Infrastructure Assessment Report

Queenstown Cable Car

Client	Queenstown Cable Car
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1. Scope

This report has been prepared to support an application for Fast Track referral for the Queenstown Cable Car project. This report addresses earthworks and the three waters servicing feasibility for each of the associated 12 network stations – specifically wastewater, stormwater, potable water and firefighting water.

2. Proposal & Context

2.1 Alignment

The proposal relates to an approximate 10 km long cable car system intended to operate as a mass rapid transport system linking Frankton and Ladies Mile to Queenstown via Queenstown Hill. The system will consist of an electric-powered cable car network capable of transporting up to 3,000 passengers per hour. The alignment is shown in Figure 1 below.

Figure 1: Cable car network alignment

The total system includes nine stations on two separate lines. These two lines intercept at the Lake Johnson Station.

The five stations on the Airport to Town Centre Line include:

- Queenstown Station
- Queenstown Hill Station
- Lake Johnson Station
- Frankton Bus Hub Station
- Airport Station

The five stations on the Frankton North Line (Route A) include:

- Lake Johnson Station
- Ferry Hill Station
- Frankton North Station
- Lower Shotover Station
- Ladies Mile Station

2.2 Alternate Frankton Flats Alignment (Route B)

Route B is an alternate alignment to the Frankton North line (Route A). This alignment crosses the Frankton Flats linking the Frankton Bus Hub Station with the Ladies Mile Station via the following three stations:

- Five Mile Station
- Quail Rise Station
- Lower Shotover Station

The alternative Frankton Flats alignment is as shown in yellow in Figure 2 below.

