f4-16f802320e62/files/planning-green-open-space-report.pdf
[5] https://www.parliament.vic.gov.au/archive/council/publicland/Submissions/pl-sub128%20att%201.pdf

Many of these benefits can provide 'insurance' against changes in future environmental conditions such as extreme temperatures floods or storms, and provide a strong case for investment by planning authorities (Commonwealth of Australia 2010; City of Melbourne 2012; Byrne and Sipe 2010).[5]

For these valuable assets to continue to contribute to the wellbeing of the community and mitigate climate change, they require irrigation, particularly for recreation.

The Contribution of Recreational Open Spaces

Irrigated recreational spaces promote plant growth year-round. The result is that the contribution to sequestration is continuous, using irrigation. A study from the USA has quantified the contribution made by golf course turf, excluding the contribution made by trees and other plantings, that also boost the overall contribution to carbon sequestration.

As part of the urbanization process, an increasing percentage of land throughout the USA is being converted into turfgrass. Because of high productivity and lack of soil disturbance, turfgrass may be making substantial contributions to sequester atmospheric C. To determine the rate and capacity of soil C sequestration, we compiled historic soil-testing data from parts of 15 golf courses that were near metropolitan Denver and Fort Collins, CO, and one golf course near Saratoga, WY. In addition, we compiled a total of about 690 data sets on previous land use, soil texture, grass species and type, fertilization rate, irrigation, and other management practices. The oldest golf course was 45 yr old in 2000, and the newest golf course was 1.5 yr old. Nonlinear regression analysis of compiled historic data indicated a strong pattern of soil organic matter (SOM) response to decades of turfgrass culture. Total C sequestration continued for up to about 31 yr in fairways and 45 yr in putting greens. However, the most rapid increase occurred during the first 25 to 30 yr after turfgrass establishment, at average rates approaching 0.9 and 1.0 t ha^{-1} yr^{-1} *for fairways and putting greens, respectively. Our study also found that past land use imparted a strong control of SOM baseline; fairways converted from agricultural lands exhibited 24% lower SOM than fairways converted from native grasslands. We concluded that C sequestration in turf soils occurs at a significant rate that is comparable to the rate of C sequestration reported for USA land that has been placed in the Conservation Reserve Program.*[6]

Other studies have shown that grasslands can have much higher uptake of carbon than turf grasses and that trees have considerably greater uptake.

Using data from a study of semi-arid Australian grasslands by the Queensland Department of Primary Industry[iv] that accounted for the amount of live grass above ground found that about 5 tonnes of carbon could be stored per hectare of perennial grass year, assuming little grazing. This compares to carbon stocks of mature dry sclerophyll forest that contain about 100 tonnes of carbon per hectare (with wide variability). [7]

Pricing of Recycled Water for Recreation and Open Space

With increasing concern over global warming, depletion of rainfall and ground water supply, the sources of water to mitigate the effects of global warming within the urban environment will reduce. Recycled water, by its very nature, is a sustainable source of water that can be provided to sustain the green spaces that are critical to community wellbeing and mitigate climate change. Water agencies have an obligation to meet that challenge through government policy.

***Water for Victoria**, the State's water plan, says that "Our water sector will be a leader in the state's climate change mitigation and adaptation actions," and recognises the State's commitment to achieve*

[6] https://acsess.onlinelibrary.wiley.com/doi/epdf/10.2134/agronj2002.9300
[7] https://www.chiefscientist.gov.au/2009/12/which-plants-store-more-carbon-in-australia-forests-or-grasses

net-zero greenhouse gas emissions by 2050, as flowing through to the water sector. ***Water for Victoria*** *commits the water corporations to demonstrating a pathway to net-zero emissions and to pledge an interim emission reduction target to be achieved by 2050.*[8]

It remains government policy to increase the use of recycled water. The departmental review of recycled water in 2020, included the following:

> *The first phase of the review focused on improving and streamlining approval processes for recycled water rather than undertaking a technical review of the guidance. The key objective of the review was to facilitate increased use of recycled water where risks to the environment and human health are acceptable.*[9]

Supporting the increased use of recycled water in preference to depleting ground water reserves through a pro-active pricing policy, is an appropriate approach to meeting government objectives.

Within the ESC framework, there is an obligation for the Water Corporations to include community expectations within their assessment for pricing approval. The wider community now sees Climate Change as a significant concern. The Lowy Institute's 2021 Climate Poll found that;

> *"Six in ten Australians (60%) say 'global warming is a serious and pressing problem. We should begin taking steps now, even if this involves significant costs', with a 4-point rise from 2020."*[10]

Recycled water is a legitimate tool in the mitigation of climate change where its use enhances the sequestration of carbon through appropriate irrigation practice.

Recycled water provides a net community benefit where green space can enhance wellbeing, provide recreation opportunities, maintain habitat and mitigate warming.

[8] Statement of Obligations (Emissions Reduction), Government of Victoria.
[9] https://www.water.vic.gov.au/liveable/using-alternative-water-sources
[10] https://www.lowyinstitute.org/publications/climatepoll-2021

Strategic Justification

Wangaratta's housing provision is constrained by the lack of sewerage capacity. This IWM approach will release capacity in the sewerage network through innovative use of detention of wet weather sewerage flows and Integrated Water Management. This approach is made possible by the site specific circumstances of this project, adjacent to open space and recreational space, that can be irrigated to provide considerable net community benefit.

This approach will provide for the early release of land in the Wangaratta South Growth area, by sewer mining approximately 350 allotments from existing urban areas, adjacent to Targoora Park, providing capacity for 233 residential lots and 3 super lots, equivalent to 250 lots in the CLP and 100 lots in the growth area. This will enable the South Wangaratta Growth area to released earlier than expected, by removing the wet weather flows from an existing urban area. However, the South Wangaratta Growth Area will need to establish a sewerage detention or treatment system once the early release land has been consumed.

The Clarkes Lane Project (CLP) will, in conjunction with NEWA, construct a wastewater treatment plant, upon the rezoning and permitting of the CLP, of sufficient capacity to treat the wet weather flows from an equivalent 350 lots. Existing zoned land in the Wangaratta South Growth area will be able to be released immediately the plant is constructed. The released capacity will be available for approximately 2 years. The CLP and NEWA will apply to EPA for permission to discharge Class A water to One Mile Creek during wet events, thereby removing these wet weather flows from the sewerage network, supporting the release of some land in the Wangaratta South Growth area.

Integrated Water Management Principles provides net community benefit through replacement of at-risk water sources (potable water and ground water) with recycled water and releases land into the market much sooner than would otherwise be the case.

The rezoning of the CLP supports the strategic objectives of the Rural City of Wangaratta through the combination of infrastructure provision and land release. Approval of the treatment plant infrastructure will be through EPA and can run in parallel with the rezoning of the land, to facilitate the early release of the Wangaratta South Growth area and the CLP.

System Operation

Sewer mining is the process of pumping wastewater from an existing sewer for the purposes of treating it for another purpose. In this case, the wastewater is removed when the flows in the sewer exceed average dry weather flows for the catchment. This trigger flow is determined by sensors in the sewer that determine the flow volume. Wastewater is then extracted and transferred to the treatment plant to produce Class A water. This water is stored until discharge is possible.

A catchment area has been selected that can be isolated and managed at a point close to the treatment plant. This catchment discharges through a series of sewers and pump stations to a pit at the rear of Wenhams Lane and adjacent to the Targoora Reserve. A new pump pit will be constructed adjacent to this pit, to house pumps and sensors. The Clarkes Lane land will also discharge to this sewer, which means that as the CLP develops, the wastewater from the CLP will form part of this flow. The amount of wastewater removed from the sewer will always be more than the CLP generates.

