Planning | Surveying | Engineering | Environmental

Water & Wastewater Assessment

Waterfall Park Developments LTD

Ayrburn Screen Hub

Document Information

Client	**Waterfall Park Developments LTD**
Site Location	1 Ayr Avenue, Arrowtown
Legal Description	Lot 4 DP 540788
CKL Reference	A20254
Office of Origin	Auckland

Author	Joe Allely, Kylin Gunkel		
Signed		**Date**	6/12/2024

Reviewed By	John Sternberg		
Signed		**Date**	9/12/2024

Authorised By	John Sternberg		
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1 Introduction

It is proposed to create a Screen Hub development to the southwest of Ayr Avenue, located as indicated in Figure 1 below. The site is located on Lot 4 DP 540788.

Figure 1: Location of project.

The proposed development comprises the following;

- Screen Hub (including sound stage, workshop, associated offices (e.g. for admin and wardrobe), and exterior filming and workshop areas).
- Offices, private actor spaces and dressing rooms. When not in use for production these will be converted into double and single accommodation suites for the visitor accommodation.
- 2-storey accommodation in multiple blocks, interspersed with landscaping, parking.
- Health spa.
- Office and reception buildings.
- A 'depot' building for Ayrburn containing storage / BOH and logistics areas and various staff facilities. There would also be parking allocated to Ayrburn staff.
- A meetings venue.

The general layout of the proposed development is as indicated in Figure 2 below. Estimated occupancies for design are given in Section 1.1.

Figure 2: Masterplan of Screen Hub.

The scope of this report is to support a resource consent application. It covers the assessment of water and wastewater flows expected to be generated by the development as well as the concept design of water and wastewater reticulation to service the development.

1.1 Reference Documents

This report refers to the following documents and information:

- "Water & Wastewater Infrastructure Assessment", dated 27th February 2023, by CKL, lodged under RM220926.
- Memorandum: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL.
- Memorandum: "Backflow Prevention Design", dated the 6th of December 2024, by CKL.
- "Ayrburn Masterplan – Building Plans – rev C", dated 17th September 2024, by S A Studio, file 24XX.
- "Fire Fighting Water Supplies – Design Advice 02", dated the 14th of November 2024, by Holmes, reference 146046.03.

2 Water Supply

The proposed Screen Hub will be serviced by an extension of the existing water supply network currently serving the Ayrburn Domain development and consented retirement village. This new network will source

potable and firefighting water from an existing 315mm OD PN12.5 PE100 HDPE water main connected to the Lake Hayes-Arrowtown bulk main.

2.1 Assessment of Water Demand

The assessment of water demand for the proposed Screen Hub development (the development) has been conducted using the following assumptions, consistent with Queenstown Lakes District Council (QLDC) guidelines and standard engineering practice. Therefore, the water demand figures can be summarised as:

1. **Occupancy Rate**: Each accommodation room is assumed to accommodate 2 people, based on the size of rooms.
2. **Water Consumption**: The daily water usage per person for each facility is listed below:
    a) **Accommodation guests/resident staff:** The daily water usage per person is assumed to be 250L/p/d (ASNZ1547 Table H4/NZS4404). The QLDC COP 2020 suggests a 700 L/p/d usage rate for residential subdivisions, but a more realistic rate of 250 L/p/d was adopted for this development, due to the occupants being film crew or visitor accommodation.
    b) **Non-resident staff (including accommodation, studio, spa, and depot staff):** The daily water usage per person is assumed to be 30L/p/d (ASNZ1547 Table H4).
    c) **Spa guests:** The daily water usage per person is assumed to be 40L/p/d (ASNZ1547 Table H4).
    d) **Meeting venue guests:** The daily water usage per person is assumed to be 20L/p/d (ASNZ1547 Table H4).
    e) **Depot guests:** The daily water usage per person is assumed to be 20L/p/d (ASNZ1547 Table H4).
    f) **Irrigation:** 4mm/m²/day for all vegetation types. Note that irrigation will cease after 2 years of establishment.
3. **Peak Factor**: A peak factor of 6.6 (QLDC guideline) has been applied for most facilities to reflect peak water demand scenarios, accounting for variations in daily consumption patterns and ensuring the network can accommodate short-term spikes in water usage. A higher peak factor of 10 was deemed appropriate for specific facilities, such as the spa.
4. **Design Flow Rates**: The design flow rates are calculated for both average daily demand and peak flow conditions, ensuring the water supply system can meet both regular and high-demand scenarios. To calculate the total occupancy of the Screen Hub, it had been assumed that all of the accommodation occupants will be working at the Screen Hub. A 20% contingency has then been included to account for additional staff/visitors at the Screen Hub from off-site.

    Please refer to **Table 1** below for the water demand calculations.

Table 1: Water Demand Calculations.

Unit Type	Facility (Double Beds)	Max No. of People Facility / Day	Daily Water Demand (L/p/d)	Daily Water Demand (m^3/d)	Daily ave. Water Demand (L/s)	Peak Factor	Peak Demand (L/s)	Assumptions
Screen Hub - 10 units, 231 Double Beds + workshop and workrooms								
Accommodation 6 (VIP)	9	2	250	4.5	0.05	6.6	0.34	All accommodation occupants assumed to occupy the Screen Hub. A 20% allowance has been made for off-site workers. Therefore: Screen Hub demand = total accommodation demand + 20%. Accommodation rooms have average occupancy of 2. Assumes demand includes laundry and kitchen facility water use.
Accommodation 7	30	2	250	15	0.17	6.6	1.15	
Accommodation 8	46	2	250	23	0.27	6.6	1.76	
Accommodation 9	32	2	250	16	0.19	6.6	1.22	
Accommodation 10	19	2	250	9.5	0.11	6.6	0.73	
Accommodation 11	19	2	250	9.5	0.11	6.6	0.73	
Accommodation 12	19	2	250	9.5	0.11	6.6	0.73	
Accommodation 13	19	2	250	9.5	0.11	6.6	0.73	
Accommodation 14	19	2	250	9.5	0.11	6.6	0.73	
Accommodation 15	15	2	250	7.5	0.09	6.6	0.57	
Off-site Screen Hub occupants	1	91	30	2.73	0.03	6.6	0.21	Assumed to have an additional 20% of Screen Hub occupants coming from off-site.
Screen Hub /Accommodation staff	1	8	30	0.24	0.00	6.6	0.02	L/d from ASNZ1547:2012 Table H4.
Total Screen Hub and Accommodation		**562**		**118.5**	**1.37**	**6.6**	**9.05**	**Sum of all Accommodation + 20% for outside workers.**
2 - Depot and staff facilities								
Depot staff	1	3	30	0.09	0.00	6.6	0.01	L/d from ASNZ1547:2012 Table H4.
Depot visitors	1	30	20	0.6	0.01	6.6	0.05	
3 - Spa and staff facilities								
Spa staff	1	9	30	0.27	0.00	10	0.03	L/d from ASNZ1547:2012 Table H4.
Spa visitors	1	50	40	2	0.02	10	0.23	
4 - Event space								
Guests	1	250	20	5	0.06	6.6	0.38	
Staff	1	33	30	0.99	0.01	6.6	0.08	
Sub Total (Domestic)				**127.5**	**2.8**		**9.8**	
Irrigation								
Irrigation for planting (9000m^2)				36				Based on 4mm / day. Irrigation can stop after 2 years.
Irrigation for lawns (1000m^2)				4				
Sub Total (Irrigation, overnight for 4 hours)				**40.0**			**2.8**	

Unit Type	Facility (Double Beds)	Max No. of People Facility / Day	Daily Water Demand (L/p/d)	Daily Water Demand (m^3/d)	Daily ave. Water Demand (L/s)	Peak Factor	Peak Demand (L/s)	Assumptions
TOTALS								
Excluding Irrigation from Peak							**9.7**	Irrigate after hours - excl. irrigation from peak
Irrigating during 50% peak demand							**7.6**	Irrigate during 50% peak demand
Total (Domestic + Irrigation)				**167.5**			**12.6**	Irrigate during peak demand. Average demand per day irrespective of irrigation timing.

2.1.1 Analysis and Observations

- **Daily Water Demand**: The total daily water is estimated to be 167.5 m^3/d for the development. This will decrease to 125.4 m^3/d after 2 years once irrigation is no longer required.
- **Peak Water Demand**: Applying a peak factor of 6.6 (or 10 for the spa), the peak water demand reaches 9.8 L/s. This assumes that all irrigation will occur overnight during off peak hours.
- **Design Considerations**: The adopted approach ensures compliance with QLDC COP. The demand calculations will guide the design of the water supply infrastructure, including pipe sizing, pressure management, and system resilience measures.

2.1.2 Effect on Overall Water Demand

The revised water demand analysis including the proposed Screen Hub facility shows an increase in Peak Daily Demand. The peak demand for the Screen Hub is 9.8 L/s (excluding irrigation). The updated combined peak daily demand for the Waterfall Park, Domain and Screen Hub is 27.3 L/s (excluding irrigation). This represents a 197% increase from the previously calculated peak daily demand of 9.16 L/s.

As a result, the overall future capacity figure has been revised to 12.2 L/s (refer to Table 2), considering this increased demand.

2.1.3 Firewater Demand

Holmes have provided design advice for firewater supply at the proposed Screen Hub (refer to Appendix 3) in accordance with SNZPAS 4509:2008:

- The Screen Hub and all structures within shall be fitted with sprinkler systems:
  - The most onerous sprinkler demand case (for each building) has been advised by Holmes. These are shown in Table 2.
  - The sprinkler demand for the accommodation and offices shall be supplied directly by the public reticulation.
  - On-site storage tanks with booster pumps are required for the sprinkler supply for the Depot, Screen Hub, Venue and Spa/Reception buildings. Refer to Appendix 3 for more information.
  - The tank/booster systems shall be fitted with a reticulated supply bypass line. This means that if the tanks or pumps are not operational, sprinkler demand shall be supplied by the

reticulated supply as a contingency/emergency standby. It is expected that this will occur during a fire event momentarily, until the tank booster pumps come online, unless the pumps are inoperable. This maximum flow (worst-case scenario) has been modelled and is shown in Table 2.

- Provided that sprinklers are installed, the firefighting water supply shall have a fire rating of FW2 for all buildings (two hydrants supplying 12.5 L/s each, within 135m and 270m, respectively).

Table 2 below provides an updated overview of the water demand requirements for both the Ayrburn Domain and Waterfall Park developments, incorporating the additional peak flow for the Screen Hub. This data includes both domestic and firefighting water needs, and it is essential for verifying the adequacy of the water supply system.