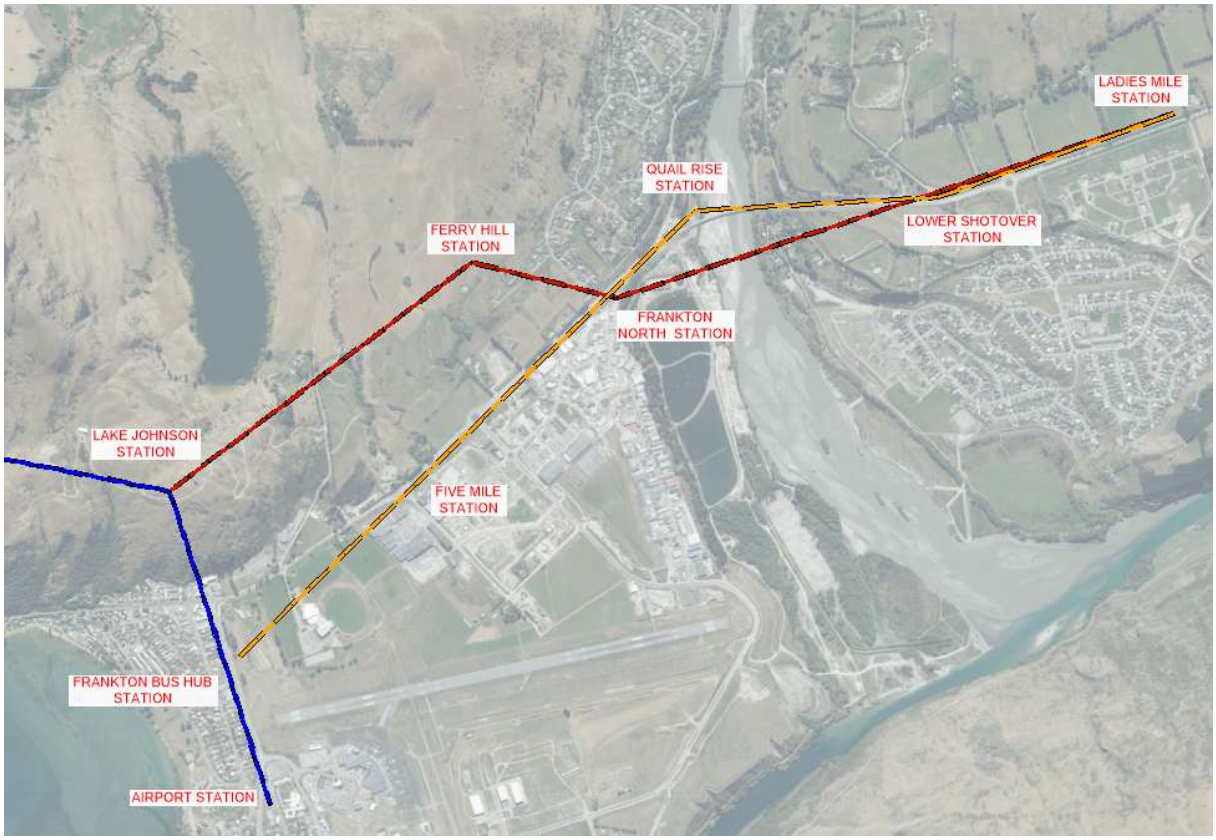

Figure 2: Alternate Frankton Flats Alignment

3. Airport Station

3.1 Location & Intended Function

Queenstown Airport Station is located is the southern termination of the cable car system. Two options are proposed – Option B is located on the west of SH6 at the roundabout intersection of Lucus Place and SH6, and Option A is located on the eastern side of SH6 south of the roundabout. This station services Queenstown Airport and is intended to function as a foot traffic transport hub only and no pick-up/drop off facilities are anticipated. Therefore, infrastructure service requirements will relate to staff and through patrons only.

Figure 3: Airport Station Location & Indicative Render

3.2 Water - Potable

The majority of potable water demand from the Airport Station will relate to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 4: Existing QLDC Water Supply Network

As per Figure 4, the station is located close to a 400mm PE QLDC trunk watermain, a 200mm PVC QLDC watermain, and a 100mm Asbestos watermain. While direct connection to the 400mm trunk watermain is possible, generally QLDC seek to avoid minor connections to trunk mains due to their strategic importance. The 200mm and 100mm watermains are feasible points of connection to the QLDC network and can service the low water demands of the Airport Station.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible.

3.3 Water - Firefighting

As per Figure 4, the station is located close to several existing QLDC fire hydrants. The location of these hydrants complies with QLDC's minimum distances based on the New Zealand Firefighting Water Supplies Code of Practice (PAS SNZ4509:2008). Given their location, these hydrants are likely only guaranteed by QLDC to supply an FW2 (25 l/s) firefighting classification and flow. The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified. If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to an alternate QLDC water main in the vicinity of the station.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

3.4 Wastewater

The wastewater produced by the Airport Station will be related to a series of toilets to be used by patrons and operational staff.

Figure 5: Existing QLDC Wastewater Network

As per Figure 5, the closest branches of the QLDC wastewater network are a 150mm PVC gravity main located at the northern extent of Douglas Street, and a 150mm asbestos main at the corner of McBride Street and Lake Avenue. Given the elevated nature of the structure and pedestrian over bridge, a gravity or pressure sewer connection to the main in Douglas Street is possible. In addition, there are further branches of the QLDC gravity network on Boyes Crescent and SH6 to the south, which are approximately 200-250m from the station but could be utilised for connection if required.

The wastewater production from the Airport station is likely to be relatively low and concentrated outside of suburban diurnal peaks. Both the Douglas Street and McBride Street branches of the QLDC network, downstream networks and catchments appear to have sufficient capacity to accommodate worst case peak flows. The greater network and QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible.

3.5 Stormwater

The stormwater runoff produced by the Airport Station will be limited to impermeable roof areas and access pathways and levels.

Figure 6: Existing QLDC Stormwater Network

As per Figure 6, the station is located close to the recently installed 1400mm PE QLDC trunk stormwater main. 675mm PVC QLDC branch mains that feed the 1400mm main and associated manholes are located directly below and to the south of the station. While direct connection to 1400mm trunk stormwater main is possible, generally QLDC seek to avoid minor connections to trunk mains due to their strategic importance. Both 675mm branch mains are feasible points of connection to the QLDC network and can drain the stormwater runoff from the Airport Station.

The stormwater runoff from the Airport Station will be negligible when compared to the significant capacity of the 1400mm main and downstream trunk network.

The requirement for treatment and / or attenuation will be established through developed design and if necessary, treatment and / or attenuation can be provided via proprietary subsurface devices/galleries prior to discharge to the QLDC stormwater network.

The provision of a suitable reticulated stormwater connection to service this station is deemed feasible.

4. Frankton Bus Hub Station

4.1 Location & Intended Function

Frankton Bus Hub Station is located directly south of the Frankton Bus Hub on the west side of SH6. This station is an intermediary station and provides connection to the Frankton Bus Hub. Given toilet and pick up/drop off facilities are included at the nearby Frankton Bus Hub to the north, these facilities are unlikely to be required at the station.