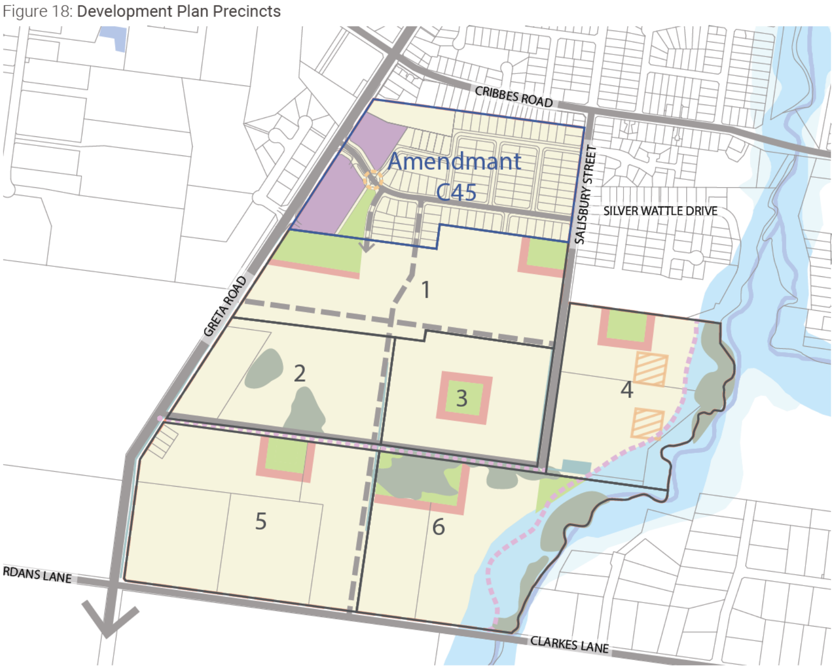
The strategic advantage to NEWA and the community, is that it allows additional land to be released within the Wangaratta South Growth area, along with the CLP. This early release does not absolve the Wangaratta South land from also contributing to the management of wastewater flows in wet weather.

As development proceeds, the existing lots mined for wastewater will be replaced with lots from Wangaratta South and Clarkes Lane. It is expected that the allocation of 350 lots will be reached in 2026.

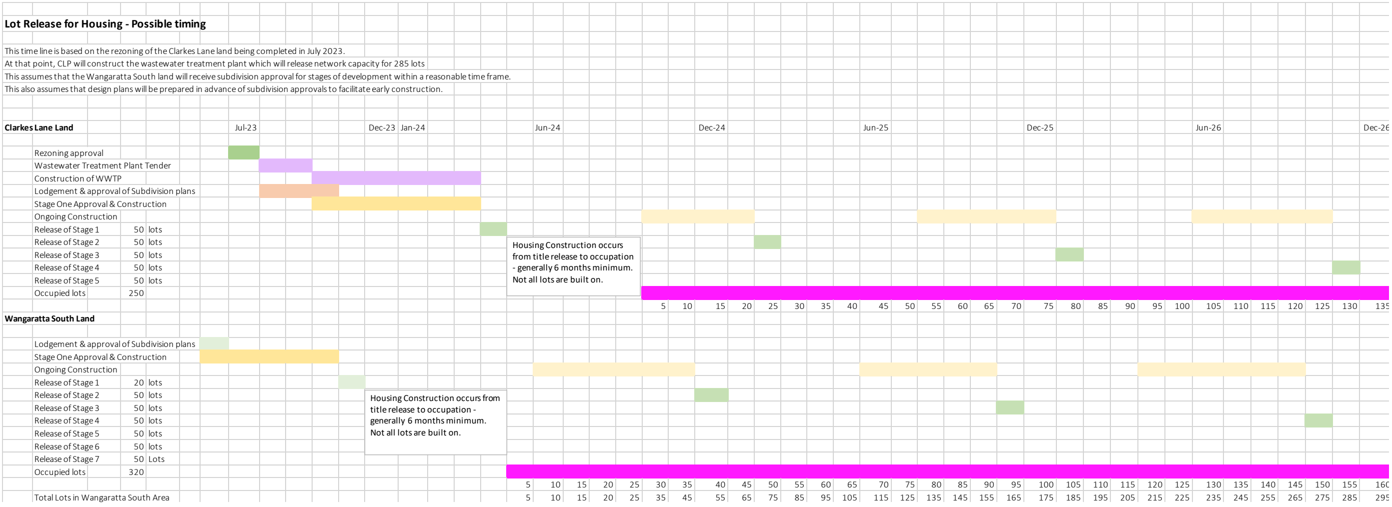
Sewer Mining Catchment Area and Extraction Pit Location

The Wangaratta South Growth Area

Figure 18: **Development Plan Precincts**



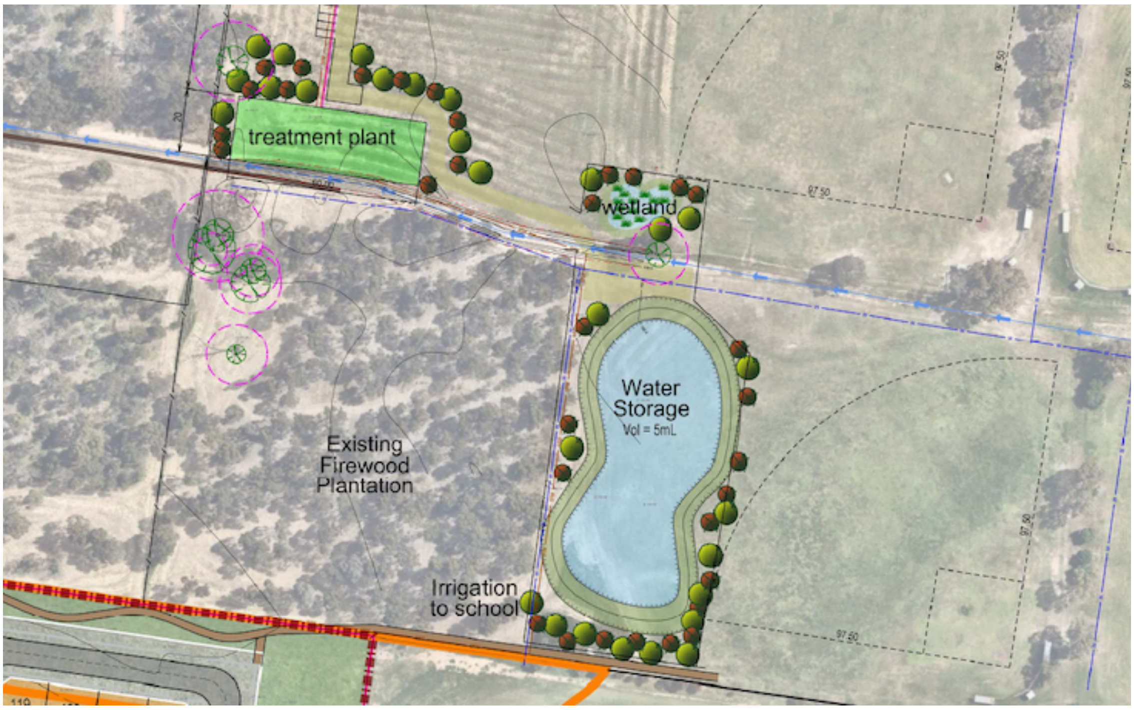
Relative Consumption of Land in Wangaratta South and Clarkes Lane



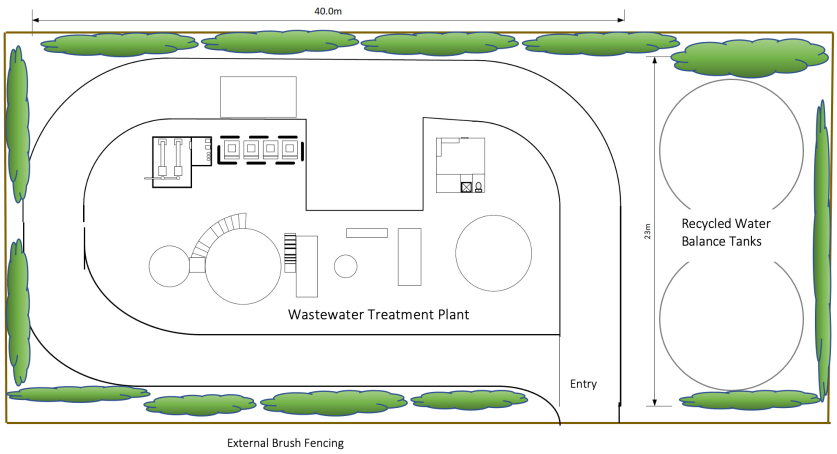
The developers in Wangaratta South Growth area will need to have a solution to wastewater detention to meet NEWA requirements by 2026. It is expected that the economic and financial analysis of the project will recognise the contribution made by CLP to the release of the Wangaratta South land.

