INFRASTRUCTURE DESIGN MEMO

Te Kowhai East Development

Te Kowhai, Hamilton

PROJECT INFORMATION

CLIENT:	Te Kowhai East Limited Partnership
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1. OVERVIEW

1.1 PROJECT BACKGROUND

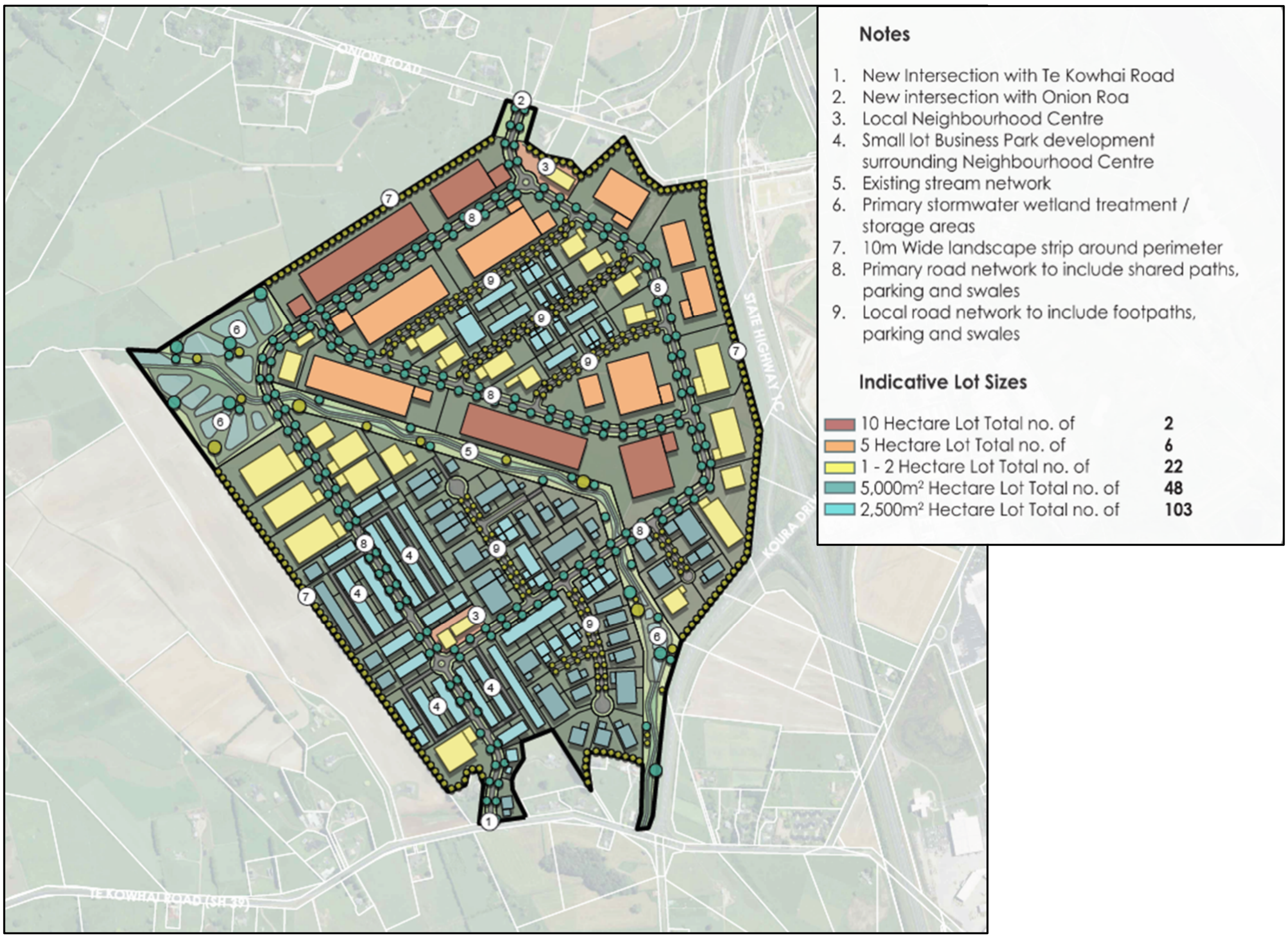
Te Kowhai East Limited Partnership (the Developer) has commissioned Maven Associates to conduct an Infrastructure Design Memo in support of the Te Kowhai East development (the Site) in Te Kowhai, Hamilton. The objective of this memo is to evaluate the three waters and additional civil infrastructure for the proposed development. This memo is based solely on preliminary desktop analysis and design.

1.2 SITE DESCRIPTION

The site is situated within the Waikato District Council (WDC) jurisdiction and falls just outside the Hamilton City Council (HCC) extents. The site is bounded by Te Kowhai Road to the south, Koura Drive and State Highway 1C to the east, and Mathers Road and Onion Road to the north. The site encompasses a total 188 hectares of small to large land parcels and is currently a working dairy farm.

1.3 PROPOSAL

The proposed development is envisioned to create 181 industrial lots of varying sizes with associated transport and 3 waters infrastructure, contributing significantly to the economic growth of the wider Hamilton and Waikato region. Once fully developed, the site is expected to support approximately 2,200[1] direct full-time equivalent (FTE) jobs. The lot size breakdown is as per the following overview[2].



[1] Urban Economics – Economic Assessment - 14 April 2025

[2] Site Overview - Adapt Studio - March 2025.

2. EARTHWORKS

2.1 SITE CONDITIONS

The site is characterised by mostly flat plains, with topography varies from RL27.0m to RL30.0m. The hills terrain in the north/northeast reaches heights of up to RL42.0m. A network of farm drains is present, discharging into the Mangaheka Stream, which bisects the site from southeast to northwest.

2.2 GEOTECHNICAL

A preliminary geotechnical report, conducted by HD Geo (ref: HD1996 PGR_REVA, dated 23 June 2023), forms the basis of our evaluation. The report indicates predominantly alluvial silty and sandy soils on the plains terrain (majority of the site), transitioning to clay soils in the hill terrain. Topsoil depths range from 0.2-0.5m, with groundwater typically encountered between 1.9-2.2m below ground level across the plains. While the site shows suitability for light industrial development and cut-and-fill earthworks, potential risks such as liquefaction, expansive soils, and settlement necessitate further review during detailed design. Soakage characteristics in the hill terrain are expected to be unfavourable while further investigations into stormwater disposal options for the plains material are advised.