Note: Despite the increase in peak demand, the total ultimate domestic flow will not exceed the consented 45 l/s during normal operations.

Table 2: Combined Domestic + Fire Flows[1].

Structure	Domestic Peak Flow (l/s)	60% Peak Flow (l/s)	FW	Fire Hydrant Flow (l/s)	Sprinkler Discharge (l/s)	Fire Flow + Sprinkler Flow (l/s)
Ayrburn Domain						
Dairy (Ice cream parlour)	0.06	0.036	FW3	50	N/A	50
Bakehouse	0.43	0.258	FW2	25	13.3	38.3
Annex Building/Stable	1.43	0.858	FW2	25	20	45
Cart Shed (Deli)	0.15	0.09	FW2	25	25	50
Burr Barr	0.08	0.048	FW3	50	N/A	50
Barrel Room	0.22	0.132	FW3	50	N/A	50
Display Suite	0.02	0.012	FW3	50	N/A	50
Homestead Building	1.16	0.696	FW2	25	13.3	38.3
Haybarn	1.19	0.714	FW3	50	N/A	-
Future Domain Demand	4.66	2.796	FW3	50	N/A	50
Irrigation	1.6	0.96	NA			
Ayrburn Domain Sub-Total	**11**	**6.6**	NA			
Waterfall Park						
Building A - Arrivals & Amenities	2.46	1.476	FW2	25	20	45
Building B - Care & Offices	0.98	0.588	FW2	25	20	45
Building C - Residential	1.16	0.696	FW2	25	20	45
Building D - Residential	1.46	0.876	FW2	25	20	45
Building E - Residential	1.04	0.624	FW2	25	20	45
Building F - Boutique Hotel Including Function Venue	0.91	0.546	FW2	25	20	45
Miscellaneous	0.05	0.03	FW2	25	20	45

[1] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Structure	Domestic Peak Flow (l/s)	60% Peak Flow (l/s)	FW	Fire Hydrant Flow (l/s)	Sprinkler Discharge (l/s)	Fire Flow + Sprinkler Flow (l/s)
Irrigation	1.10	0.66	NA			
Waterfall Park Sub-Total (Current)	**9.16**	**5.496**				
Screen Hub						
1 - Screen Hub Office Staff + off-site workers	0.23	0.14	FW2	25	58.3 (On-site tank)	83.3
2 - Depot	0.05	0.03	FW2	25	71.8 (On-site tank)	96.8 (Worst Case)
3 - Spa	0.26	0.16	FW2	25	30.0 (On-site tank)	55.00
4 - Event Space	0.46	0.27	FW2	25	30.0 (On-site tank)	55.00
Accommodation 6 (VIP)	0.57	0.34	FW2	25	10.8	35.83
Accommodation 7	1.15	0.69	FW2	25	10.8	35.83
Accommodation 8	1.68	1.01	FW2	25	10.8	35.83
Accommodation 9	1.22	0.73	FW2	25	10.8	35.83
Accommodation 10	0.73	0.44	FW2	25	10.8	35.83
Accommodation 11	0.73	0.44	FW2	25	10.8	35.83
Accommodation 12	0.73	0.44	FW2	25	10.8	35.83
Accommodation 13	0.73	0.44	FW2	25	10.8	35.83
Accommodation 14	0.73	0.44	FW2	25	10.8	35.83
Accommodation 15	0.57	0.34	FW2	25	10.8	35.83
Screen Hub Domestic total	**9.8**	**5.90**				
Total (irrigation + domestic)	**12.6**	**7.56**				
Future Capacity / Totals						
Current Total (excl. irrigation)	**27.3**	**16.4**				
Total (incl. irrigation)	**32.8**	**19.7**				
Future Capacity	**12.2**	**NA**	Allowance for additional flows based on total potential			
TOTAL POTENTIAL (CONSENTED)	**45**	**27.0**				

These scenarios have been modelled in EPANET. The results are discussed in Section 2.5. As can be seen from the above, during the peak domestic situation with no fire flows, there is an estimated 12.2 L/s of additional capacity available for future developments.

The **critical fire flow for the current proposal** situation is as follows:

- Tank/booster system is not operational
- Depot sprinklers are operating = 71.8 L/s (Worst Case Scenario)
- Two hydrants are operating at 12.5 L/s each = 25 L/s (FW2)
- 60% of **current** peak domestic demand for entire development (excluding irrigation) = 16.4 L/s
- Total = 113.20 L/s

Considering the maximum consented peak daily demand (45 L/s) the **max consented critical fire flow**:

- Tank/booster system is not operational

- Depot sprinklers are operating = 71.8 L/s
- Two hydrants are operating at 12.5 L/s each = 25 L/s
- 60% of **maximum consented** peak domestic demand = 27 L/s (45 L/s x 60%)
- Total = 123.83 L/s

2.2 Proposed Water Supply Connection and Network Performance

The proposed development will be serviced by an extension of the existing water supply network currently serving the Ayrburn Domain development and retirement village. This new network will source potable and firefighting water from an existing 315mm OD PN12.5 PE100 HDPE water main connected to the Lake Hayes-Arrowtown bulk main.

The existing internal water network predominantly comprises high-density polyethylene (HDPE) pipes with diameters ranging from 180mm to 315mm. The specific pipe materials and lengths utilized within the network are as follows:

- **225 OD PN 12.5 PE100 HDPE**: 720m
- **315 OD PN 12.5 PE100 HDPE**: 940m
- **180 OD PN 12.5 PE100 HDPE**: 343m

The existing water distribution network was modelled based on preliminary reticulation designs provided by PPG, as detailed in Annexure A. Initial pipe sizes and lengths from these designs were used as input parameters, and their suitability was assessed using hydraulic modelling principles. The previously constructed model[2] was then expanded, including the above additional water demands as well as fire demands, as described in Section 2.1.3.

The existing network connects to a DN 225 PVC QLDC water main at the intersection of Speargrass Flat Road and Arrowtown-Lake Hayes Road, as illustrated in Figure 3.

Figures 3 and 4 illustrate the existing water network layouts, respectively.

[2] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Figure 3: Existing Network Connection.

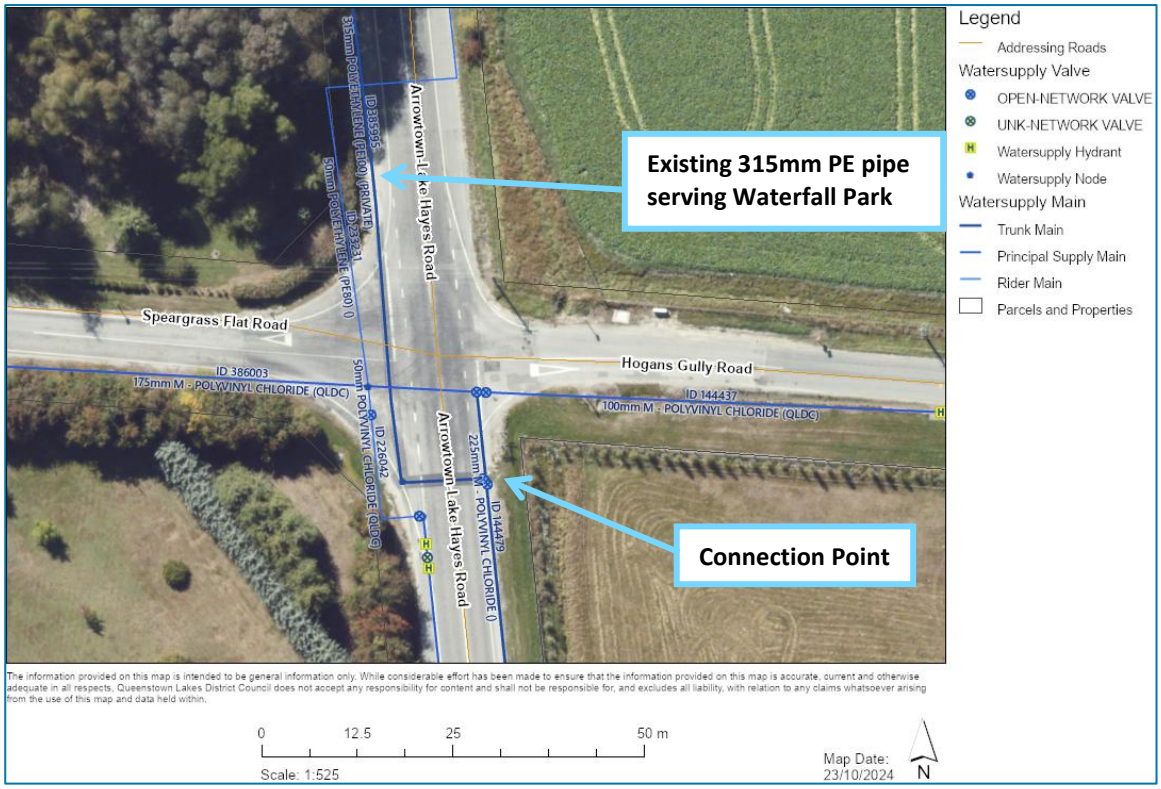
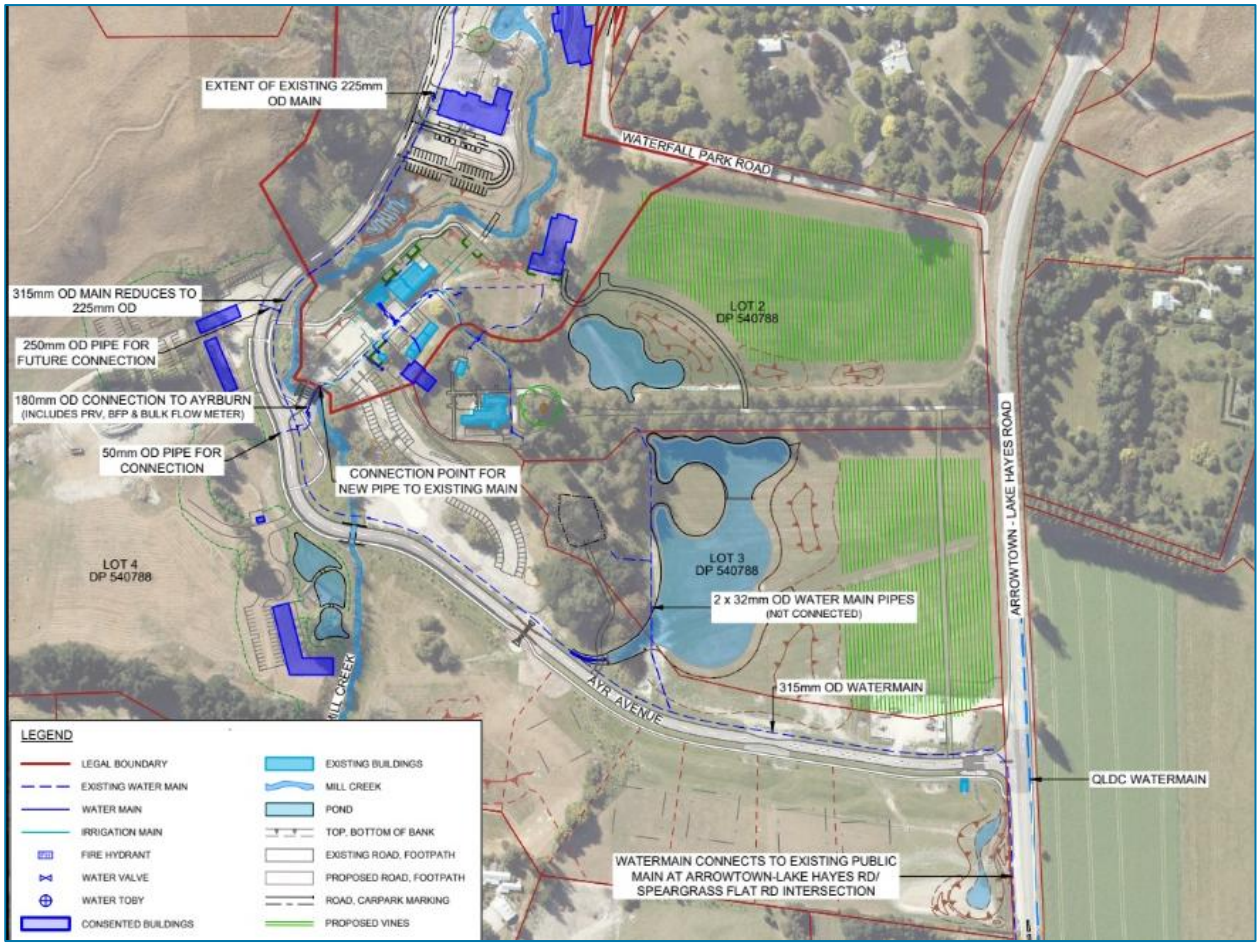