Indicative Plant Footprint

Based on typical plant requirements, an indicative layout has been prepared as a guide to the likely area required for the plant and storage.



Indicative Wastewater Treatment Plant Layout



Elevation – Typical Plant Arrangement

Preliminary Risk Assessment

A preliminary risk assessment has been undertaken to inform the IWM model and the issues to be addressed in the development of the design of the system. The risk assessment follows the standard approach of allocating a Likelihood and a resulting Consequence of particular events that may be experienced with the proposed system.

The allocation of risk level is determined from the following table:

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood						
Rare		Low	Low	Low	Moderate	High
Unlikely		Low	Low	Moderate	High	High
Possible		Low	Moderate	High	High	Extreme
Likely		Low	Moderate	High	Extreme	Extreme
Almost Certain		Low	Moderate	High	Extreme	Extreme

It is possible to quantify the risk allocations using the Hazard Quotient. However, as the project is small in scale and recycled use is limited to open space irrigation and surface water discharge, the use of a quantitative approach is not considered necessary.

Table 4 – Qualitative measures of consequence or impact

Level	Descriptor	Example of description
1	Insignificant	Insignificant impact or not detectable.
2	Minor	Minor impact for small population.
		Potentially harmful to local ecosystem with local impacts contained to site. Short-term reversible environmental impacts. No detectable change to ecosystem. Can be readily managed but requires immediate action to minimise impacts. For example, a minor leakage of recycled water overland into a nearby creek causing some nuisance impacts (e.g. odour) or some stress to native plants (e.g. phosphorus-sensitive natives).
		Some manageable disruption to normal use or discharge.
3	Moderate	Minor impact for large population.
		Potentially harmful to regional ecosystem with local impacts primarily contained to on-site. Possible minor impacts on adjacent areas. Medium-term, generally reversible environmental impacts. Environmental impacts should be readily contained or mitigated (e.g. eutrophication of waterway from run-off when irrigated with recycled water).
		Significant disruption, affecting normal use or discharge, increased monitoring.
4	Major	Major impact for small population.
		Potentially lethal to local ecosystem. Predominantly local, but potential for offsite impacts. Medium- to long-term environmental impacts. Potentially reversible over a duration of several years. Significant impact on ecosystems. Environmental impacts difficult to contain or mitigate (e.g. major fish kills, widespread death of flora and fauna).
		Significant disruption, affecting normal use or discharge. Possible cessation of use. High level of monitoring required.
5	Catastrophic	Major impact for large population.
		Potentially lethal to regional ecosystem or threatened species.
		Widespread, on and offsite impacts. Catastrophic harm, with environmental impacts extremely difficult, if not impossible, to contain or mitigate (e.g. catastrophic impacts on World Heritage areas, or species, populations or ecological communities identified as threatened).
		Major failure of system leading to cessation of use.

Table 5 – Hazard quotient conversion to environment impact or risk using guideline values

Hazard quotient (HQ)	Consequence for risk matrix (Table 59) (semi quantitative)	HQ description for risk directly[A] (quantitative)
<0.5	Insignificant	Low (L)
0.5 to <1.0	Minor	Moderate (M)
1.0 to <2	Moderate	High (H)
2 to <10	Major	Extreme (E)
10 or greater	Catastrophic	

Although not specifically used for this project, the quantitative approach informs the development of the risk analysis for this project. The assessment that follows is based on the proposed model referred to above and focusses on the steps required to mitigate the identified risks.

Risk Assessment Table

Item	Risk Description	Likelihood	Consequence	Risk Rating	Remediation Actions	Adjusted Risk Rating	Comments
1.	Treatment plant output is out of specification – unsuitable for irrigation	Possible	Major	High	Real time monitoring of treated water to ensure compliance. Include holding tank prior to discharge to winter storage or surface waters. Out of specification water discharged to sewer.	Moderate	Monitoring equipment can assess parameters that indicate compliance with specification. Ensure enough storage in the holding tank for 6 hours peak flow.
2.	Treatment plant produces odour beyond the boundary of the installation.	Possible	Moderate	High	D&C contract requires a sealed system with no odour generation. All backwash and sludge to go to sewer. If event occurs, locate source and treat with appropriate addition of scrubber / activated carbon filter.	Moderate	Compliance at design stage and commissioning will identify possible sources of odour. Retro-fit equipment to address issues. All backwash and sludge to go to sewer.
3.	Insufficient sewage available to maintain performance of treatment plant in early stages.	Possible	Major	High	The option for sewer mining to provide sufficient flows as initial feed stock for the STP is available. This option also releases capacity in the existing sewerage network.	Low	Sewer mining from nearby sewers will provide supply to the STP to maintain operations.
4.	Irrigation system fails and cannot use winter storage	Possible	Minor	Moderate	Winter storage will be drawn down when irrigation is required. Ensure that winter storage is adequate to hold flows for up to 48 hours without irrigation.	Low	Freeboard will be available during irrigation season to accept additional flows. Drawdown exceeds inflow during irrigation season.
5.	Discharge to One Mile Creek is not available due to insufficient passing flows or environmental conditions.	Possible	Major	High	Identify alternate storage or irrigation area to utilise recycled water or discharge to sewer off-peak. Discharge to sewer occurs during detention phase.	Moderate	Freeboard within the winter storage is managed proactively in response to weather forecasts to ensure that storage is available at all times, by off-peak discharge to sewer.
6.	Public has access to irrigation area whilst in operation. Potential exposure to recycled water.	Possible	Minor	Moderate	Recycled water is to be treated to Class A standard for irrigation operation. Times can be limited to 22:00 to 05:00 hrs.	Low	Class A recycled water has no restrictions on exposure during or after irrigation.
7.	Irrigated area impacted by irrigation water quality.	Possible	Major	High	Soil conditions monitored regularly and testing undertaken to prevent loss of soil structure. Apply	Low	Soil capability testing to be undertaken as part of the approval process. Qualified ground staff

					appropriate minerals and nutrient to ensure health of the soil structure.		(Council & School) operate the system.
8.	Cross connection of recycled water with potable supply.	Rare	Major	Moderate	All irrigation will use purple pipe. Provide training and advice to all local plumbers and Council staff on the management and operation of recycled water systems	Low	All installation and maintenance will be by municipal staff and school engaged plumbers. Ensure that the entities involved have systems in place to manage recycled water maintenance.
9.	Power failure to the WWTP. All pumps and treatment fails.	Possible / Likely	Major	Extreme	Design capacity in collection and pump wells to allow for 4 hours of power outage. Have standby generator available for delivery. Incorporate appropriate electrical connection to receiving pumps, WWTP and pump to winter storage.	Moderate	Alarm system will alert staff to power failure. 4 hours is sufficient to get alternate power source to site. Need to ensure that suitably sized equipment is available. Water from the restart to be discarded.
10.	Treatment Plant is unavailable for multiple days, due to operational failure, prior to NEWA network upgrade complete.	Possible	Major	High	Design system to be able to utilise detention and discharge to existing sewers off-peak and use of eduction to reduce load on NEWA network.	High	NEWA is responsible for managing controlled discharges in consultation with EPA. If capacity to manage discharges off-peak is available, discharges can be managed. Eduction connections to be included in design.
11.	Treatment Plant is unavailable due to maintenance prior to NEWA network upgrade complete.	Almost Certain	Major	Extreme	Schedule maintenance for low flow periods. Utilise detention time in receiving tanks to manage flows. Provide for diversion to NEWA sewer off-peak. Design WWTP in modular form to enable easy replacement of key components.	High	Coordinate maintenance procedures with weather conditions. Require detail of modular systems in design and maintenance schedule.
12.	Treatment Plant is unavailable due to maintenance after NEWA network upgrade complete.	Almost Certain	Minor	Moderate	Schedule maintenance for low flow periods. Design system to be able to utilise detention and discharge to existing sewers off-peak and use of eduction to reduce load on NEWA network.	Low	Maintenance can be scheduled to reduce demand on existing network. Use of modular design will reduce down-time.
13.	Detained treated recycled water is unable to be released to sewer due to capacity constraints and irrigation is not available.	Possible	Major	Moderate	The detention capacity in this system is significant relative to other systems in the NEWA network. Shorter	Low	Operation of the system can be optimised by predictive management based on weather forecasts. In

					duration of detention (that is less than 21 days) would enable discharge of treated water to sewer over an extended period. Alternatively, as the water is stable, it could be trucked to another location to allow disposal.		summer, the detention level can be managed to address predicted events.
14.	Detention storage is retained for too long and water quality degrades.	Possible	Minor	Moderate	If the recycled water is not turned over regularly (i.e. in excess of many months), like any open water system, it may reduce in quality resulting in algae growth. This can be managed with chemical application or aeration if required. Any concern on water quality is most likely to occur in summer when water will be drawn down for irrigation so risk is low.	Low	Maintain and inspection record of the storage to record chlorophyl and turbidity levels and respond as required.