2.3 EARTHWORKS MODELLING

A preliminary earthworks design of the site was undertaken to determine the general road gradients and site levels that would achieve flood free platforms while still maintaining earthworks cut to fill balance. The earthworks model has been produced using publicly available existing LiDAR contours at 1.0m intervals and therefore the accuracy is limited to this.

The earthworks model assumes that the invert of the Mangaheka Stream is to be lowered through the site, extending to the northwestern boundary where it exits the property. The existing stream will require minor realignment and widening from its original dimensions to ensure adequate capacity to comply with the Mangaheka ICMP requirements and provide adequate freeboard to buildings.

The collector road within the site has been modelled to tie in with the adjacent road network and to provide adequate clearance over the stream. The preliminary road gradients range from 0.1- 4.33%. Swales will be constructed on each side of the carriageway to convey stormwater flows. This approach to stormwater conveyance on light industrial land has been successfully implemented to Te Rapa Gateway to the south, and more recently at Northgate Business Park, to the north of the site. Roads 3 and 4 have been modelled within the residential areas with a “hump and hollow” approach to generally achieve longitudinal grades of a minimum 1% gradient.

The preliminary modelling indicates that there will be a cut volume of 540,566m3 and a fill volume of 506,141 m3 (assuming a 300mm topsoil strip) across the full site extents. It is therefore considered that within detailed design that a cut to fill balance for the site can be achieved.

The maximum depth of cuts is 13.0m and fills at a maximum of 3.6m depth. Depending on the final delivery model, optimisations and adjustments to levels can be implemented in detailed design to refine earthworks volumes.

The final earthwork proposal will be subject to detailed geotechnical review and appropriate erosion and sediment controls.

3. ROADING

A public roading network is proposed throughout the development to service the site. Through the spine roads where road longitudinal gradients are less than 0.5%, stormwater swales are proposed. This will allow surface runoff into the swales which will then discharge into the downstream stormwater network.

Local road corridors and industrial lanes will be designed to achieve a minimum of 0.5% longitudinal gradient with kerbs, channels and catchpits along the edges of the carriageway. Alternating sag and crest curves (hump and hollow design approach) will be created along the alignment of the roads to achieve this. This strategy aims to enhance stormwater management while providing on street parking for future worker and visitors.

The proposed roading design will balance functionality and aesthetics to optimise stormwater conveyance, ensure safe vehicular movement, and enhance the overall environment. Further refinement may be necessary during the detailed design phase to address specific site constraints and stakeholder requirements.

4. STORMWATER

The subject site is located within the Mangaheka Integrated catchment management plan (ICMP) area. The ICMP provides guidance on how stormwater and flooding will need to be managed to support the future urban development within the catchment.

Key stormwater principles from ICMP that relate to the subject site development are:

- Flooding is identified along the bank of the Mangaheka Stream which will need to be mitigated as part of future land use development.
- HCC have implemented catchment-wide stormwater attenuation devices to mitigate flooding and allow development in the upper catchment.
- On lot stormwater reuse is required for all industrial/commercial developments to assist in managing peak flow and downstream water levels. This will be achieved through providing rainwater harvesting tanks for water reuse.
- Active management of stormwater devices to maintain flood carrying capacity.
- Secondary overland flow path needs to be considered during the design of the developments.
- Ecological restoration and erosion protection of the stream.

4.1 STORMWATER RETICULATION

The Mangaheka Stream divides the subject site into two halves and carries stormwater runoff from the site and the surrounding upper area toward the northwest, eventually flowing into the Waipa River to the west.

Currently, there is no public piped network nearby, and the surrounding area remains predominantly rural. Stormwater within the site currently flows directly into the Mangaheka Stream as sheet flows, while runoff from the upper catchment enters the stream through existing culverts under Koura Drive.

The proposed development on the site is industrial, with up to 70% of the area being impermeable. Stormwater runoff from rainfall events up to a 10-year Annual Recurrence Interval (ARI), including considerations for climate change, will be managed through a combination of open swales and a piped stormwater network. Ultimately, this runoff will be directed to wetlands before discharging downstream to the Mangaheka Stream.

Attenuation of peak stormwater flow will be required for the 10 year and 100-year rainfall events to manage the peak flow exiting the site to at least the pre-development level. It is anticipated that this will be achieved primarily by a mixture of conveyance channels, swales, and wetlands which will be offline from the Mangaheka stream. Stormwater runoff will be discharged into and detained by the wetlands before release into the stream. The swales will also be designed to enable the moderation and reduction of peak flows into the wetlands to reduce the storage requirements.

On lot water rainwater harvesting and reuse devices may also be provided for potable water, which will assist in managing peak flow level and downstream water levels.

Where considered appropriate, stormwater generated from sites may be discharged directly to ground via soakage. This will minimise discharge volume, help to recharge groundwater, maintain stream base flows, and mimic the natural water cycle. This will however require further assessment in terms of the suitability of soil infiltration rates and water table depths to confirm the appropriateness of soakage.

4.2 STORMWATER QUALITY

The removal of agricultural land provides the benefit of improved stream quality by reducing stock access and runoff, however industrial land use can lead to increased/changes in contaminant loads on stormwater. To mitigate any changed or increased contaminant loadings, catchment wide stormwater control devices, including constructed wetlands, are proposed within the Mangaheka catchment ICMP. Waikato Regional Councils Waikato Stormwater Management Guideline 2020 requires a wetland surface area of 4% of catchment for >70% impervious area, equating to an area of 7.5 Ha for the 180 ha TKE site assuming an impervious area ratio of 90% for industrial. The wetlands will not only provide treatment, but also flood detention capacity, ecological habitat, and public amenity for the development. Wetland sizing will be further refined at detailed design to determine the minimum water quality volume required for each sub-catchment within the development.

Proposed wetlands will be supplemented using a treatment train approach utilising upstream devices such as raingardens, swales, and propriety filters as and where required.

The ultimate stormwater quality solution will be assessed and detailed as part of future stormwater design, and compliance will be achieved to meet the Mangaheka ICMP, and other local and regional authority requirements.