Figure 4: Existing Water Reticulation Network.



2.3 Pressure Reduction Requirements

2.3.1 Existing Pressures

Previous reporting concluded that due to the elevated static head pressures exceeding the QLDC maximum requirement of 90m within the Ayrburn Domain vicinity, a Pressure Reducing Valve (PRV) has been installed at the entrance to the Ayrburn Domain. The PRV is necessary to regulate pressure levels within the network, ensuring that pressures remain below the stipulated maximum limits.

The PRV has been incorporated into the hydraulic model to simulate network performance under varying flow conditions. This inclusion ensures effective pressure control, enhancing overall system reliability and minimizing the potential for pipeline damage.

The current PRV to the Ayrburn Domain is set at 750Kpa and is separate from this assessment.

2.3.2 Proposed Pressure Management

As per NZBC G13, the hazard rating for the overall development (Waterfall Park, Ayrburn Domain, and Screen Hub) has been assessed as 'high'. Therefore, a reduced pressure zone backflow prevention valve is proposed, and shall be installed at the entrance to the development at the Ayr Avenue/Arrowtown-Lake Hayes Road intersection. These valves have an average of 8m of head loss (based on a Zurn Wilkens – 375ASTL Series), with a maximum head loss under peak flows across the whole valve assembly of 14m. This RPZ has been included in the model. This is discussed in CKL's Backflow Prevention Design Memorandum.

With the addition of the RPZ, the proposed connection points for the Screen Hub may experience residual pressures between 85m to 90m during average daily flows and may exceed the QLDC's maximum recommended limit. Such high pressures can stress the water distribution system, increasing the risk of leaks and infrastructure damage. To address this, installing Pressure Reducing Valves (PRVs) at key points will be necessary to regulate pressures within safe operating limits and protect both the network and plumbing. A PRV valve set to 750Kpa can be installed at each connection point to the existing 315mm OD pipe. This will be investigated further at detailed design stage. Individual pressure reduction to be investigated at detailed design stage.

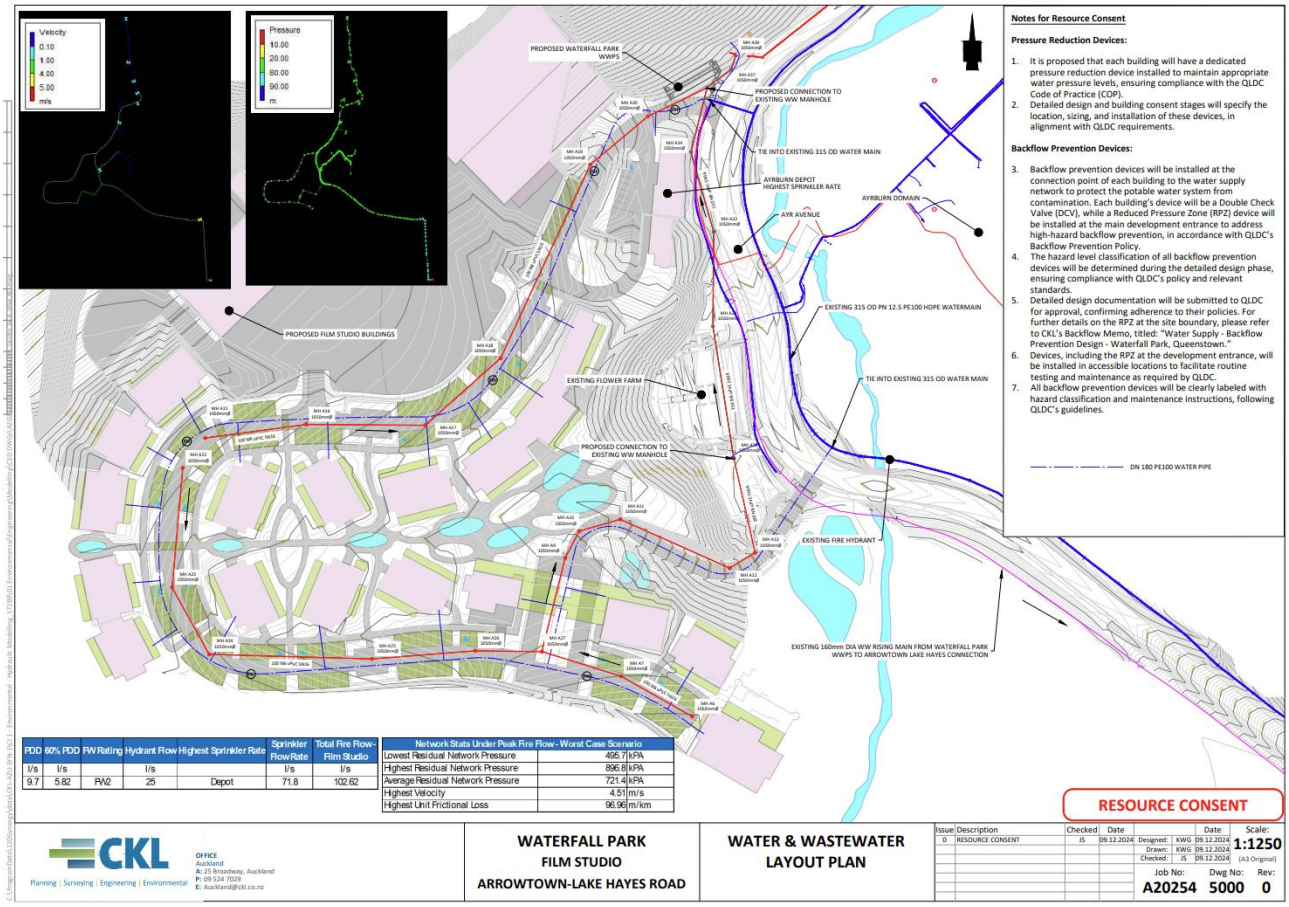
2.4 Proposed Water Reticulation Layout

The water reticulation for the Screen Hub is illustrated in Figure 5. These lots will be supplied from a tee-off on the incoming 315 OD PE main. To manage residual pressures which exceed 90m during peak daily flows, pressure reducing valve(s) will be installed (to be confirmed at detailed design stage). This portion of the development can be isolated by means of either isolation valves upstream or downstream of the pressure reducing or check valve.

The design will accommodate both fire hydrants and potable water supply. Based on an assumed FW-2 rating per SNZ PAS 4509, two fire hydrants will be included, each capable of supplying 12.5 l/s simultaneously. Sprinkler flows shall be supplied via on-site storage and boosting (Appendix 3).

The take-off from the 315 OD main will consist of a DN 180 principal main with appropriately located fire hydrants. This will be refined at detailed design stage.

Figure 5: Screen Hub Proposed Water Reticulation Network (Refer to Appendix 1).



2.5 Network Pressures and Modelling

The hydraulic modelling conducted by CKL in 2023 was based on the pre-development network layout and did not account for the specific configuration of the proposed Screen Hub. Therefore, the modelling has been expanded. The purpose of the additional modelling is to provide an updated view of the expected development demands and assess the proposed network based on the following criteria:

1. Ensuring that the available firefighting flows meet the firefighting requirements in accordance with SNZ PAS 4509:2008 "New Zealand Fire Fighting Service Fire Fighting Water Supplies Code of Practice".