Modelling the Selected System

A preliminary assessment has been made to determine the scale of the infrastructure required to implement the IWM and Detention model.

The assumptions are:

Assumptions	Detail	Comment
Lots Serviced	350 approximately	Subject to approved design.
Sewage per person	150 L per day	
Occupancy	3.5 people per lot	ABS data is 2.3 p/lot
Solids from processing	5% of total inflows	Solids not dealt with on-site. Solids to sewer to NEWA approval
Irrigation rate	6 ML / Ha / yr	Typical for high quality recreation surfaces.
Area available for irrigation	7.7 Ha	Includes Council reserve and Cathedral College land, fully developed
Decile 9 Wet Year for irrigation	Assume wet year to address climate change	If Decile 9 is adopted, then flows in One Mile Creek will also be regular, supporting environmental flows.
Evaporation	1400 mm / m^2 / yr	No direct pan data available, adopt average for Wangaratta.

Sewage Detention Solution

The detention period has been determined from analysis of past rainfall events recorded by the Bureau of Meteorology (BOM). Data has been selected from the 1987 to 2022 range as this includes impacts of climate change. The longest duration of rainfall recorded is 16.4 days. A detention period of 18 days has been adopted for a conservative assessment. Sewage generated from the 350 lots is 185 KL per day ADWF. The AWWF is assumed to be 555 KL per day (3 x ADWF).

Sewage Generated	555 – 185 = 370 KL/day
Days of Detention	18
Sewage detained	6,600 KL
Storage Required	6.6 ML

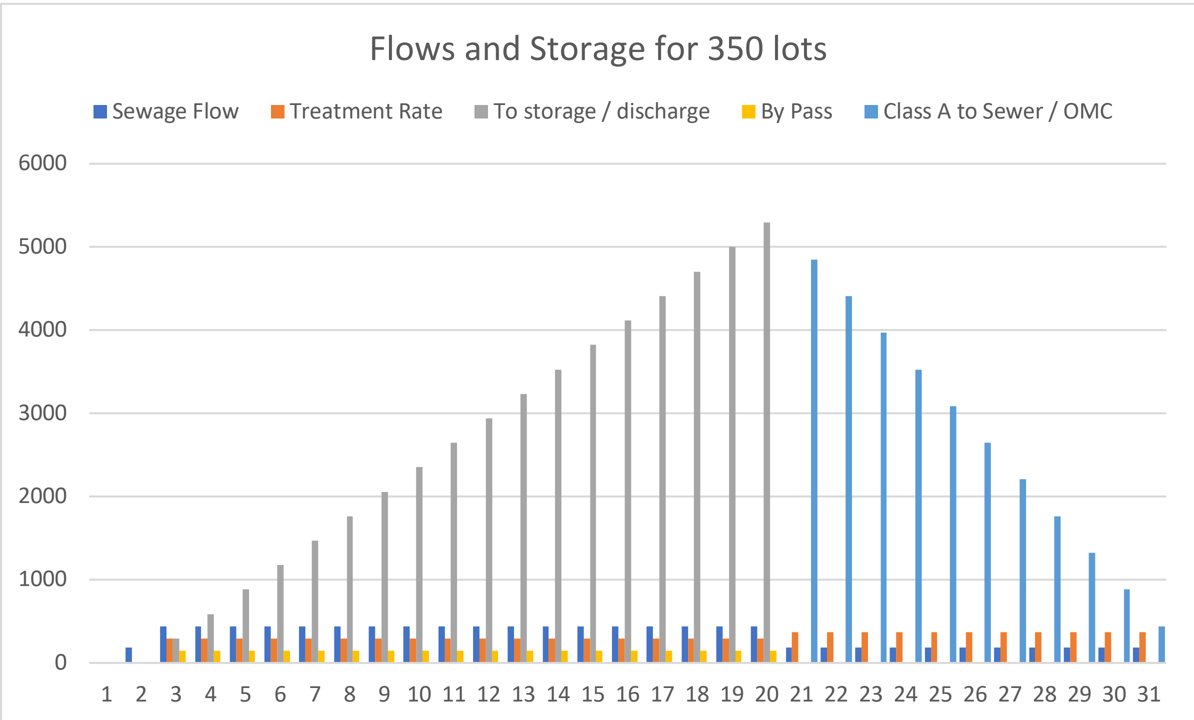
Allowing for reduced infiltration during wet weather for newer sewers, the infiltration can be reduced by 20%. The required volume for detention, 5.4 ML.

Detention systems require aeration and mixing to avoid anerobic reactions and generation of excessive odour. Tanks would need to be small enough to manage aeration and mixing, filling to at least 1 metre depth in 24 hours to allow mixing and aeration to be effective. Circular tanks are most efficient for mixing. With the sewage flow rate at an average over the 18 days of 555 KL per day, it is not practicable to store this volume of sewage in a tank configuration.

An alternate solution is to continue with the Integrated Water Management approach and use the proposed treatment plant to facilitate the storage of the detained sewage, but in a treated form.

Integrated Water Management Option as Detention

During an event that requires detention of wet weather sewage flows from the network, the wet weather volume will be diverted to the treatment plant, treated, and stored in the storage dam. This water will continue to be available for irrigation in either a wet or dry year once it has passed through the Class A treatment plant. Through a predictive management process, the level in the storage can be managed to enable successive detention events during wet years. The discharge to sewer can be over a month or longer period. If irrigation is required, the stored water can be used for irrigation. A nominal month of operation has been modelled graphically. The storage required for the 18 day period is 5.4 ML.



Typical month where detention is required.

The rain event occurs at Day 2 and lasts for 18 days. At the end of that period, the storage is discharged to sewer. Discharge to sewer will be at 450 KL/day for a period of 11 days during low flow periods to the Graham Avenue pump station. This is the worst-case scenario. In practical operation, the expectation is that rainfall will be irregular and occur across the entire month. Discharge can therefore be managed more regularly to ensure that the maximum amount of storage is available to meet predictive management of storm events. With access to discharge Class A water to One Mile Creek available, there will be no discharge to sewer.

By treating the water to Class A standard, the storage will be stable, organically and chemically, and not produce any odour. When capacity in the sewerage network is available, this water can be discharged to sewer or to surface waters when there is no irrigation demand.

Dry Year Detention and Irrigation

The treatment plant has a capacity of 370 KL/day. Irrigation demand is expected to be 6 ML/Ha/Yr. 7.4 Ha of park and sporting fields are available for irrigation. The estimated demand for irrigation supply to create green open space is approximately 40 ML per year. The irrigation rate is expected to be 233 KL per day for a dry period over 30 days. Therefore, the treatment plant can provide sufficient flow to support irrigation, without the need for a large storage.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Irrigation Volume Required	7.46	7.26	6.54	5.37	0.00	0.00	0.00	0.00	0.00	4.99	5.99	6.79	44.4
Less Rain Contribution	0.30	0.10	0.05	0.35	0.44	1.67	1.88	0.98	1.00	0.37	0.95	0.47	
Irrigation Applied	7.16	7.17	6.49	5.02	0.00	0.00	0.00	0.00	0.00	4.62	5.04	6.32	41.8

Irrigation demand for typical dry year.