5. OVERLAND FLOW AND FLOODING

5.1 FLOODING

The Mangeheka ICMP identifies flooding within the site. The extent of flooding under the post development 100yr MPD scenario is shown overleaf. The results were produced on the basis that the upper catchments are developed with associated stormwater ponds installed, and the lower catchments including the subject site were un-developed.

Flood extent MPD100Yr Climate Change with Proposed Mitigation

Flooding information received to date is considered preliminary. Detailed assessment and modelling will need to be carried out as part of future design to confirm extent of flooding which will then be used to inform site layout and flood mitigation measures. Based on the current information, the following considerations should be given as part of future design:

- Detailed flood assessment to be undertaken to confirm extent of flooding within the subject site. The assessment will need to consider the actual surface imperviousness, contours and flood storage basins proposed as part of the development.
- All buildings within proximity of the flood plains should be provided with sufficient freeboard as required by the standard.
- Flood storage basins and outflow structure should be sized accordingly to manage peak flow to pre-development level.
- Utilisation of swales and road corridors to divert and convey overland flow.

5.2 OVERLAND FLOWPATHS

The proposed overland flow path from the subject site will be diverted away from the building areas into swales and road corridors which will convey them downstream into the wetlands and eventually to the central stream. Preliminary design of the proposed reconstructed Mangaheka Stream has been undertaken utilising Hec RAS 1D modelling using results from the Mangaheka ICMP which have confirmed that the 100 year flows can be contained within the engineered channels. Careful consideration of the site layout and levels will need to be considered at future detailed design stages.

6. WASTEWATER

The Developer is working with HCC Strategic Growth and District Planning Committee to option engineer servicing solutions for the site to connect to the wider wastewater network. Wastewater generated by the site has been considered by four methods:

1. RITS: The Regional Infrastructure Technical Specifications V 2.0 (RITS) set out the design principles for wastewater disposal in development projects.
2. Reduced population: Proposed FTE provided by the economic business case whilst maintaining other design calculations required by RITS.
3. Reduced population and GD06 – upper range: Wastewater disposal using the upper limit of wastewater generation rate for Industrial activities from the guideline document 2021/006 On-site Wastewater Management in the Auckland Region (GD06) in conjunction with the proposed FTE provided by the economic business case.
4. Reduced population and GD06 – lower range: As per option 3 but using the lower limit of wastewater generation rate for Industrial activities.

The results from the four scenarios have been summarised in the table below. Based on the engineering assessment of these values, the primary contributor to the Peak Wet Weather Flow (PWWF) wastewater generation is the infiltration of ground and surface water into the wastewater system during heavy rainfall events. This can be significantly reduced or eliminated using a Low-Pressure Sewer (LPS). Additionally, the PWWF can be further reduced through the implementation of Water Reduction Fixtures (WRF). Please refer to Appendix A for the wastewater generation calculations for more information.

Peak Wet Weather Flow					
	Scenario	PWWF (l/s)	PWWF WITH WRF (l/s)	PWWF WITH LPS (l/s)	PWWF WITH LPS & WRF (l/s)
1	RITS - 45p/ha	77.03	73.40	43.48	39.13
2	Economic Case	51.49	50.42	12.83	11.55
3	Day staff – high usage	44.01	42.94	3.85	2.57
4	Day staff – low usage	42.94	41.87	2.57	1.28

It is anticipated that the site will have minimal wastewater demand and the GD06 calculations would be suitable. It is noted though that some industries have heavier waste loads. In this regard it is assumed that additional systems may be required for treatment and disposal separate to the site solution. Such solutions will be detailed through design of on-site facilities subject to development controls.

6.1 WASTEWATER PUMP STATION

Given the site's lower elevation relative to the proposed discharge points into the public network, a wastewater pump station is required to serve the TKE development. This pump station will operate in conjunction with a rising main that will discharge into the public network. Proposed is a single large wastewater pump station servicing the entire site. If the pump station is receiving flows from a gravity network rather than a low-pressure network, then the inclusion of strategically positioned lifting stations may be incorporated to ensure adequate falls and gradients can be achieved within the system, thereby reducing the overall depth requirement of the wet well in the pump station. The design of the wastewater pump station will include provisions for emergency storage and off-peak discharge storage.

6.2 CONNECTIONS TO EXISTING INFRASTRUCTURE

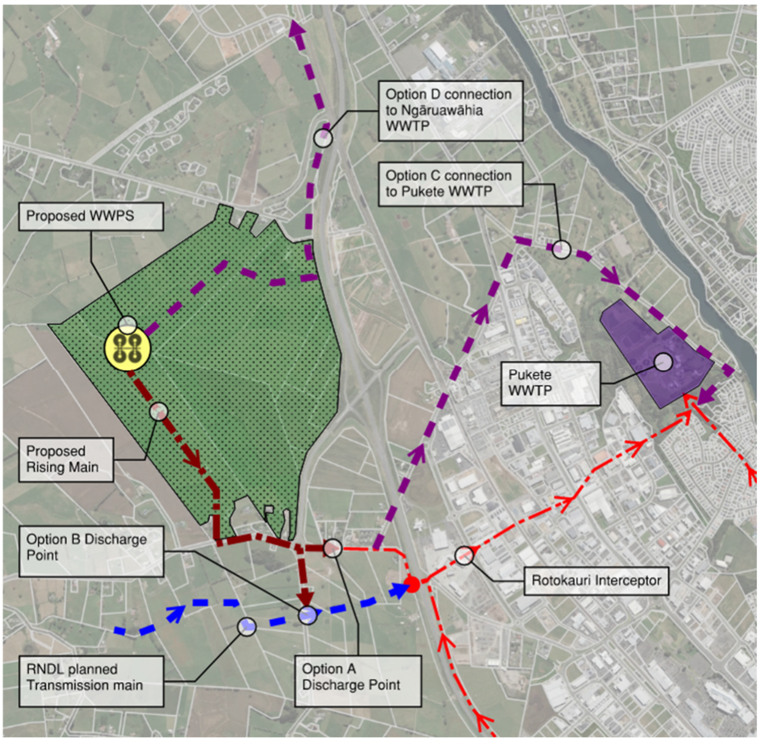
Multiple discharge points are possible to the wider network as summarised and depicted below.