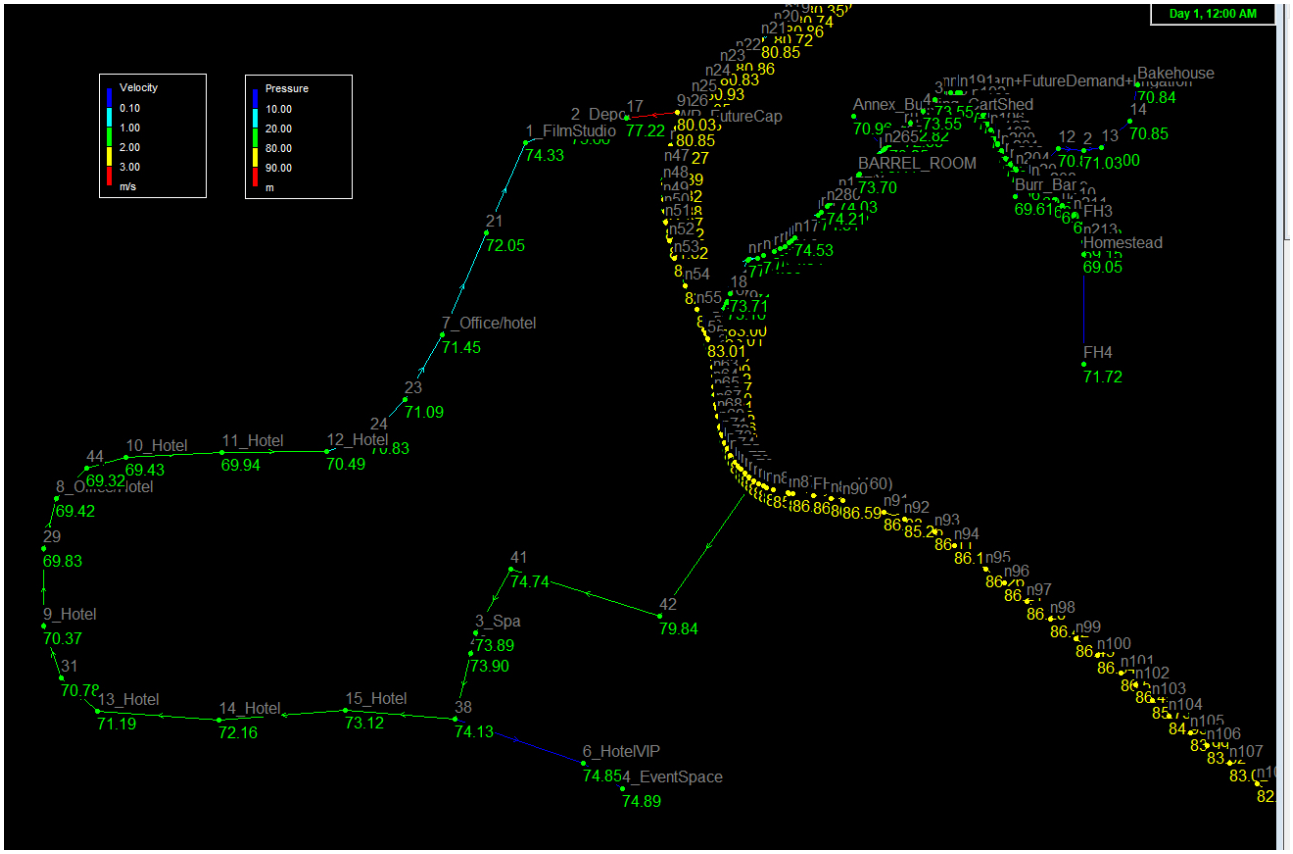
2. Verifying that the minimum residual pressures at each connection are ≥ 300kPa during peak hour demand, as stipulated in the Queenstown Lakes District Council "Land Development and Subdivision Code of Practice" 2015.

Based on criteria 1 and 2, the initial assessments demonstrated that the water distribution system was capable of maintaining the required minimum residual pressures under typical operating and fire flow conditions:

- Normal Operation: Minimum residual pressure of 300 kPa
- Fire Flow Scenarios: Minimum residual pressure of 100 kPa

The proposed Screen Hub will be adequately serviced even during peak fire flow scenarios, with residual pressures remaining above these minimum thresholds. Further modelling can be undertaken to confirm this, but it is not deemed necessary at this stage. The EPANET model under the **critical fire flow for the current proposal** (as per Section 2.1.3) is shown in Figure 6.

Figure 6: Screen Hub EPANET Model with Pipe Velocities And Residual Pressures Under The Critical Fire Flow For The Current Proposal



3 Wastewater

3.1 General Description

The wastewater solution for the proposed development will be directed to the Waterfall Park Wastewater Pump Station, which will then pump to the existing wastewater main in Arrowtown-Lake Hayes Road.

3.1.1 Existing Wastewater Network (Overall Strategy)

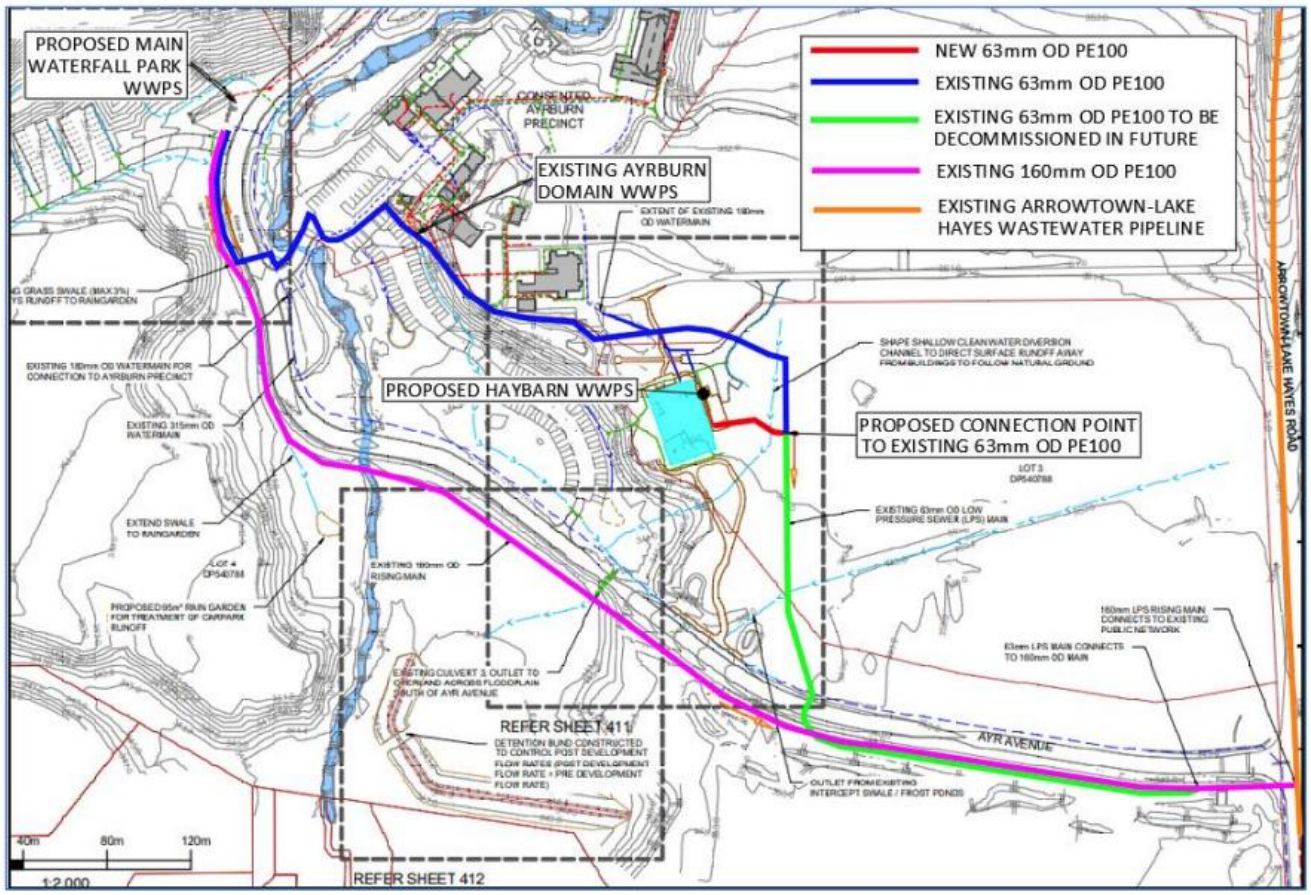
Figure 7 illustrates the general location of key components of the existing wastewater reticulation system.

Summary of Key Components:

- **Waterfall Park Wastewater Pump Station (WPWWPS):** Once commissioned, this pump station will accommodate wastewater from both the Waterfall Park and Ayrburn developments via a 160 OD PE rising main to the Lake Hayes-Arrowtown gravity main. The maximum consented wastewater delivery rate is 23.4 l/s.
- **Ayrburn Wastewater:** Currently transported through a 63 OD PE pipe which connects to the existing 160 OD PE rising main. In the future, Ayrburn's wastewater will be redirected to the WPWWPS. The 63 OD rising main will then be utilised to convey wastewater from the proposed Haybarn pump station to the same 160 OD PE main.

Haybarn Wastewater: This is a proposed pump station that will pump wastewater from the recently consented Haybarn Venue to the existing 63OD rising main once Ayrburn wastewater is re-directed, as described above.

Figure 7: Existing Wastewater Network.



3.2 Assessment of Wastewater Flows

The assessment of wastewater demand for the proposed Screen Hub has been conducted using the following assumptions, consistent with QLDC guidelines and standard engineering practice:

1. **Occupancy Rate**: Each accommodation room is assumed to accommodate 2 people, based on the size of rooms.

2. **Wastewater Flow Rate**: The daily wastewater production per person for each facility is listed below. To calculate the total occupancy of the Screen Hub, it had been assumed that all of the accommodation occupants will be working at the Screen Hub. A 20% contingency has then been included to account for additional staff/visitors at the studio from off-site.

    a. **Accommodation guests/resident staff:** The daily wastewater production per person is assumed to be 220L/p/d (ASNZ1547 Table H4/NZS4404).

    b. **Non-resident staff (including accommodation, studio, spa, depot, and event venue staff):** The daily wastewater production per person is assumed to be 30L/p/d (ASNZ1547 Table H4).

    c. **Spa guests:** The daily wastewater production per person is assumed to be 40L/p/d (ASNZ1547 Table H4).

    d. **Event venue guests:** The daily wastewater production per person is assumed to be 20L/p/d (ASNZ1547 Table H4).

e. **Depot guests:** The daily wastewater production per person is assumed to be 20L/p/d (ASNZ1547 Table H4).

3. **Peak Wet Weather Flow (PWWF)**: The PWWF is calculated based on the peak flow conditions that can occur during wet weather. The standard assumption for the PWWF is typically 5 times the average daily flow, though this can vary based on local regulations and design requirements. A PWWF of 5 has been applied for this development.

4. **System Operation:** The system assumes that the WPWWPS will be operational before the Screen Hub is connected.

5. **Future Expansion:** The retained segment of the 63 OD PE rising main will serve as a contingency for future operational flexibility and system reliability.

Table 3: Assessment of Wastewater Flows from The Screen Hub.