This means that the plant and detention capacity would continue to be available to manage wet weather events during summer.

The system would operate on a predicted demand basis. If wet events are expected, then the system would divert wet weather flows to the plant and then to storage. Post the event, the treated water can be discharged to sewer or One Mile Creek with irrigation demand being met from a minimum storage of 1 ML.

Wet Year Detention Capacity

During wet years, the irrigation demand will be low. The system may be used as a means of reducing flows in the network by diverting flows to the treatment plant. Wastewater would be directed to the treatment plant at a lower flow rate than the full capacity, to reduce overall flow rates in the NEWA network over an extended period. For example, taking equivalent 50 lots out of the network through sewer mining for extended periods (up to 4 months), may mitigate some capacity concerns.

Wet weather events also occur in summer thunderstorms, although saturated ground conditions in winter results in most surcharges in sewerage networks.

Peak Events BOM Data – 1868 to 1987

Monthly Climate Statistics for 'WANGARATTA' [082053]												
Created on [08 Sep 2021 15:37:13 GMT+00:00]												
082053 WANGARATTA												
Commenced: 1868												
Statistic Element	January	February	March	April	May	June	July	August	September	October	November	December
Mean rainfall (mm) for years 1868 to 1987	37.8	37.7	46.3	47.1	55.5	69.3	65.1	65.4	60	63.8	46	42.1
Highest rainfall (mm) for years 1868 to 1987	226.7	235.2	224.6	201.9	173.2	200.5	187.8	148.8	218.1	187	161.3	171.4
Date of Highest rainfall for years 1868 to 1987	1934	1939	1906	1939	1889	1931	1986	1981	1955	1894	1912	1954
Lowest rainfall (mm) for years 1868 to 1987	0	0	0	0	0	6.8	9.1	1.3	9.7	0	0	0
Date of Lowest rainfall for years 1868 to 1987	1957	1979	1889	1923	1934	1975	1902	1944	1946	1914	1922	1925
Decile 1 monthly rainfall (mm) for years 1868 to 1987	4.2	1	5.1	6.2	14.1	20.7	22.8	20.6	22.6	15.7	8.4	6.1
Decile 5 (median) monthly rainfall (mm) for years 1868 to 1987	25.9	26.6	34.5	39.6	48.1	67.2	57.3	62.8	51	60.6	38	29.8
Decile 9 monthly rainfall (mm) for years 1868 to 1987	90.2	90.7	114.5	104.3	109.6	115.1	115.2	117.1	110.3	112.8	93.4	93.5
Highest daily rainfall (mm) for years 1878 to 1987	129	104.6	89.7	74.7	70.4	55.1	54.4	49.8	129.3	63.2	64.8	77.7
Date of Highest daily rainfall for years 1878 to 1987	07 Jan 1934	27 Feb 1939	11 Mar 1906	14 Apr 1939	30 May 1893	06 Jun 1917	16 Jul 1958	11 Aug 1921	23 Sep 1955	20 Oct 1973	09 Nov 1954	05 Dec 1886
Mean number of days of rain for years 1868 to 1987	4.6	4.4	5.2	6.7	9	11.1	12.1	12.5	10	9.4	6.9	5.7
Mean number of days of rain >= 1 mm for years 1878 to 1987	3.5	3.2	4	4.9	6.6	8.1	8.6	9.1	7.5	7.2	4.9	4.2
Mean number of days of rain >= 10 mm for years 1878 to 1987	1.2	1.1	1.4	1.3	1.5	1.8	1.8	1.8	1.6	1.9	1.3	1.2
Mean number of days of rain >= 25 mm for years 1878 to 1987	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.4	0.3	0.3

BOM data, 1868 - 1987

The option of extended detention of sewage flows provides opportunity for dynamic management of the detention system, based on weather predictions, providing flexibility for managing the sewerage network.

Operation of the system will use the ability of the sewerage network to accept flows back into the network, finding an alternate use for treated water to be able to cycle the storage, or discharge to One Mile Creek.

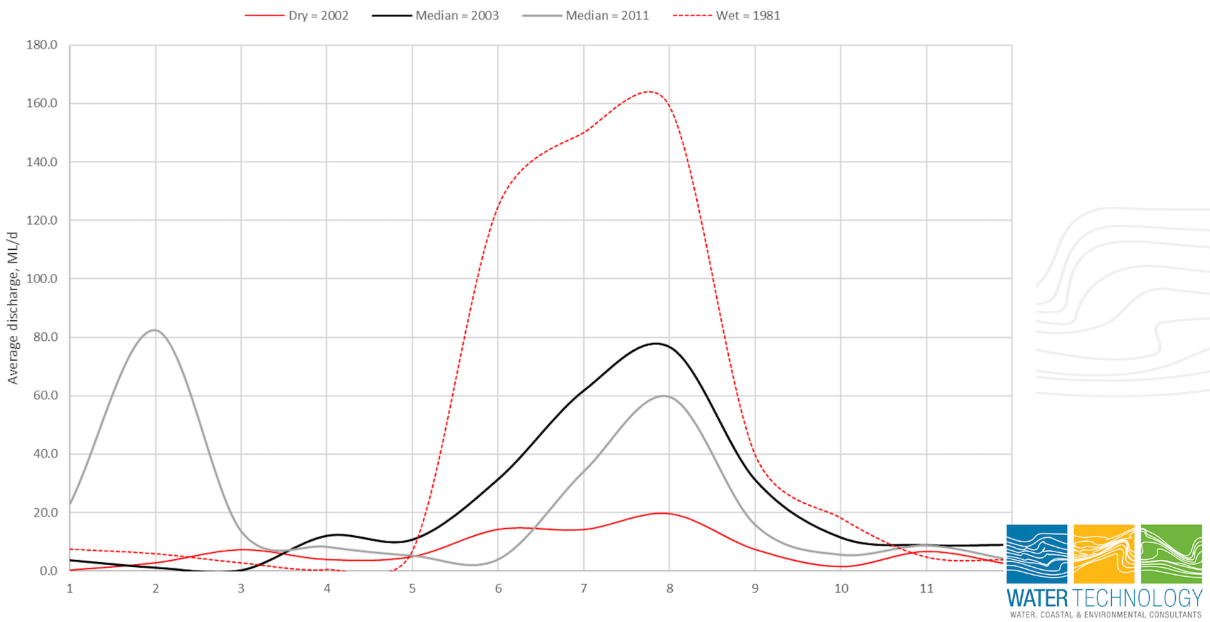
With the ability to discharge to One Mile Creek, the system has inherent flexibility, in that the detention time can be reduced or extended, to meet the needs of the network, without the need to dispose of the retained product to sewer.