A. Connection to local gravity network: If the Low-Pressure System and Economic business case scenarios are acceptable to HCC then a connection could be made to the existing 150mm diameter gravity pipe network on Te Kowhai Road, which has not yet reached its full capacity. Preliminary calculations indicate that this pipe has the potential to accommodate approximately 12.69 L/s, allowing it to support the development area under these conditions.

If the Low-Pressure and Economic business case solutions are not acceptable to HCC then the following solutions are available:

B. Connection to Rotokauri Interceptor: As part of Rotokauri North Development Limited's (RNDL) PDA with HCC, there is a plan to construct a 600mm diameter transmission wastewater gravity pipe from the Rotokauri Interceptor through to Burbush Road, following Stage 1 of the RNDL development. A connection could be made to this in future with flows going to the Pukete WWTP.
C. Alternative Pukete connection: If HCC modelling concludes that the Rotokauri Interceptor is at planned maximum capacity, then an alternative connection could be provided to a new transmission line through to the eastern side of the Pukete WWTP inlet works. The discharge point for the rising main from the site would be around Maui Street / Old Ruffell Road.
D. Connection to WDC: A third option would also be possible by discharging wastewater to the Ngāruawāhia WWTP via the wastewater network in Holmes Road to the north of the site.

Under the higher PWWF solutions a connection could be made to the existing 150mm diameter gravity pipe network on Te Kowhai Road for initial stages of development. Under the worst-case scenario, the existing pipe could service approximately 26 hectares of development in the interim.



7. WATER SUPPLY

The Developer is working with HCC Strategic Growth and District Planning Committee to option engineer servicing solutions for the site to connect to the wider water network. Water allocation and peak water demand required by the site has been considered by four methods:

1. RITS: The Regional Infrastructure Technical Specifications V 2.0 (RITS) set out the design principles for water supply and requires assessment against SNZPAS 4509:2008 NZ Fire Service Fire Fighting Water Supply Code of Practice.
2. Reduced population: Proposed FTE provided by the economic business case whilst maintaining other design calculations required by RITS.
3. Reduced population and GD06 – upper range: Water supply using the upper limit of water demand for Industrial activities from the guideline document 2021/006 On-site Wastewater Management in the Auckland Region (GD06) in conjunction with the proposed FTE provided by the economic business case. It is anticipated that day staff usage will closely match wastewater flow allowances based on GD06 Table 18.
4. Reduced population and GD06 – lower range: As per option 3 but using the lower limit of wastewater generation rate for Industrial activities.

The results from the four scenarios have been summarised in the table below. Water demand for the site can be significantly reduced or eliminated using a combination of Water Reduction Fixtures (WRF) and rainwater (RW) harvesting. The demand represented by the rainwater option below assumes that water is required from the reticulated municipal or bore supply only in the periods of dry weather and for firefighting water storage top up if required. Please refer to Appendix B for the water generation calculations for more information.

Annual Water Demand required by municipal or bore supply				
	Scenario	Average Demand (m3/YR)	Average Demand with WRF (m3/YR)	RW supply - Dry weather Demand only (m3)
1	RITS - 45p/ha	802,854	741,096	156,087
2	Economic Case	208,780	192,720	40,590
3	Day staff – high usage	48,180	32,120	7,920
4	Day staff – low usage	32,120	16,060	3,960

7.1 SERVICING OPTIONS

Multiple servicing options are possible to the site:

A. Municipal Supply from HCC: RNDL intends to extend a 450mm and 250mm water main from the existing 250mm water main at 119 Ruffell Road. Maven conducted water supply modelling, confirming that this planned upgrade can accommodate 37.5 hectares of the TKE development in the worst-case water demand or larger development area depending on the water demand calculation on each scenario. If the worst-case scenario is adopted, the ultimate water servicing solution will require the following network upgrades:
    - Extend a transmission line from the Te Kowhai Road & Burbush intersection to connect with the existing 250mm water main on Arthur Porter Drive.

- Establish an additional connection point for the looped network to integrate with the planned 600mm water transmission line by the Rotokauri Arterial Project.

B. Decentralised supply from Bore Water: Should connection to the HCC municipal supply not be a viable option, TKE has undertaken investigations to confirm that on site water sources (treated to a potable standard) are available to meet the site allocation requirements.

C. On Site Rainwater harvest tank: Rain harvesting tanks can provide the development site with its own water demand. These tanks can be topped up in periods of peak demand through municipal supply or bore supply options above. Alternatively, the tanks could be topped up by water truck. If a reticulated supply is not available, then additional on lot firefighting capacity to a minimum of FW3 will be required within 90m of each building.

7.2 RAINWATER HARVESTING/REUSE

It is anticipated that water usage will closely match wastewater flow allowances. Based on the average rainfall figures (1,124.2mm per year for Hamilton - NIWA), rainfall volumes for roof water collection could be achieved throughout the year depending on the total roof catchment area provided.

In times of below average rainfall, on site buffering would be required in the form of storage tanks and either refilling with a water truck or from the municipal or bore supply. The size of such tanks would be dependent on the industrial use and roof area.

Through utilising the roof water, it also offsets stormwater runoff for each site, and it also meets the Water-Sensitive Urban Design (WSUD) criteria.

Rainwater harvesting requires a building consent and would be enforced by a condition of resource consent and consent notice within the overarching consent for the site.

7.3 FIRE FIGHTING DEMAND

The minimum firefighting water supply classification for this development is FW3, as specified in RITS 2.0. However, a higher classification may be required depending on site-specific conditions, which can be confirmed at the detailed design stage.

The proposed development can meet the required water supply for firefighting through one of the following provisions:

- A minimum of 180 m^3 of dedicated water storage for firefighting purposes, provided on a per-lot basis, in accordance with SNZ PAS 4509:2008, or
- A primary flow rate of 1500 L/min available within 135 m of the building,
- A secondary flow rate of 1500 L/min available within 270 m,
- Both flows must be achievable from a maximum of two hydrants operating simultaneously,
- A minimum residual running pressure of 200 kPa must be maintained.

8. CONCLUSION

This report provides an assessment of civil infrastructure to support the proposed Te Kowhai East Industrial and residential development.