Unit Type	No. of Facilities (Double Beds)	Max No. of People Facility / Day	Daily WW Flow (L/p/d)	Daily WW Flow (m^3/d)	Daily WW Flow (L/s)	Peak Dry weather Flow (PDWF) (l/s)	Peak wet weather flow (PWWF) (l/s)	Comments/Assumptions
Screen Hub - 10 units, 231 Double Beds + workshop and workrooms								
Accommodation occupants	231	2	220	101.64	1.18	2.35	5.88	All occupants assumed to occupy the Screen Hub. Accommodation rooms have average occupancy of 2. Assumes demand includes laundry and kitchen facility water use.
Off-site Screen Hub occupants	1	91	30	2.73	0.03	0.06	0.16	Assumed to have an additional 20% of Screen Hub occupants coming from off-site. L/d from ASNZ1547:2012 Table H4.
Screen Hub /Accommodation staff	1	8	30	0.24	0.00	0.01	0.01	L/d from ASNZ1547:2012 Table H4.
Depot and staff facilities								
Depot staff	1	3	30	0.09	0.00	0.00	0.01	L/d from ASNZ1547:2012 Table H4.
Depot visitors	1	30	20	0.6	0.01	0.01	0.03	
Spa and staff facilities								
Spa staff	1	9	30	0.27	0.00	0.01	0.02	L/d from ASNZ1547:2012 Table H4.
Spa visitors	1	50	40	2	0.02	0.05	0.12	
Event space								
Guests	1	250	20	5	0.06	0.12	0.29	L/d from ASNZ1547:2012 Table H4.
Staff	1	33	30	0.99	0.01	0.02	0.06	
TOTALS								
Total				**113.56**	**1.31**	**2.63**	**6.58**	

3.2.1 Impact on Overall Flows

The effect of the proposed Screen Hub yields an increase in the peak wet weather flow of 6.5 L/s from 10.21 L/s to 16.71 L/s.

The development is currently consented for a Peak Wet Weather Flow (PWFW) of 23.4 l/s as per **Table 4** below. As a result of the proposed Screen Hub and other recent consented developments, the future (spare) system capacity reduces from 13.3 l/s to 6.69 l/s. Further wastewater modelling of the development is therefore not considered necessary and the conclusion that the existing infrastructure has available capacity for the current, 2028 and 2058 design horizons remain unchanged.

Table 4: Updated Wastewater Flows[3].

Development Area	Modelled (HAL January 2019)		Proposed Development	
	Peak Daily Volume (m^3)	PWWF (l/s)	Peak Daily Volume (m^3)	PWWF (l/s)
Waterfall Park & Ayrburn Domain				
Waterfall Park Hotel	247.4	14.3	-	-
Northbrook Arrowtown	-	-	98.15	5.68
Ayrburn Domain (Consented as part of RM 180584)	-	-	18.8	1.1
Ayrburn Domain change of use buildings	-	-	2.6	0.2
Ayrburn Domain Extension (RM211193)			32.5	1.9
Ayrburn Farm - No longer proposed Residential Development	150	9	-	-
Barrel Room (RM220829)**			3.3	0.19
Bakehouse (RM220874)**			4.2	0.24
Haybarn (RM230425)			14.23	0.82
Sub-total (Ayrburn Domain + Waterfall Park)			**173.8**	**10.13**
Screen Hub				
Screen Hub sub-total			**113.56**	**6.58**
TOTALS				
Total: Screen Hub, Ayrburn Domain, Waterfall park	247.4	14.3	287.36	16.71
Future Capacity (Subject to Future RC applications)	-	-	128.84	6.69
Total	**416.2**	**23.4**	**416.2**	**23.4**

3.2.2 Proposed Wastewater Reticulation

Figure 5 depicts the wastewater reticulation for the proposed Screen Hub.

[3] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Proposed Solution: installation of gravity reticulation, directing wastewater towards the Waterfall Park WWPS (WPWWPS). Gravity reticulation will generally consist of 150mm NB uPVC SN16 piping laid at grades between 0.58% and a maximum of approximately 9.4%. The reticulation layout is shown in Figure 8.

To mitigate excessively steep pipe grades and deep manhole installations, drop manholes can be employed to dissipate energy and manage flow velocities. While this option offers minimal control over the timing of flow to the Waterfall Park WWPS, it remains the most cost-effective solution in terms of long-term operational costs.

An alternate solution is to install low pressure sewer and grinder pumps at each building, with small-bore rising mains. This can be investigated at detailed/building design stage.

3.2.3 Waterfall Park Wastewater Pump Station

The available capacity in the main Waterfall Park Wastewater Pump Station (WPWWPS) has been evaluated based on current and future flow calculations. CKL's calculations indicate a Peak Wet Weather Flow (PWWF) of 16.71 l/s and a future capacity of 6.69 l/s. The WWPS itself has been designed to accommodate a PWWF of 23.4 l/s, which is the maximum consented value. Both the current and future flow assessments demonstrate that the WWPS will operate well within its design limits, confirming that there is sufficient available capacity in the system to accommodate the Screen Hub.

4 Conclusion

The assessment conducted for the proposed Screen Hub indicates that the existing water and wastewater infrastructure, with some modifications, can adequately service the development. The hydraulic modelling confirms that the existing water network has sufficient capacity to meet the increased demand from the new development, including peak domestic and firefighting requirements. Installing Pressure Reducing Valves (PRVs) at key points will be necessary to regulate pressures within safe operating limits and protect both the network and plumbing. A PRV valve set to 750Kpa can be installed at each connection point to the existing 315mm OD pipe. This will be investigated further at detailed design stage.

A reduced pressure zone backflow prevention valve is proposed and shall be installed at the entrance to the development. This is discussed in CKL's Backflow Prevention Design Memorandum.

The water demand calculations, using a conservative approach aligned with QLDC Code of Practice requirements, ensure that the system is robust enough to handle the domestic water use of the proposed lots. The increase in peak daily demand is within the consented limits and does not compromise the overall system performance.

The proposed water reticulation layout, including specific measures for pressure control and fire safety, meets regulatory requirements and ensures adequate water supply for all buildings. The film facilities wastewater flows are expected to be within the existing capacity of the wastewater network, and no significant upgrades are required.

The main Waterfall Park Wastewater Pumpstation has sufficient capacity to receive flows from the proposed Screen Hub. It is proposed that wastewater is reticulated to the wastewater pump station via gravity. Gravity reticulation will generally consist of 150mm NB uPVC SN16 piping laid at grades between 0.58% and a maximum of approximately 9.4%.

An alternate solution is to install low pressure sewer and grinder pumps at each building, with small-bore rising mains. This can be investigated at detailed design stage.

5 Recommendations

5.1 Water

1. **Install Pressure Reducing Valves (PRVs):** To address elevated residual pressures between exceeding 90m during peak flows, install PRVs at key connection points/at point of use to regulate system pressure. This measure is critical to maintaining the integrity of the water supply network and minimizing the risk of leaks and damage. This will be confirmed at detailed design stage.
2. **Fire Hydrant Placement and Flow Rates:** Ensure the placement of fire hydrants at the specified locations and confirm that they meet the required flow rates as per SNZ PAS 4509:2008 standards. This will ensure compliance with fire safety regulations and adequate coverage for firefighting purposes.

5.2 Wastewater

- Install gravity reticulation, generally consisting of 150mm NB uPVC SN16 piping laid at grades between 0.58% and a maximum of approximately 9.4%.
- The reticulation will direct wastewater towards an existing wastewater pipeline that starts at the proposed flower farm location and terminates at the WPWWPS.
- The location and necessity of drop manholes will be assessed at detailed design stage.

6 Limitations

This report has been prepared solely for the benefit of our client with respect to the particular brief and it may not be relied upon in other contexts for any other purpose without the express approval by CKL. Neither CKL nor any employee or sub-consultant accepts any responsibility with respect to its use, either in full or in part, by any other person or entity. This disclaimer shall apply notwithstanding that the memo/report may be made available to other persons including Council for an application for consent, approval or to fulfil a legal requirement.

Appendix 1 Drawings

Ayrburn Screen Hub Drawings

- Ayrburn Screen Hub – Masterplan. Dated the 17th December 2024.

Proposed Water and Wastewater Reticulation Plans

- Proposed Water & Wastewater Layout Plan – Sheet 5000

(A) **Filming studios**
14m external height clear span building for set construction and filming.

(B) **Workshop and workroom spaces**
Flexible spaces for construction, fabrication, wardrobe, paint and tech departments such as Grip, Lighting, Rigging and Camera etc.

(C) **'Backlot'**
Flexible hardstand area for tech trucks, catering, outdoor sets, storage and carparking as required.

(D) **Controlled entries**
Two entries so that the facility can be used for two smaller productions working at the same time.

(E) **Offices and private actor spaces and dressing rooms**
To be used as production and department offices. When not in use for a production, these will be able to convert to double and single visitor accommodation suites for the open market.

(F) **Worker or visitor accommodation**
Single unit worker accommodation to be used for accommodating crew. When not in use for a production these will be used for visitor accommodation.

(G) **Christine's Hill**
Retained as open pasture browntop grass and grazed by sheep and kept free of invasive weeds. Riparian planting areas to be fenced.

(H) **Countryside Trail**
Public trail largely via easement over the applicant's land on Christines Hill and in road reserve on the flat land.

(I) **Extension of existing spur**
To mitigate landscape effects from the trail up Christines Hill and screen larger studio buildings from view.

(J) **Existing conifer shelter belt**
To be retained as required by the Ayrburn Structure Plan.

(K) **Existing mature vegetation.**
To be retained.

(L) **Native riparian planting**
To the ephemeral watercourse.

(M) **Grapevines**
To bookend the site and provide an open space buffer as per that between Arrowtown - Lake Hayes Road and the site.

(N) **Ayrburn Depot**
Deliveries and ancillary function to the Ayrburn hospitality precinct. This will replace / formalise all the temporary storage containers, portacom staff rooms and offices scattered around the site.

(O) **Engineered Wetlands / detention ponds**
To ensure water entering Mill Creek is sufficiently treated.

(P) **Ayrburn Hospitality Precinct (existing)**
5 Restaurants, 7 bars, butcher, retail, bakery, music events area ice creamery, children's playgrounds, wedding venue and botanic garden including a flower farm.

(Q) **Northbrook Retirement and Hotel**
170 retirement units including 23 hospital grade care suites, clubhouse, gym pool and spa. An 18 room boutique Hotel with a 120 pax event space.