Discharge to One Mile Creek

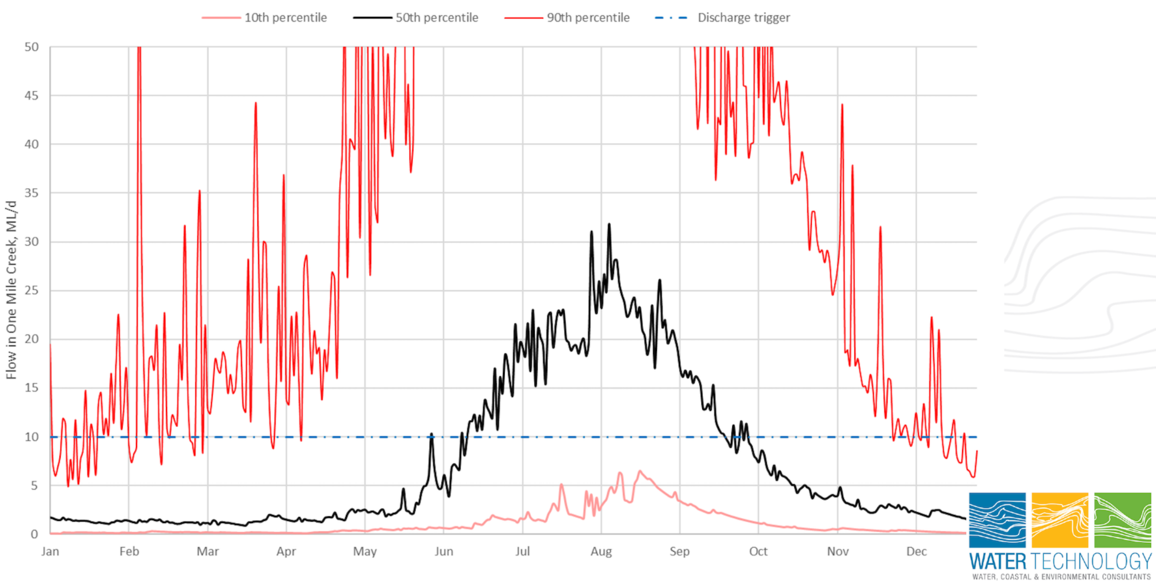
Wet year events are the most difficult to manage for sewerage network surcharges. Wet year events also see higher flows in waterways. For the detention system to provide the greatest flexibility for NEWA, the option of discharging Class A water to One Mile Creek from the detention system, provides an ongoing capability of managing un-intended discharges from elsewhere in the sewerage network. The storage can be emptied during wet year events, rather than discharging to sewer.

Water Technology were engaged by CLP to assess the hydrological profile of the One Mile Creek. A copy of the report is included in Appendix 2. One Mile Creek is not in a Declared Catchment and discharges to the Three Mile Creek near Edwards Street, and then to the Ovens River downstream of the Wangaratta intake. The waterway is well defined and forms a landscape spine through the residential areas of Wangaratta.

In summary, the analysis shows that the flows in One Mile Creek, at the CLP site, for given seasonal events, are typical with high flows in wet years.



The average daily flow generated from the treatment plant is 0.37 ML/day. If we adopt 10 ML/day as a trigger point for any potential consideration for discharge of Class A water to One Mile Creek (4% ratio of discharge to passing flow), the trigger point is exceeded under most conditions. When the hydrology data is rescaled, the number of days on which discharge to One Mile Creek is possible for any given probability event, can be determined. Wet years, when discharge of highly treated water to One Mile Creek is proposed, exceeded the trigger flows for most of the year. For an average year (50th percentile) the passing flow is sufficient to enable discharge to One Mile Creek during winter, which is the highest probability of wet weather events causing surcharging of the sewerage network. In very wet years (90th percentile) discharge is available for most of the year. It is only in very dry years (10th percentile) that discharge is not possible. However, irrigation will be in high demand and surcharge of the sewerage network is unlikely.



Developing the Discharge Model

The proposal to discharge to One Mile Creek is an extension of the detention model referred to above and its approval by EPA and NEWA is not contingent upon the discharge option being in place. The Discharge Model provides the ultimate flexibility to NEWA in the longer term to manage their sewerage network.

It is therefore proposed that the Discharge Model be explored once the planning consent for the development of the CLP has been obtained. This will require community engagement, agency engagement and further research.

Plant Configuration and Amenity

A modern wastewater treatment plant utilises natural processes as much as possible to break down the wastewater to a stable disinfected water product. All solids from the process are returned to sewer or dried and taken to landfill.

The treatment plant is yet to be designed. Approval of the treatment plant rests with EPA and the process involved is covered under the Environment Protection Act, 2017. The plant and recycled water use is classified as AO3 in Schedule 1, Item 5. This is a Prescribed Development and Operation. A Licence will be required from EPA for the plant. CLP and NEWA will be the applicant and the recipient of the Licence will be NEWA.

The process is set out in this report and sets the timeline for the expected approval processes, including the detailed design. The application and approval will be based on a schematic design of a treatment system, which will enable EPA to assess the efficacy of the plant in being able to provide the necessary treatment and disinfection required to meet water quality objectives for Class A recycled water. EPA will determine if the design is appropriate. When that approval is obtained, the detailed design of the plant can proceed. The design will not exceed the footprint proposed in this report.

Existing examples of small wastewater treatment plants demonstrate the ability of treatment plants to operate without impacting on the amenity of the adjacent area. These systems also demonstrate that separation distances can be adjusted in response to the technology applied to the treatment process.

Separation Distances and EPA Referral.

Clause 53.10 of the Rural City of Wangaratta Planning Scheme does not specify any minimum distance for separation of a wastewater treatment plant from any sensitive use. This distance is determined from EPA 1518, Table 6.

Wangaratta Planning Scheme

Table to Clause 53.10-1

Type of use or activity (purpose)	**Threshold distance (metres)**
Water and wastewater	
Sewage treatment plant, exceeding a design or actual flow rate of 5,000 litres per day	None specified
Water treatment plant	None specified

EPA 1518 Recommended Separation Distances for Industrial Residual Air Emissions.

Table 6: Separation distances for sewage treatment plants (in metres)

Type of installation	Separation Distance (n = equivalent population)
Mechanical/biological wastewater plants	$=10n^{1/3}$
Aerobic pondage systems	$=5n^{1/2}$
Facultative ponds	$=10n^{1/2}$
Disposal areas for secondary treated effluent by spray irrigation	200m
Disposal areas for secondary treated effluent by flood irrigation	50m

Example of how to use this table:
What is the recommended separation distance for an aerobic pondage system serving an equivalent population of 10,000 people?
Distance = $5n^{1/2}$ where n=10,000
Distance = $5(10,000)^{1/2}$
Separation distance = 500m

Based on the 350 allotments serviced, and 3.5 people per lot, the separation distance is 107 metres. However, this distance can be reduced under certain criteria.

EPA 1518 Definitions

Sensitive land use	Any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment, for example residential premises, child care centres, pre-schools, primary schools, education centres or informal outdoor recreation sites.

Clause 9 of EPA 1518, provides for the variation of separation distances with the approval of EPA and the Responsible Authority.

9 Variation from a recommended separation distance

Where a variation from the recommended separation distance is sought, approval should not be given by the planning authority or other responsible authority until the relevant land use separation issues have been resolved to the satisfaction of EPA

The separation distance can be varied, with consent, within the following criteria.

Table 4: Criteria for site-specific variation

Criteria	Explanation
Transitioning of the industry	Existing industry has formally indicated that it will transition out of an area and over a specified timeframe.
Plant equipment and operation	The industrial plant and equipment have an exceptionally high standard of emission control technology.
Environmental risk assessment	An environmental risk assessment of IRAEs has been completed that demonstrates a variation is justified.
Size of the plant	The plant is significantly smaller or larger than comparable industries.
Topography or meteorology	There are exceptional topographic or meteorological characteristics which will affect dispersion of IRAEs.
Likelihood of IRAEs	Particular IRAEs are either highly likely or highly unlikely to occur.

Plant Equipment and Operation

The treatment process to be used will have odour control as part of the design. The system design includes negative air pressure to all areas where odour may be generated. The exposed air will pass through a hypochlorite shower or ozone tank and activated carbon filter. These processes remove all odours. Similar systems have been investigated and serve as examples for the reduction in separation distance.

Example; Melbourne Cricket Ground Recycling Plant

The MCG Recycled Water Plant is located in the garden area of the MCG (a sensitive use) and has been in operation since October 2012. It uses a bio reactor process and membrane treatment. It has "air management" as the system is at negative pressure over all the treatment areas. The exhaust air is passed through air scrubbers consisting of a hypochlorite shower and an activated carbon filter. The exhaust air is discharged within the park area and no odour is detectable adjacent to the building or its surrounds. The sewage source is by sewer mining. The plant capacity varies from 200 KL/day in winter to 600 KL/day in summer to meet irrigation demand. The CLP plant will be 370 KL/day. The footprint will be about half the size of this plant.

Process Diagram

Treatment Plant within the MCG grounds. The plant is located underground but treated air is expelled to the open space. The surrounding open space is irrigated with recycled water.

The treatment system will include bio reactor and membrane technology which reduces odour during operation. There is also a reduction in nutrient loads. An example of this technology was inspected at Sunbury Wastewater Treatment Plant. The system produces no odour for a plant that serves a population of 40,000 people.