Cut to fill earthworks can be provided to produce flood free platforms that are suitable for the proposed development. A network of collector and local roads are proposed to service the proposed development.

A network of swales, as well as public and private stormwater piped network will be constructed to provide a means of stormwater disposal for the development. A treatment train approach will be adopted where a combination of raingardens, swales, wetlands and ponds will be utilised. The existing stormwater discharge point to the Mangaheka stream will remain.

Stream hydrology will be provided, as required by the ICMP. Retention will be provided at-source. Detention for up to 100-year ARI will be provided on a catchment wide basis via wetlands. Additional on lot devices can also be provided by future occupiers.

Flooding information received to date is preliminary and a detailed assessment and modelling will be required as part of future design. Overland flow paths from the proposed development will be directed away from building areas into swales and road corridors to be conveyed downstream into flood storage basins.

Water and wastewater connections to the external network will be subject to final agreement with HCC though multiple feasible options are available for discharge and supply to the municipal network.

APPENDIX A WASTEWATER CALCULATIONS

Models		Population	Standard Usage	With Water Reduction (WRF)	Infiltration Allowance[4]	Surface Water Ingress[5]	Peaking Factor
		(188 ha)	Litre/person/day		Litre/ha/day		factor
1	RITS - 45p/ha[1]	8,460	200	180	2,250	16,500	1.85
2	Economic Case[2]	2,200	200	180	2,250	16,500	2.10
3	Day staff – high usage[3]	2,200	60	40	2,250	16,500	2.10
4	Day staff – low usage[3]	2,200	40	20	2,250	16,500	2.10
5	Low Pressure System (LPS)				0	1.2	2.10

Scenario 1 - gravity network		Standard Usage				With Water Reduction Fixtures			
		Average Daily Flow (ADF) m3/day	Peak Daily Flow (PDF) l/s	Peak Wet Weather Flow (PWWF) l/s	Pump Station Storage[6] Required m3	Average Daily Flow (ADF) m3/day	Peak Daily Flow (PDF) l/s	Peak Wet Weather Flow (PWWF) l/s	Pump Station Storage[6] Required m3
1	RITS - 45p/ha	2,115	41.13	77.03	1,851	1,946	37.50	73.40	1,703
2	Economic Case	863	15.59	51.49	755	819	14.52	50.42	717
3	Day staff – high usage	555	8.10	44.01	486	511	7.03	42.94	447
4	Day staff – low usage	511	7.03	42.94	447	467	5.97	41.87	409

Scenario 2 - low pressure network		Standard Usage				With Water Reduction Fixtures			
		Average Daily Flow (ADF) m3/day	Peak Daily Flow (PDF) l/s	Peak Wet Weather Flow (PWWF) l/s	Pump Station Storage[6] Required m3	Average Daily Flow (ADF) m3/day	LPS Peak Daily Flow (PDF) l/s	LPS Peak Wet Weather Flow (PWWF) l/s	Pump Station Storage[6] Required m3
1	RITS - 45p/ha	1,692	36.23	43.48	1,481	1,523	32.61	44.42	1,332
2	Economic Case	440	10.69	12.83	385	396	9.63	11.55	347
3	Day staff – high usage	132	3.21	3.85	116	88	2.14	2.57	77
4	Day staff – low usage	88	2.14	2.57	77	44	1.07	1.28	39

1 RITS calculations uses standard domestic demand
2 Economic Case as per Urban Economics directly employed full time equivalents
3 Day staff usage as per wastewater flow allowances - GD06 Table 18
4 No infiltration is expected or allowed for LPS network since the system is pressurised.
5 1.2 peaking factor has been adopted for the LPS to calculate surface water ingress as per Watercare COP.
6 Pump Station Storage allows 9hrs Emergency Storage and 12hrs Off Peak Storage of the Average Daily Flow

Maven Associates	Job Number	Sheet	Rev
	180010	1	A
Job Title: TKE Development	Author	Date	Checked
Calc Title: Wastewater Demand Calc Scenario 1 Option 1	KH	2/05/2025	RW

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	180	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Development Area using Gravity/Pumpstation

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	8460	
Wastewater Peaking factor as per Table 5-2=	1.85	

Average Daily Flow (ADF)=	2115.00	*m^3/day*
Peak Daily Flow (PDF)=	41.13	*L/sec*
Peak Wet Weather Flow (PWWF)=	**77.03**	*L/sec*

Wastewater Pump station storage requirement =	793.125	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	1057.5	*m^3/day*	12 hours storage
Combined storage volume=	**1850.6**	*m^3/day*	

Development Area using Gravity/Pumpstation with water reduction fixture

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	8460	
Wastewater Peaking factor as per Table 5-2=	1.85	

Average Daily Flow (ADF)=	1945.80	*m^3/day*
Peak Daily Flow (PDF)=	37.50	*L/sec*
Peak Wet Weather Flow (PWWF)=	**73.40**	*L/sec*

Wastewater Pump station storage requirement =	729.675	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	972.9	*m^3/day*	12 hours storage
Combined storage volume=	**1702.6**	*m^3/day*	

Maven Associates	Job Number 180010	Sheet 1	Rev A
Job Title: TKE Development Calc Title: Wastewater Demand Calc Scenario 1 Option 2	Author KH	Date 2/05/2025	Checked RW

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	180	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Development Area using Gravity/Pumpstation

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	863.00	*m^3/day*
Peak Daily Flow (PDF)=	15.59	*L/sec*
Peak Wet Weather Flow (PWWF)=	**51.49**	*L/sec*

Wastewater Pump station storage requirement =	323.625	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	431.5	*m^3/day*	12 hours storage
Combined storage volume=	**755.1**	*m^3/day*	

Development Area using Gravity/Pumpstation with water reduction fixture

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	819.00	*m^3/day*
Peak Daily Flow (PDF)=	14.52	*L/sec*
Peak Wet Weather Flow (PWWF)=	**50.42**	*L/sec*

Wastewater Pump station storage requirement =	307.125	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	409.5	*m^3/day*	12 hours storage
Combined storage volume=	**716.6**	*m^3/day*	

Maven Associates	Job Number	Sheet	Rev
	180010	1	A
Job Title TKE Development	Author	Date	Checked
Calc Title Wastewater Demand Calc Scenario 1 Option 3	KH	2/05/2025	RW