(R) **Reception**
For worker / visitor accommodation

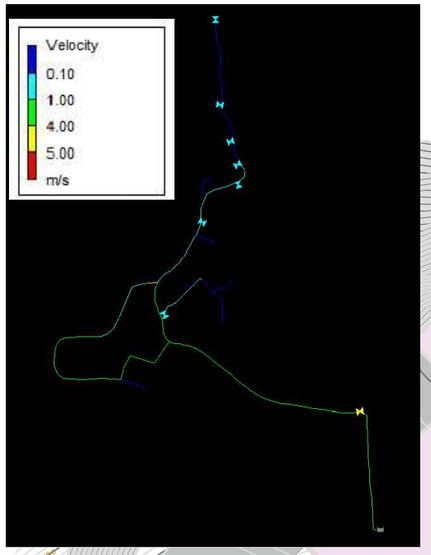
(S) **Gym / wellness**
For worker / visitor accommodation

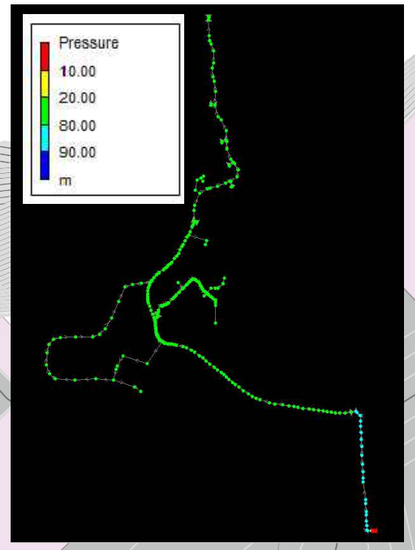
(T) **Conference / event space**

(U) **Productive Garden**

(V) **Mill Creek**

(W) **Proposed Mill Creek Sediment Trap**
50x12m serviceable in line sediment trap.





PROPOSED WATERFALL PARK WWPS

PROPOSED CONNECTION TO EXISTING WW MANHOLE

TIE INTO EXISTING 315 OD WATER MAIN

AYRBURN DEPOT HIGHEST SPRINKLER RATE

AYRBURN DOMAIN

AYR AVENUE

EXISTING 315 OD PN 12.5 PE100 HDPE WATERMAIN

TIE INTO EXISTING 315 OD WATER MAIN

EXISTING FLOWER FARM

PROPOSED FILM STUDIO BUILDINGS

PROPOSED CONNECTION TO EXISTING WW MANHOLE

EXISTING FIRE HYDRANT

EXISTING 160mm DIA WW RISING MAIN FROM WATERFALL PARK WWPS TO ARROWTOWN LAKE HAYES CONNECTION

MH A39 1050mmØ
MH A37 1050mmØ
MH A20 1050mmØ
MH A34 1050mmØ
MH A19 1050mmØ
MH A32 1050mmØ
MH A21 1050mmØ
MH A18 1050mmØ
MH A15 1050mmØ
MH A16 1050mmØ
MH A17 1050mmØ
MH A22 1050mmØ
MH A28 1050mmØ
MH A11 1050mmØ
MH A10 1050mmØ
MH A9 1050mmØ
MH A13 1050mmØ
MH A12 1050mmØ
MH A23 1050mmØ
MH A24 1050mmØ
MH A25 1050mmØ
MH A26 1050mmØ
MH A27 1050mmØ
MH A7 1050mmØ
MH A6 1050mmØ

100 NB uPVC SN16
150 NB uPVC SN16

PDD	60% PDD	FW Rating	Hydrant Flow	Highest Sprinkler Rate	Sprinkler Flow Rate	Total Fire Flow - Film Studio
l/s	l/s		l/s		l/s	l/s
9.7	5.82	FW2	25	Depot	71.8	102.62

Network Stats Under Peak Fire Flow - Worst Case Scenario		
Lowest Residual Network Pressure	495.7	kPA
Highest Residual Network Pressure	896.8	kPA
Average Residual Network Pressure	721.4	kPA
Highest Velocity	4.51	m/s
Highest Unit Frictional Loss	96.96	m/km

Notes for Resource Consent

Pressure Reduction Devices:

1. It is proposed that each building will have a dedicated pressure reduction device installed to maintain appropriate water pressure levels, ensuring compliance with the QLDC Code of Practice (COP).
2. Detailed design and building consent stages will specify the location, sizing, and installation of these devices, in alignment with QLDC requirements.

Backflow Prevention Devices:

3. Backflow prevention devices will be installed at the connection point of each building to the water supply network to protect the potable water system from contamination. Each building's device will be a Double Check Valve (DCV), while a Reduced Pressure Zone (RPZ) device will be installed at the main development entrance to address high-hazard backflow prevention, in accordance with QLDC's Backflow Prevention Policy.
4. The hazard level classification of all backflow prevention devices will be determined during the detailed design phase, ensuring compliance with QLDC's policy and relevant standards.
5. Detailed design documentation will be submitted to QLDC for approval, confirming adherence to their policies. For further details on the RPZ at the site boundary, please refer to CKL's Backflow Memo, titled: "Water Supply - Backflow Prevention Design - Waterfall Park, Queenstown."
6. Devices, including the RPZ at the development entrance, will be installed in accessible locations to facilitate routine testing and maintenance as required by QLDC.
7. All backflow prevention devices will be clearly labeled with hazard classification and maintenance instructions, following QLDC's guidelines.

DN 180 PE100 WATER PIPE

RESOURCE CONSENT

CKL
Planning | Surveying | Engineering | Environmental

OFFICE
Auckland
A: 25 Broadway, Auckland
P: 09 524 7029
E: Auckland@ckl.co.nz

WATERFALL PARK
FILM STUDIO
ARROWTOWN-LAKE HAYES ROAD

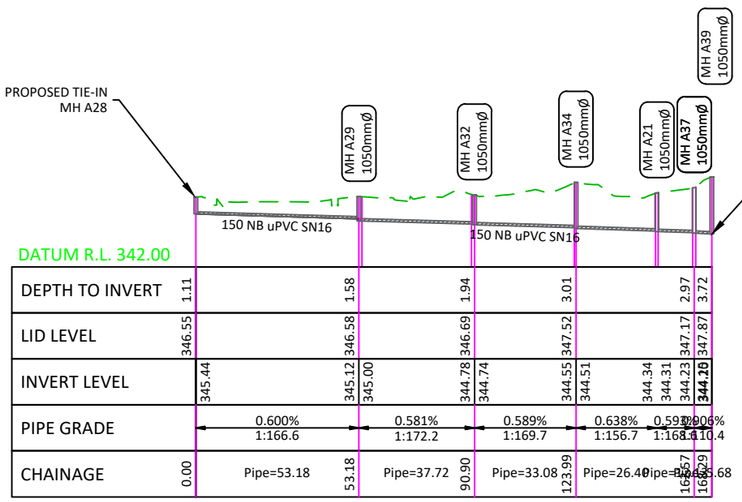
WATER & WASTEWATER LAYOUT PLAN

Issue	Description	Checked	Date
0	RESOURCE CONSENT	JS	09.12.2024

		Date
Designed:	KWG	09.12.2024
Drawn:	KWG	09.12.2024
Checked:	JS	09.12.2024

Scale: 1:1250 (A3 Original)

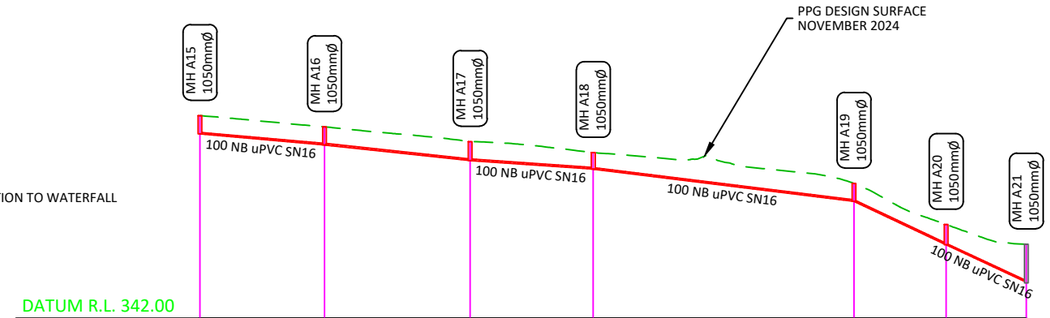
Job No: A20254 Dwg No: 5000 Rev: 0



DATUM R.L. 342.00

DEPTH TO INVERT	1.11		1.58		1.94		3.01			2.97	3.72		
LID LEVEL	346.55		346.58		346.69		347.52			347.17	347.87		
INVERT LEVEL	345.44		345.12	345.00	344.78	344.74	344.55	344.51	344.34	344.31	344.23	344.19	
PIPE GRADE		0.600% 1:166.6		0.581% 1:172.2		0.589% 1:169.7		0.638% 1:156.7		0.598% 1:168.1	0.906% 1:110.4		
CHAINAGE	0.00	Pipe=53.18	53.18	Pipe=37.72	90.90	Pipe=33.08	123.99	Pipe=26.40	Pipe=[illegible]	165.57	165.29	Pipe=[illegible].68	

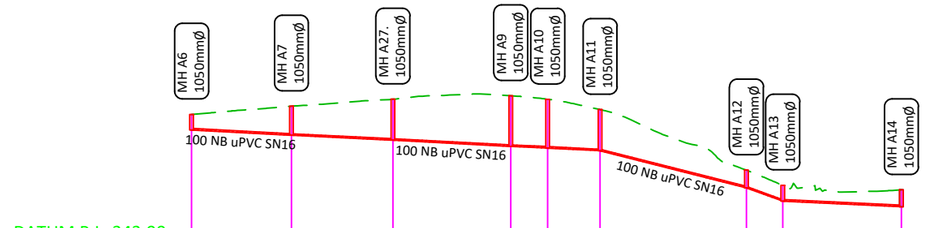
LONGITUDINAL SECTION FOR Alignment - Flower Farm Ex WW Line



DATUM R.L. 342.00

DEPTH TO INVERT	1.20		1.18		1.24		1.07			1.17	1.32		2.52
LID LEVEL	355.21		354.48		353.51		352.79			350.79	348.10		346.82
INVERT LEVEL	354.01		353.30	353.30	352.28	352.28	351.72	351.72		349.61	349.61	346.78	346.78	344.34
PIPE GRADE		1.755% 1:57.0		2.142% 1:46.7		1.387% 1:72.1		2.480% 1:40.3				9.417% 1:10.6	9.343% 1:10.7	
CHAINAGE	0.00	Pipe=40.65	40.65	Pipe=47.49	88.14	Pipe=40.17	128.31	Pipe=85.04		213.35	Pipe=30.09	243.43	Pipe=26.14	269.57