A simplified odour control system has been included in the Appendix for clarification.

Project Risk Assessment

Evaluation of this project will include an environmental risk assessment. These assessments address all issues that may arise in the operation of the plant and will cover odour, noise and amenity. A preliminary assessment has been prepared and included above. With the inclusion of odour control systems, such as hypochlorite shower or ozone and carbon filter, the risk of odour being a nuisance is very low.

Size and Operation of the plant

This is a small treatment plant. An indicative footprint is provided in the attachments. The footprint has been prepared to provide an approximate scale of the plant and show the access required for services and maintenance. There will be delivery of chemicals and removal of dried course screenings on a regular basis, in addition to weekly inspections by NEW operations staff. Associated delivery vehicle movements will be during daylight hours and occur approximately monthly. These issues will be dealt with in the Licencing process under the EPA Act, to which Council and the community will have input.

North East Water, as the responsible agency for wastewater management, agrees that the proposed design intent will avoid the emission of odour from the treatment plant through the effective management of air handling at the plant.

Water Storage

The water storage is not a source of odour. Class A water can be used for toilets, laundries, car washing and irrigation. The storage is no different to an agricultural dam and the water will be drawn down for use on a regular basis.

Noise

There are two guidelines for assessing noise for this project. The EPA 1411 – Noise From Industry in Regional Victoria and EPA 1412 – SEPP N1. Both arrive at similar noise level recommendations.

EPA 1411

Table 1: Zone Levels – must only be applied in conjunction with steps 2 to 5

Planning zone for noise-receiving location

Receiving zone → / Generating Zone ↓	❑ Green Wedge A GWAZ ❑ Rural Conservation RCZ ❑ Rural Living RLZ	❑ Low Density Residential LDRZ ❑ Public Conservation and Resource PCRZ ❑ Public Park and Recreation PPRZ ❑ Public Use 2,5 PUZ ❑ Urban Floodway UFZ	❑ Farming FZ† ❑ Green Wedge GWZ ❑ Residential 1 R1Z ❑ Residential 2 R2Z ❑ Residential 3 R3Z ❑ Rural Activity RAZ ❑ Township TZ ❑ Urban Growth UGZ‡	❑ Business 1 B1Z ❑ Business 2 B2Z ❑ Business 5 B5Z ❑ Comprehensive Development CDZ‡ ❑ Mixed Use MUZ ❑ Priority Development PDZ‡ ❑ Public Use 1,3,4,6,7 PUZ ❑ Road RDZ	❑ Industrial 3 IN3Z ❑ Special Use SUZ‡	❑ Business 3 B3Z ❑ Business 4 B4Z	❑ Industrial 1 IN1Z ❑ Industrial 2 IN2Z
▸ Low Density Residential LDRZ ▸ Public Conservation and Resource PCRZ ▸ Public Park and Recreation PPRZ ▸ Residential 1 R1Z ▸ Residential 2 R2Z ▸ Residential 3 R3Z ▸ Urban Floodway UFZ	Day: 45 Evening: 37 Night: 32	Day: 45 Evening: 39 Night: 34	Day: 45 Evening: 40 Night: 35	Day: 47 Evening: 42 Night: 37	Day: 48 Evening: 43 Night: 38	Day: 50 Evening: 45 Night: 40	Day: 53 Evening: 48 Night: 43
▸ Business 5 B5Z							

EPA1412

APPENDIX C: TYPICAL NOISE LIMITS UNDER SEPP N–1

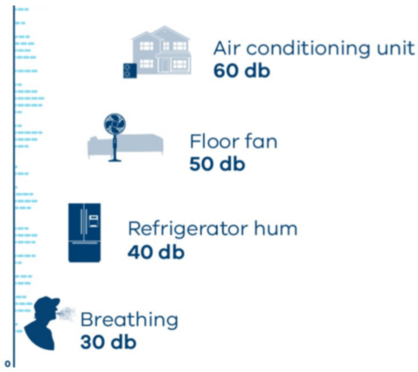
Below are examples of typical SEPP N-1 noise limits for various types of land uses.

Description of area	Typical noise limit dB(A)		
	Day* 0700-1800 hours	Evening 1800-2200 hours	Night 2200-0700 hours
Mainly residential area	50-54	44-48	39-43
Area with some commerce or industry	54-59	48-52	43-47
Commercial district or bordering an industrial area	59-63	52-57	47-52
Predominantly industrial area	63-68	57-61	52-56

* The evening noise limit applies on:

- Saturdays between 1300 and 1800 hours
- Sundays and public holidays between 0700 and 1800 hours.

EPA 1411 defines Wangaratta as a Major Urban Area to which EPA 1412 applies. EPA 1411 does require that noise levels do not exceed the standard in these policies.
Noise attenuation systems are available to reduce noise to the acceptable levels. These include buildings over noise generating equipment and specifying low noise equipment. Council and the community will have input to these requirements as part of the Licencing process for the plant.



Typical systems for noise attenuation include Acoustic Enclosures;

> *Acoustic enclosure is a generally accepted technical term, which is used to define a closed engineering structure, specifically designed and built for the purpose of reduction, minimisation, or attenuation of the noise generated by particular types of equipment or machinery. Such as large air conditioning and refrigeration units, power generators, manufacturing lines, grinders, blowers, compressors, pumps, saw booths, gear boxes,*

etc. Acoustic enclosures represent a separate type of noise control solutions. Other examples of which are acoustic barriers, screens, louvers, acoustic walls and doors, each specifically designed for a particular application.
NCE uses the most advanced technologies and innovative sound absorbing materials in building its acoustic enclosures, which are capable of reducing noise pollution by 15-50 dBA without compromising the efficiency of the machinery or equipment performance.

Source: Noise Control Engineering, http://noisecontrolengineering.com.au/acoustic-enclosures-2/

Noise attenuation will be incorporated into the design of the treatment system, as part of the Licensing process with EPA.

Plant Location and Amenity

Based on the above initiatives and design measures, the location of the treatment plant as shown, will not cause nuisance or impact on the amenity of the park area or the existing and future housing.

Requested Approval

This strategy has set out a proposal for the sewerage servicing of the Clarkes Lane Property, using a flexible and effective approach to Integrated Water Management and meeting NEWA requirements as a sewage detention system.

Because of the unique nature of this proposal, CLP propose that this document constitute a Development Works Application, with the intention of working collaboratively with NEWA to a Negotiated Agreement, to establish the Financial Contributions, Design Requirements and Construction Requirements for the project.

We therefore seek approval to this IWM Sewerage Servicing model to enable the Clarkes Lane Project to proceed to planning consent, by advising the Rural City of Wangaratta that a servicing solution has been agreed.

Appendices

Appendix 1: Classes of Recycled Water – Quality and Uses

Table 1 Classes of recycled water and corresponding standards for biological treatment and pathogen reduction.

Class	Water quality objectives - medians unless specified 1, 2	Treatment process	Range of uses– uses include all lower class uses
A	Microbiological objectives expressed as microbial log reduction target based on QMRA and based on Australian Guidelines for Water Recycling (Phase 1) and with attainment demonstrated in accordance with the Guidelines for validating treatment processes for pathogen reduction: Supporting class A recycled water schemes in Victoria (DH Victoria, 2013) • Turbidity < 2 NTU • < 10 / 5 mg/L BOD / SS • pH 6 – 9 [3]	The treatment processes should be designed to achieve the required Log Reduction Value (LRV) Table 2 shows LRV examples for dual pipe supply scheme	Acceptable uses of class A recycled water of the quality specified in Table 2 include: a. Uses included in a risk assessment (DHS, 2005). ▪ irrigation of public open spaces, such as parks and sports fields, where public access is unrestricted, and any irrigation method is used ▪ agricultural food production, i.e. foods consumed raw ▪ domestic garden watering, including vegetable gardens ▪ toilet flushing ▪ washing machine use. b. Uses not specifically included in the risk assessment, but likely to result in very low ingestion of recycled water: ▪ general outdoor uses such as car washing, dust suppression, construction and wash-down ▪ filling water features and ponds that are not used for swimming ▪ use in cooling towers. c. Firefighting and fire protection systems, including hydrants and sprinkler systems (as documented in the WSAA (2004) risk assessment). d. Other uses, considered on a case-by-case basis, where there is sufficient information provided to support their safety (contact EPA for advice regarding this). See also AGWR Phase 1 (NRMMC et al , 2006)
B	• < 100 *E. coli* org/100 mL • pH 6 – 9[3] • < 20 / 30 mg/L BOD / SS[5]	Secondary and pathogen (including helminth reduction for cattle grazing) reduction[4]	Agricultural: for example, dairy cattle grazing Industrial: for example, washdown water
C	• < 1,000 *E. coli* org/100 mL • pH 6 – 9[3] • < 20 / 30 mg/L BOD / SS[5]	Secondary and pathogen reduction[4] (including helminth reduction for cattle grazing use schemes)	Urban (non- potable) with controlled public access Agricultural: for example, human food crops cooked/processed, grazing/fodder for livestock Industrial: systems with no potential worker exposure