As per Waikato Local Authority RITS standards

Day staff- high usage as per GD06 TABLE 18	60	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	40	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Development Area using Gravity/Pumpstation

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	555.00	*m^3/day*
Peak Daily Flow (PDF)=	8.10	*L/sec*
Peak Wet Weather Flow (PWWF)=	**44.01**	*L/sec*

Wastewater Pump station storage requirement =	208.125	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	277.5	*m^3/day*	12 hours storage
Combined storage volume=	**485.6**	*m^3/day*	

Development Area using Gravity/Pumpstation with water reduction fixture

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	511.00	*m^3/day*
Peak Daily Flow (PDF)=	7.03	*L/sec*
Peak Wet Weather Flow (PWWF)=	**42.94**	*L/sec*

Wastewater Pump station storage requirement =	191.625	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	255.5	*m^3/day*	12 hours storage
Combined storage volume=	**447.1**	*m^3/day*	

Maven Associates	Job Number 180010	Sheet 1	Rev A
Job Title: TKE Development	Author	Date	Checked
Calc Title: Wastewater Demand Calc Scenario 1 Option 4	KH	2/05/2025	RW

As per Waikato Local Authority RITS standards

Day staff- low usage as per GD06 TABLE 18	40	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	20	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Development Area using Gravity/Pumpstation

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	511.00	*m^3/day*
Peak Daily Flow (PDF)=	7.03	*L/sec*
Peak Wet Weather Flow (PWWF)=	**42.94**	*L/sec*

Wastewater Pump station storage requirement =	191.625	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	255.5	*m^3/day*	12 hours storage
Combined storage volume=	**447.1**	*m^3/day*	

Development Area using Gravity/Pumpstation with water reduction fixture

Industrial		
Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=		*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	467.00	*m^3/day*
Peak Daily Flow (PDF)=	5.97	*L/sec*
Peak Wet Weather Flow (PWWF)=	**41.87**	*L/sec*

Wastewater Pump station storage requirement =	175.125	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	233.5	*m^3/day*	12 hours storage
Combined storage volume=	**408.6**	*m^3/day*	

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As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	180	*l/person/day*
peak flow factor for added capacity safety=	1.2	*as per watercare's COP 5.3.12.3.3 (a)*

Development Area using low pressure sewer system/Pumpstation

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	8460	
Wastewater Peaking factor as per Table 5-2=	1.85	

Average Daily Flow (ADF)=	1692.00	*m^3/day*
Peak Daily Flow (PDF)=	36.23	*L/sec*
Peak Flow =	**43.48**	*L/sec*

Wastewater Pump station storage requirement =	634.5	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	846	*m^3/day*	12 hours storage
Combined storage volume=	**1480.5**	*m^3/day*	

Development Area using low pressure sewer system/Pumpstation with water reduction fixture

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	8460	
Wastewater Peaking factor as per Table 5-2=	1.85	

Average Daily Flow (ADF)=	1522.80	*m^3/day*
Peak Daily Flow (PDF)=	32.61	*L/sec*
Peak Wet Weather Flow (PWWF)=	**39.13**	*L/sec*

Wastewater Pump station storage requirement =	571.05	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	761.4	*m^3/day*	12 hours storage
Combined storage volume=	**1332.5**	*m^3/day*	

Maven Associates	Job Number	Sheet	Rev
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Calc Title: Wastewater Demand Calc Scenario 2 Option 2	KH	2/05/2025	RW

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	180	*l/person/day*
peak flow factor for added capacity safety=	1.2	*as per watercare's COP 5.3.12.3.3 (a)*

Development Area using low pressure sewer system/Pumpstation

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	440.00	*m^3/day*
Peak Daily Flow (PDF)=	10.69	*L/sec*
Peak Flow =	**12.83**	*L/sec*

Wastewater Pump station storage requirement =	165	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	220	*m^3/day*	12 hours storage
Combined storage volume=	**385.0**	*m^3/day*	

Development Area using low pressure sewer system/Pumpstation with water reduction fixture

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	396.00	*m^3/day*
Peak Daily Flow (PDF)=	9.63	*L/sec*
Peak Wet Weather Flow (PWWF)=	**11.55**	*L/sec*

Wastewater Pump station storage requirement =	148.5	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	198	*m^3/day*	12 hours storage
Combined storage volume=	**346.5**	*m^3/day*	

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Job Title: TKE Development Calc Title: Wastewater Demand Calc Scenario 2 Option 3	Author KH	Date 2/05/2025	Checked RW

As per Waikato Local Authority RITS standards

Day staff- high usage as per GD06 TABLE 18	60	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	40	*l/person/day*
peak flow factor for added capacity safety=	1.2	*as per watercare's COP 5.3.12.3.3 (a)*

Development Area using low pressure sewer system/Pumpstation

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	132.00	*m^3/day*
Peak Daily Flow (PDF)=	3.21	*L/sec*
Peak Flow =	**3.85**	*L/sec*

Wastewater Pump station storage requirement =	49.5	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	66	*m^3/day*	12 hours storage
Combined storage volume=	**115.5**	*m^3/day*	

Development Area using low pressure sewer system/Pumpstation with water reduction fixture

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	88.00	*m^3/day*
Peak Daily Flow (PDF)=	2.14	*L/sec*
Peak Wet Weather Flow (PWWF)=	**2.57**	*L/sec*

Wastewater Pump station storage requirement =	33	*m^3/day*	9 hours emergency storage
Storage for off peak pumping =	44	*m^3/day*	12 hours storage
Combined storage volume=	**77.0**	*m^3/day*	

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As per Waikato Local Authority RITS standards

Day staff- low usage as per GD06 TABLE 18	40	*l/person/day*
Domestic Average Daily Flow with water reduction fixture=	20	*l/person/day*
peak flow factor for added capacity safety=	1.2	*as per watercare's COP 5.3.12.3.3 (a)*

Development Area using low pressure sewer system/Pumpstation

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	88.00	*m³/day*
Peak Daily Flow (PDF)=	2.14	*L/sec*
Peak Flow =	**2.57**	*L/sec*

Wastewater Pump station storage requirement =	33	*m³/day*	9 hours emergency storage
Storage for off peak pumping =	44	*m³/day*	12 hours storage
Combined storage volume=	**77.0**	*m³/day*	