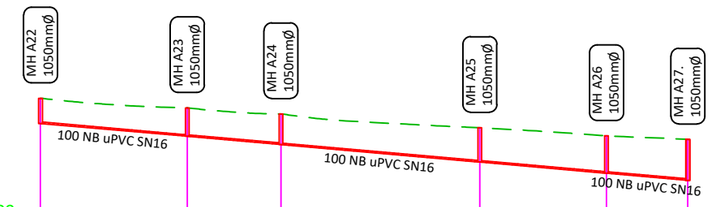
LONGITUDINAL SECTION FOR Alignment - WW Line B



DATUM R.L. 343.00

DEPTH TO INVERT	1.02		1.89		2.67		3.30	3.18	2.69		1.17	1.04	1.11
LID LEVEL	351.47		352.00		352.45		352.68	352.45	351.78		347.83	346.85	346.55
INVERT LEVEL	350.45		350.10	350.10	349.78	349.78	349.38	349.38	349.27	349.27	349.09	346.67	345.81	345.81	345.44
PIPE GRADE		1.050% 1:95.3		0.980% 1:102.0		1.045% 1:95.7		0.925% 1:108.1	1.006% 1:99.4	5.084% 1:19.7		7.270% 1:13.8	0.945% 1:105.8	
CHAINAGE	0.00	Pipe=32.56	32.56	Pipe=33.10	65.66	Pipe=38.46	104.09	Pipe=12.05	116.16	Pipe=17.09	133.25	Pipe=47.71	180.96	Pipe=11.86	192.82	Pipe=38.69	231.51

LONGITUDINAL SECTION FOR Alignment - WW A Line



DATUM R.L. 347.00

DEPTH TO INVERT	1.64		1.86		2.00			2.25			2.44		2.67
LID LEVEL	355.14		354.51		354.12			353.22			352.69		352.45
INVERT LEVEL	353.49		352.65	352.65	352.12	352.12		350.97	350.97		350.25	350.25	349.78
PIPE GRADE		1.753% 1:57.0		1.761% 1:56.8		1.765% 1:56.6				1.753% 1:57.0		1.761% 1:56.8	
CHAINAGE	0.00	Pipe=47.86	47.86	Pipe=30.54	78.40	Pipe=64.89			143.29	Pipe=41.32	184.61	Pipe=26.53	211.14

LONGITUDINAL SECTION FOR Alignment - WW Line C

RESOURCE CONSENT

CKL
Planning | Surveying | Engineering | Environmental

OFFICE
Auckland
A: 25 Broadway, Auckland
P: 09 524 7029
E: Auckland@ckl.co.nz

WATERFALL PARK
FILM STUDIO
ARROWTOWN-LAKE HAYES ROAD

WASTEWATER LONG SECTIONS

Issue	Description	Checked	Date
0	RESOURCE CONSENT	JS	09.12.2024

		Date
Designed:	KWG	09.12.2024
Drawn:	KWG	09.12.2024
Checked:	JS	09.12.2024

Scale: **1:1250** (A3 Original)

Job No: **A20254** Dwg No: **5100** Rev: **0**

Appendix 2 EPANET Model Output

Figure 8: Screen Hub modelled during peak domestic flow (no fire flow).

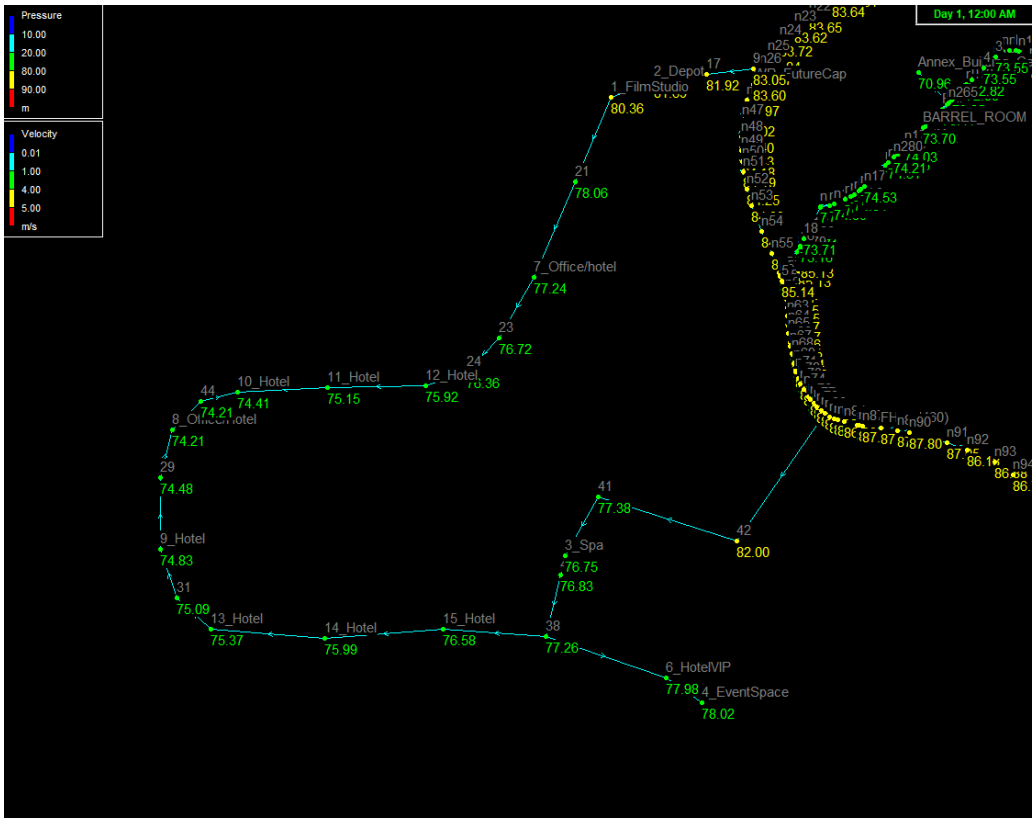


Figure 9: Screen Hub modelled (pressure vs velocity) during peak domestic flows (no fire flow).

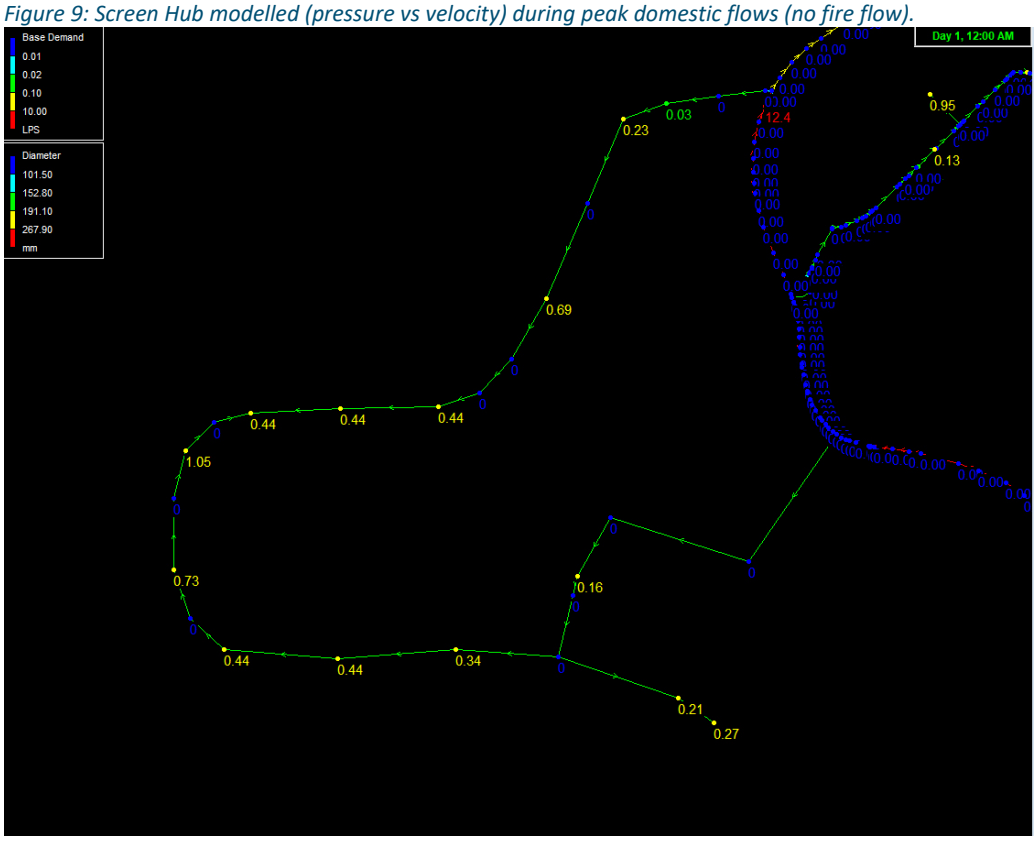


Figure 10: Screen Hub modelled (pressure vs velocity) during critical fire flow condition (60% peak demand + FW2 + depot sprinklers).