Notes:

1. Medians to be determined over a rolling 12- month period.
2. Refer also to *Technical Information for the Victorian Guideline for Water Recycling* (publication 1911) and *Guidelines for wastewater irrigation,* (publication 168) (EPA Victoria, 1991) for additional guidance on water quality criteria and controls for salts, nutrients and toxicants.
3. pH range is 90th percentile. A higher upper pH limit for lagoon-based systems with algal growth may be appropriate, provided it will not be detrimental to receiving soils and disinfection efficacy is maintained.

Appendix 2; Water Technology Hydrology Analysis – One Mile Creek

Appendix 3 – Bom Data and Model Data

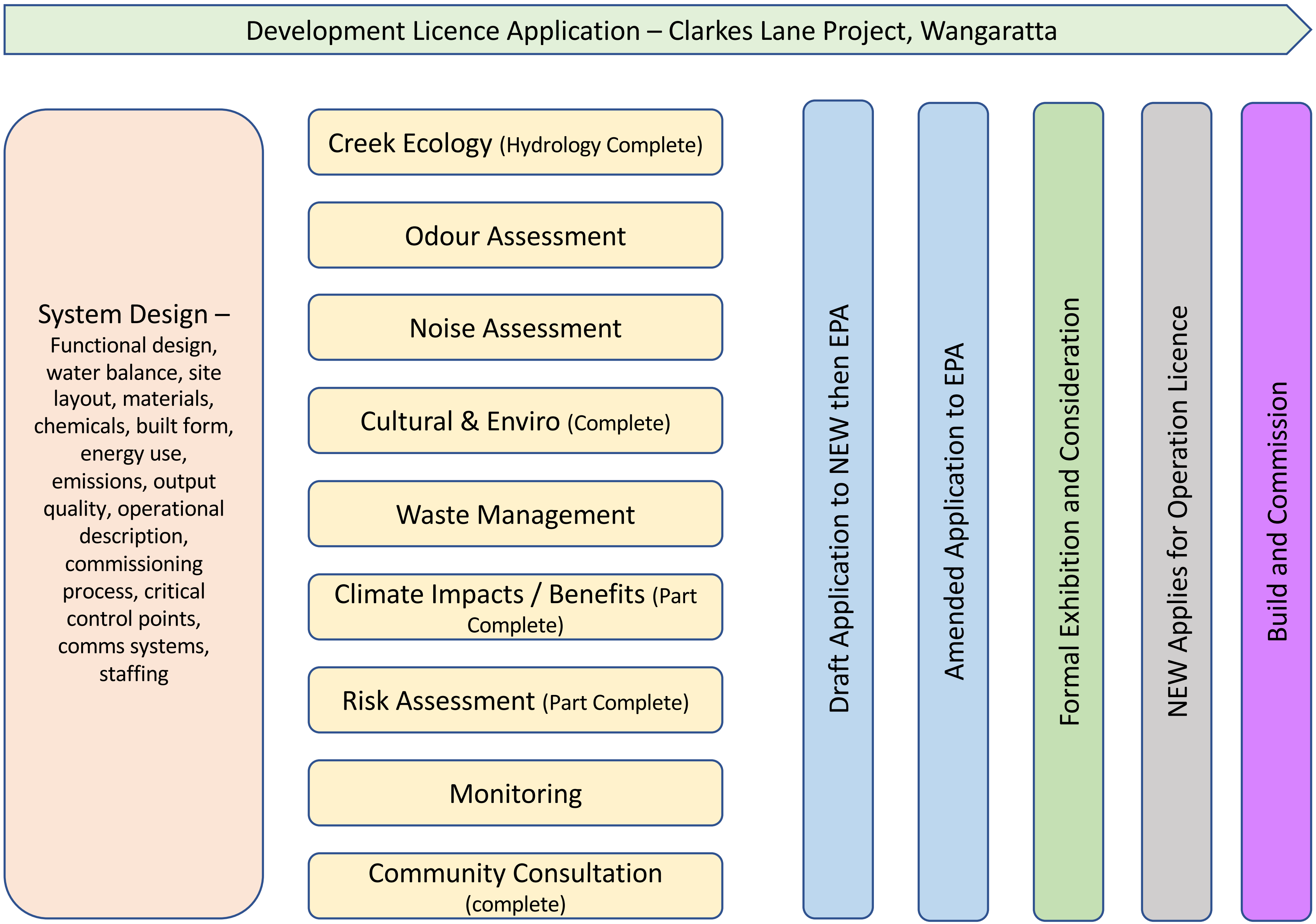
Appendix 4 – Simplified Odour Control System

END OF DOCUMENT

Clarkes Lane Wangaratta – IWM Project

System Description – April 2023

- A wastewater treatment plant will be constructed on Targoora Park, to initially treat wastewater from adjacent developed areas to relieve NEW wastewater network. The capacity of the system will manage wet weather flows from up to 350 lots. Operational flow rate is 500 KL per day. Wastewater will be mined from adjacent access chambers in Targoora Park and pumped to the WWTP.
- As development proceeds at Clarkes Lane, and other lots at Wangaratta South, the amount of wastewater mined will reduce as new development comes on-line.
- The WWTP will treat wastewater to Class A standard. The Class A water will be available for irrigation of the Targoora Park and Cathedral College recreation areas. Class A water will also be discharged to One Mile Creek when passing flows permit. This arrangement will provide maximum flexibility for NEW to manage discharge to its network under all conditions (wet and dry).
- Discharge to One Mile Creek will be at a location agreed with EPA and NECMA. Discharge is expected to occur when passing flows are at least 4 ML per day. This may change once ecology assessments are made. The 4 ML/day flow is recorded on all months for a 90th percentile year and for 5 months for a 50th percentile year. In a dry year, 10th percentile, the flow rate is exceeded in only 2 months of the year (winter).
- Irrigation Class A water will be from a storage located in Targoora Park and will be a minimum of 5 ML to provide for full irrigation of all spaces over an 8 hour period. Wet weather storage volume will be reduced with discharge to One Mile Creek available.
- EPA have advised that a Development Licence will be required for the system and that discharge to One Mile Creek is best managed as part of the DL. EPA guidelines need to be addressed in the application.
- Once the application draft has been prepared, it needs to be provided to EPA for review, their comments reviewed and the final document prepared.
- It is proposed that NEW and Akvotek will be joint applicants for the DL and NEW will be the Operator and will need to lodge an application for an Operation Licence.
- The following sets out the process for the licencing of the system.



Development Licence Application – Clarkes Lane Project, Wangaratta
System Design – Functional design, water balance, site layout, materials, chemicals, built form, energy use, emissions, output quality, operational description, commissioning process, critical control points, comms systems, staffing
Creek Ecology (Hydrology Complete)
Odour Assessment
Noise Assessment
Cultural & Enviro (Complete)
Waste Management
Climate Impacts / Benefits (Part Complete)
Risk Assessment (Part Complete)
Monitoring
Community Consultation (complete)
Draft Application to NEW then EPA
Amended Application to EPA
Formal Exhibition and Consideration
NEW Applies for Operation Licence
Build and Commission