Development Area using low pressure sewer system/Pumpstation with water reduction fixture

Industrial Catchment area =	**188.00**	*Ha*
Population Equivalent as per Table 5-3=	45	*persons per hectare*
Total Population	2200	*as per Economic case*
Wastewater Peaking factor as per Table 5-2=	2.1	

Average Daily Flow (ADF)=	44.00	*m³/day*
Peak Daily Flow (PDF)=	1.07	*L/sec*
Peak Wet Weather Flow (PWWF)=	**1.28**	*L/sec*

Wastewater Pump station storage requirement =	16.5	*m³/day*	9 hours emergency storage
Storage for off peak pumping =	22	*m³/day*	12 hours storage
Combined storage volume=	**38.5**	*m³/day*	

APPENDIX B WATER CALCULATIONS

Models		Population	Standard Usage	With Water Reduction Fixtures (WRF)	Rain Water Harvesting with WRF	Annual Rainfall	Total Net Area
		(per 188ha)	Litre/person/day			(mm)	(ha)
1	RITS - 45p/ha[1]	8,460	260	240	205	1,124.2	137.3
2	Economic Case[2]	2,200	260	240	205		
3	Day staff – high usage[3]	2,200	60	40	40		
4	Day staff – low usage[3]	2,200	40	20	20		

Scenario 1 - Municipal or Bore Supply		Standard Usage			With Water Reduction Fixtures		
		Average Demand m3/year	Average Demand l/s	Peak Demand l/s	Average Demand m3/year	Average Demand l/s	Peak Demand l/s
1	RITS - 45p/ha	802,854	25.46	127.29	741,096	23.50	117.50
2	Economic Case	208,780	6.62	33.10	192,720	6.11	30.56
3	Day staff – high usage	48,180	1.53	7.64	32,120	1.02	5.09
4	Day staff – low usage	32,120	1.02	5.09	16,060	0.51	2.55

Scenario 2 - Average Demand and Fire Supply5 provided 'On Lot'[5] - Peak Demands will be supplemented by water truck refill[6]		Rain Water Harvesting with Water Reduction Fixtures					
		Average Demand m3/year	Average Demand l/s	Roof Catchment Required (m2)	Roof Catchment % of Total Net Area	FW3 water volume (m3)	FW4 water volume (m3)
1	RITS - 45p/ha	633,020	20.07	563,084	41.0%	180	540
2	Economic Case	164,615	5.22	146,429	10.7%	180	540
3	Day staff – high usage	32,120	1.02	28,571	2.1%	180	540
4	Day staff – low usage	16,060	0.51	14,286	1.0%	180	540

Scenario 3 - Average Demand provided 'On Lot'[7] - Peak Demand[8] and Fire Supply[9] provided by restricted municipal or bore supply		Rain Water Harvesting with Water Reduction Fixtures					
		Average Demand m3/year	Average Demand l/s	Roof Catchment Required (m2)	Roof Catchment % of Total Net Area	FW4 water volume required (m3)	Dry weather Demand Required (m3)
1	RITS - 45p/ha	633,020	20.07	563,084	41.0%	540	156,087
2	Economic Case	164,615	5.22	146,429	10.7%	540	40,590
3	Day staff – high usage	32,120	1.02	28,571	2.1%	540	7,920
4	Day staff – low usage	16,060	0.51	14,286	1.0%	540	3,960

1 RITS calculations uses standard domestic demand
2 Economic Case as per Urban Economics directly employed full time equivalents
3 It is anticipated that day staff usage will closely match wastewater flow allowances based on GD06 Table 18
4 Economic and Day staff models will need to be metered to limit total annual water usage
5 Scenario 2 requires multiple FW3 or FW4 reservoirs within 90m of every building
6 Scenario 2 requires occupiers to supplement shortfall of water supply via purchasing tank water
7 Scenario 3 assumes most of the year will be supplied by on lot collected rainwater
8 Scenario 3 assumes peak demand will be supplied via municipal or bore supply for 90 days per year (no rainfall)
9 Scenario 3 requires a single FW4 reservoir and ring main for the whole development

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Calc Title	Water Demand scenario 1 option 1	KH	2/05/2025	RW

Water Demand

Population=	8460	persons	as per RIT population
Demand=	260	l/person/day	
Average demand=	2199600	l/day	
	2199.6	m³/day	
Average yearly demand=	802854	m³/year	

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	8460	260	25.46
PD Water	8460	1300	127.29

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	8460	1300	**127.29**

Water Demand with water reduction fixture

Population=	8460	persons
Demand=	240	l/person/day
	2030400	l/day
	2030.4	m³/day
	741096	m³/year

Demand Rates

Average Demand =	240	litres/person/day
Peak Demand (5x) =	1200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	8460	240	23.50
PD Water	8460	1200	117.50

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	8460	1200	**117.50**

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Job Title: TKE Development	Author	Date	Checked
Calc Title: Water Demand scenario 1 option 2	KH	2/05/2025	RW

Water Demand

Population=	2200	persons	as per economic case
Demand=	260	l/person/day	
Average demand=	572000	l/day	
	572	m³/day	
Average yearly demand=	208780	m³/year	

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	260	6.62
PD Water	2200	1300	33.10

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	1300	**33.10**

Water Demand with water reduction fixture

Population=	2200	persons
Demand=	240	l/person/day
	528000	l/day
	528	m³/day
	192720	m³/year

Demand Rates

Average Demand =	240	litres/person/day
Peak Demand (5x) =	1200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	240	6.11
PD Water	2200	1200	30.56

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	1200	**30.56**

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Water Demand

Population=	2200	persons	as per economic case
Demand=	60	l/person/day	as per GD06 table 18 for high usage day staff
Average demand=	132000	l/day	
	132	m³/day	
Average yearly demand=	48180	m³/year	

Demand Rates

Average Demand =	60	litres/person/day
Peak Demand (5x) =	300	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	60	1.53
PD Water	2200	300	7.64

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	300	**7.64**

Water Demand with water reduction fixture

Population=	2200	persons	
Demand=	40	l/person/day	for high usage day staff
	88000	l/day	
	88	m³/day	
	32120	m³/year	