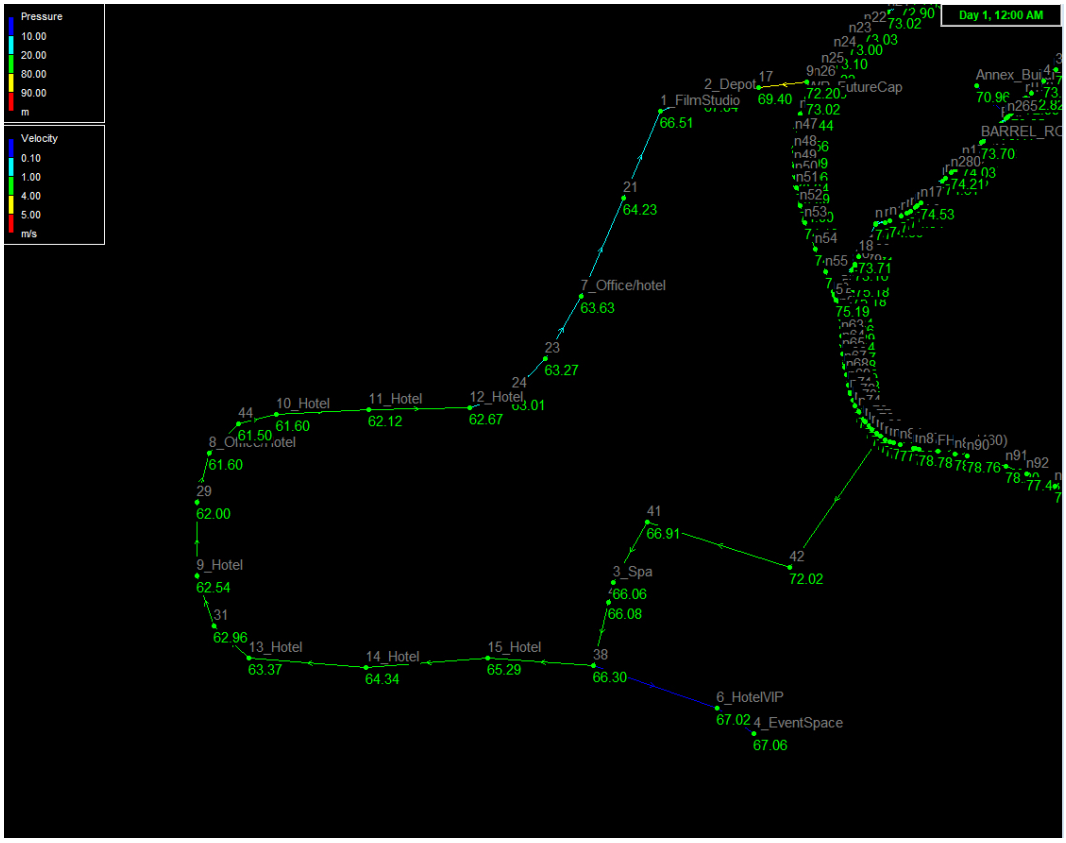
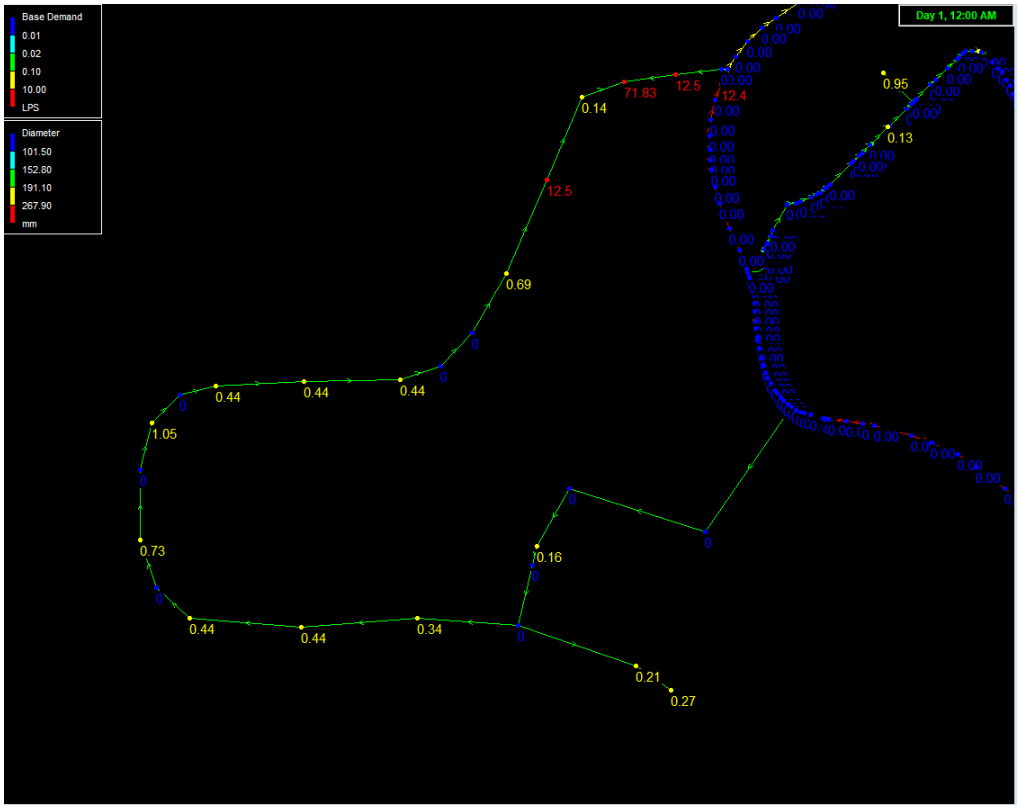


Figure 11: Screen Hub modelled (demand vs diameter) during critical fire flow condition (60% peak demand + FW2 + depot sprinklers



Appendix 3 Holmes Design Advice – Screen Hub

Holmes NZ LP
Level 2, 254 Montreal Street
Christchurch Central
PO Box 6718
Christchurch 8442
holmesanz.com

Design Advice

To:	Shaun Niven	Winton	By Email Only
	John Sternberg	CKL	
	Kylin Gunkel	CKL	
From:	Martin Jackson		Project: 146046.03
Date:	14 November 2024		Page: 1 of 4
For:	☐ Action / ✓ Information		DA: 2
Subject:	Ayrburn Film Hub - Ayr Avenue, Arrowtown Fire Fighting Water Supplies		

The purpose of this design advice is to identify the minimum firefighting and sprinkler water supply requirements for the development in accordance with the firefighting code of practice SNZ PAS 4509:2008 and NZS 4541:2020. We have assumed full sprinkler coverage is provided to each building, resulting in an FW2 classification, as previously discussed.

1 EXECUTIVE SUMMARY

A tank will be required for the sprinkler water supply for the Depot, Film Studio, Venue and Spa/ Reception buildings due to the combined sprinkler and hydrant demands exceeding the Queenstown Lakes District Council (QLDC) maximum guaranteed supply. A combined fire infrastructure arrangement could be used to cover all the buildings provided it is based on the single most onerous demand for the site or each building. Alternatively, each building can be supplied separately with multiple tanks. A minimum 150 m^3 infill tank will be required for the site.

2 FIRE FIGHTING WATER SUPPLY DEMANDS AND TANK SIZES

The Firefighting water supply for each building will be FW2 which consists of 1,500 L/min for hydrant water plus the demand from the sprinkler system.

The supply to each of the buildings sprinklers systems will be classified as a Class C1 Supply (A single approved primary water supply).

2.1 Flow Rates and Tank Sizes

The table on the following page, addresses the minimum required flow rates and tank sizes each of the various proposed building types.

Our aim is to provide a flexible space, considering likely future uses of the building without overdesigning the system for unlikely scenarios.

General assumptions and notes:

- The single worst fire scenario is taken for the tank size i.e. the water demands from multiple fire events are not added together.
- No general retail tenancies are proposed.
- No loading docks are proposed.
- The water supply tank(s) will require a Diesel Fire Pump to boost the supply.
- From our previous experience on Northbrook Arrowtown, QLDC will only guarantee a supply of 41.6 L/s (2,500 L/min).
- Storage arrangements for the Depot is based Category 6 Expanded Plastics (includes goods such as furniture with foam plastic cushioning, mattresses and polystyrene products) on palletised, bin box or shelf type storage arrangements.

Holmes NZ LP
Level 2, 254 Montreal Street
Christchurch Central
PO Box 6718
Christchurch 8442
holmesanz.com

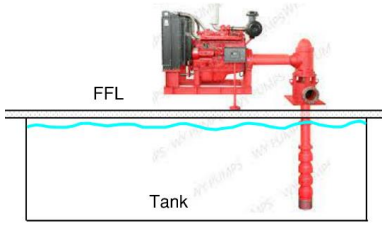
Building	General	Most Onerous Sprinkler System Design Criteria and Flow	Total Fire Water Tank Size with infill	Independent Sprinkler Tank Size*	Hydrant Flow Required Within 135 m	Hydrant Flow Required Withing 270 m	Additional Assumptions
Film Studio	Tanks to be combined for fire sprinkler and fire hydrants. The Film Studio Infrastructure could be shared with the Depot subject to FENZ approvals.	EHHP (Studios, Store Rooms and Workshops) 3,500 L/min	**135 m^3** This includes a 90 min supply for sprinklers, and factors an infill of 1,000 L/min for 30 min (duration of hydrant demand) and 2,500 L/min for the remaining 60 minutes.	315 m^3	750 L/min	750 L/min	
Depot	Tanks to be combined for fire sprinkler and fire hydrants. The Film Studio Infrastructure could be shared with the depot subject to FENZ approvals.	EHH (Store Room) 4,310 L/min	**154 m^3** This includes a 60 min supply for sprinklers, and factors an infill of 1,000 L/min for 30 min (duration of hydrant demand) and 2,500 L/min for the remaining 30 minutes.	260 m^3	750 L/min	750 L/min	Final storage arrangements will need to be co-ordinated and comply with the sprinkler standard.
Hotel and Offices	Due to the low flows, a tank and pump would not be required for these buildings.	OH1 650 L/min	**N/A**	N/A	750 L/min	750 L/min	No allowance has been made for carparking within the building, or for high rise hotels. Plant Rooms assumed to be no greater than 54 m^2
Spa + Reception & Function Hall	Criteria is similar to NBAT. Tank and pump infrastructure from the film studio and depot could be used to service these buildings.	OH3 (Porte Cochere, Function Space) 1,800 L/min	**50 m^3** This includes a 60 min water supply for sprinklers and an infill rate of 1,000 L/min.	108 m^3	750 L/min	750 L/min	Functions featuring covered kiosks have not been allowed for.

* Sprinkler tank size with no infill provided for information only

Holmes NZ LP
Level 2, 254 Montreal Street
Christchurch Central
PO Box 6718
Christchurch 8442
holmesanz.com

3 TANK OPTIONS

The following tank options are available:

Option 1 – Circular	Option 2 – Modular	Option 3 – Below Ground
Circular tanks are normally the cheapest option and typically installed external to the building. If located inside the building the foundation would likely require additional reinforcement due to tank loading. 	Modular tanks can be used outside but are often located inside the building if it suits the space better. It needs a 0.8 m clearance around the outside for servicing and construction. 	Underground tanks are another option when space is particularly tight on site. These are typically the most expensive option. The vertical turbine pumps associated with belowground tanks come in at a premium compared to a standard pump arrangement. 

The tank must comply with NZSEE:2009, AS 2304:2019 (clause 3.6), and NZS4541:2020

A pump room/s will be required to house the fire pump and associated equipment to boost the water from the tank/s. Allow a minimum of 20 m^2 with at least one dimension being 5 m.

Holmes NZ LP
Level 2, 254 Montreal Street
Christchurch Central
PO Box 6718
Christchurch 8442
holmesanz.com

4 NEXT STEPS

- Meet to discuss the outcomes and possible tank locations.
- Following feedback on what option is preferred and fits best with the site layouts, we can provide concept infrastructure layouts and progress dialogue with Fire and Emergency New Zealand (FENZ), who will need to approve the final locations.

Regards,

Martin Jackson
SENIOR FIRE PROTECTION ENGINEER
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