Demand Rates

Average Demand =	40	litres/person/day
Peak Demand (5x) =	200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	40	1.02
PD Water	2200	200	5.09

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	200	**5.09**

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Water Demand

Population=	2200	persons	as per economic case
Demand=	40	l/person/day	as per GD06 table 18 for low usage day staff
Average demand=	88000	l/day	
	88	m³/day	
Average yearly demand=	32120	m³/year	

Demand Rates

Average Demand =	40	litres/person/day
Peak Demand (5x) =	200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	40	1.02
PD Water	2200	200	5.09

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	200	**5.09**

Water Demand with water reduction fixture

Population=	2200	persons	
Demand=	20	l/person/day	for high usage day staff
	44000	l/day	
	44	m³/day	
	16060	m³/year	

Demand Rates

Average Demand =	20	litres/person/day
Peak Demand (5x) =	100	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	20	0.51
PD Water	2200	100	2.55

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	100	**2.55**

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Water Demand

Population=	8460	persons	as per RIT population
Demand=	205	l/person/day	as per RIT water demand with water saving fixture
Average demand=	1734300	l/day	
	1734.3	m³/day	
Average yearly demand=	633019.50	m3/year	

Demand Rates

Average Demand =	205	litres/person/day
Peak Demand (5x) =	1025	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	8460	205	20.07
PD Water	8460	1025	100.36

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	8460	1025	**100.36**

Rain collection calculation

Total net site area=	137.3	Ha	
Annual rain fall =	1124.2	mm	mean rainfall from figure nz 1991-2020
Potential rain captured through net site a	1543526.6	m3/ year	
Roof area required=	**563084.4**	m2	
Percentage of roof over net site area=	41.01	%	

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Water Demand

Population=	2200	persons	as per economic case
Demand=	205	l/person/day	as per RIT water demand with water saving fixture
Average demand=	451000	l/day	
	451	m³/day	
Average yearly demand=	164615.00	m3/year	

Demand Rates

Average Demand =	205	litres/person/day
Peak Demand (5x) =	1025	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	205	5.22
PD Water	2200	1025	26.10

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	1025	**26.10**

Rain collection calculation

Total net site area=	137.3	Ha	
Annual rain fall =	1124.2	mm	mean rainfall from figure nz 1991-2020
Potential rain captured through net site a	1543526.6	m3/ year	
Roof area required=	**146428.6**	m2	
Percentage of roof over net site area=	10.66	%	

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Water Demand

Population=	2200	persons	as per economic case
Demand=	40	l/person/day	as per GD06 table 18 for high usage day staff with water reduction fixture
Average demand=	88000	l/day	
	88	m³/day	
Average yearly demand=	32120.00	m3/year	

Demand Rates

Average Demand =	40	litres/person/day
Peak Demand (5x) =	200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	40	1.02
PD Water	2200	200	5.09

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	200	**5.09**

Rain collection calculation

Total net site area=	137.3	Ha	
Annual rain fall =	1124.2	mm	mean rainfall from figure nz 1991-2020
Potential rain captured through net site a	1543526.6	m3/ year	
Roof area required=	**28571.4**	m2	
Percentage of roof over net site area=	2.08	%	

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Water Demand

Population=	2200	persons	as per economic case
Demand=	20	l/person/day	as per GD06 table 18 for low usage day staff with water reduction fixture
Average demand=	44000	l/day	
	44	m³/day	
Average yearly demand=	16060.00	m3/year	

Demand Rates

Average Demand =	20	litres/person/day
Peak Demand (5x) =	100	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	20	0.51
PD Water	2200	100	2.55

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	100	**2.55**

Rain collection calculation

Total net site area=	137.3	Ha	
Annual rain fall =	1124.2	mm	mean rainfall from figure nz 1991-2020
Potential rain captured through net site a	1543526.6	m3/ year	
Roof area required=	**14285.7**	m2	
Percentage of roof over net site area=	1.04	%	

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Water Demand

Population=	8460	persons	as per RIT population
Demand=	205	l/person/day	as per RIT water demand with water saving fixture
Average demand=	1734300	l/day	
	1734.3	m³/day	
Average yearly demand=	633019.50	m3/year	

Demand Rates

Average Demand =	205	litres/person/day
Peak Demand (5x) =	1025	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	8460	205	20.07
PD Water	8460	1025	100.36

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	8460	1025	**100.36**

Demand through dry period source through on site bore or municipal suppply

Average daily demand=	1734.3	m³/day
Demand over 90 day dry weather=	156087	m³

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Water Demand

Population=	2200	persons	as per economic case
Demand=	205	l/person/day	as per RIT water demand with water saving fixture
Average demand=	451000	l/day	
	451	m³/day	
Average yearly demand=	164615.00	m3/year	

Demand Rates

Average Demand =	205	litres/person/day
Peak Demand (5x) =	1025	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	205	5.22
PD Water	2200	1025	26.10

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	1025	**26.10**

Demand through dry period source through on site bore or municipal suppply

Average daily demand=	451	m³/day
Demand over 90 day dry weather=	40590	m³

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Water Demand

Population=	2200	persons	as per economic case
Demand=	40	l/person/day	as per GD06 table 18 for high usage day staff with water reduction fixture
Average demand=	88000	l/day	
	88	m³/day	
Average yearly demand=	32120.00	m3/year	

Demand Rates

Average Demand =	40	litres/person/day
Peak Demand (5x) =	200	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	40	1.02
PD Water	2200	200	5.09

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	200	**5.09**

Demand through dry period source through on site bore or municipal suppply

Average daily demand=	88	m³/day
Demand over 90 day dry weather=	7920	m³

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Calc Title: Water Demand scenario 3 option 4	KH	2/05/2025	RW

Water Demand

Population=	2200	persons	as per economic case
Demand=	20	l/person/day	as per GD06 table 18 for low usage day staff with water reduction fixture
Average demand=	44000	l/day	
	44	m³/day	
Average yearly demand=	16060.00	m3/year	

Demand Rates

Average Demand =	20	litres/person/day
Peak Demand (5x) =	100	litres/person/day

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2200	20	0.51
PD Water	2200	100	2.55

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2200	100	**2.55**

Demand through dry period source through on site bore or municipal suppply

Average daily demand=	44	m³/day
Demand over 90 day dry weather=	3960	m³