However, if the alternative Frankton Flats alignment is pursued, the Frankton Bus Hub Station will become a 3-way station connecting the Airport to Town Centre Line to the Frankton Flats Line. This station would then operate as an interchange between the two lines and public toilets would likely be required. Therefore, for the purposes of this report, the incorporation of toilets for staff and through patrons has been considered.

The land, road network, and infrastructure services in the vicinity of the Frankton Bus Hub Station are currently being upgraded under the NZTA/Alliance SH6/SH6A intersection upgrade programme. At the time of writing, these works are in progress and are programmed to be completed prior to the station being constructed. The below infrastructure assessment is therefore based on review of the 'for construction' design plans for these works rather than confirmed in ground services.

Figure 7: Frankton Bus Hub Station Location & Indicative Render

4.2 Water - Potable

The majority of potable water demand from the Frankton Bus Hub Station will relate to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

As part the current NZTA/Alliance SH6/6A intersection upgrade work, a 400mm trunk watermain is being installed in the berm on the western side of the state highway and a rider main is being installed to service the new Frankton Bus Hub. Given the low water demands of the Frankton Bus Hub Station, potable water demand can be serviced via connection to the new QLDC rider main.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible.

4.3 Water - Fire Fighting

As part the current NZTA/Alliance SH6/6A intersection upgrade work, a 400mm trunk watermain is being installed in the berm on the western side of the state highway and a rider main service the new Frankton Bus Station. As part of these works there are no hydrants proposed in the vicinity of the Frankton Bus Hub Station.

The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified.

If hydrants are required and/or a sprinkler supply, this can be catered for through the installation of a dedicated rider main connection to the QLDC 400mm trunk main.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

4.4 Wastewater

The wastewater produced by the Frankton Bus Hub Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

The closest branch of the QLDC wastewater network is a 150mm Asbestos gravity main located approximately 120m south-west in McBride Street. A gravity or pressure sewer connection to this 150mm main is possible. In addition, there is a branch of the QLDC gravity network that services the Frankton Bus Hub toilets via an easement over 20 McBride Street. This is approximately 190m north of the station but connection could be made to this main if necessary.

The wastewater production from the Frankton Bus Hub Station is likely to be relatively low and concentrated outside of suburban diurnal peaks. The McBride Street branch of the QLDC network, and downstream networks and catchments appear to have sufficient capacity to accommodate worst case peak flows. The greater network and QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible.

4.5 Stormwater

The stormwater runoff produced by the Frankton Bus Hub Station will be limited to impermeable roof areas and access pathways and levels.

As part the current NZTA/Alliance SH6/6A intersection upgrade works, 300mm and 375mm stormwater mains are being installed on the western side of the state highway in the vicinity of the proposed station. These two branches drain back to the new 1400mm truck main to the south. Connection to either of these mains will be feasible.

The stormwater runoff from the Frankton Bus Hub Station will be negligible when compared to the significant capacity of the 1400mm main and downstream trunk network. The requirement for attenuation will be established through developed design and if necessary, attenuation can be provided via proprietary subsurface devices/galleries prior to discharge to the QLDC stormwater network.

The proposed NZTA/Alliance 375mm main includes a Stormfilter treatment gallery prior to connection to the 1400mm trunk main. Assuming suitable capacity and connection to this main, treatment can be provided via this device. If capacity isn't available or connection is made to the 300mm main, any treatment requirement of stormwater runoff can be addressed through priority treatment devices at the station itself.

The provision of a suitable reticulated stormwater connection to service this station is deemed feasible.

5. Lake Johnson Station

5.1 Location & Intended Function

Lake Johnson Station is located on the vacant hill slope land approximately 550m north of the SH6/SHA intersection. If the Frankton North line is pursued, Lake Johnson Station will be a 3-way station connecting the Airport to Town Centre line to the Frankton North line. The station will operate as an interchange between the two lines.

If the Alternative Frankton Flats alignment is pursued, the Lake Johnson Station would become an intermediary station only.

Regardless of which alignment option is pursued, the station will feature facilities including a bar, a casual dining area, a restaurant area (seating for approx. 250pax) and retail shop. Vehicle access and parking for operational staff will be necessary. Therefore water and wastewater connections will need to be sufficient to cater for a commercial kitchen, bar and associated toilets.

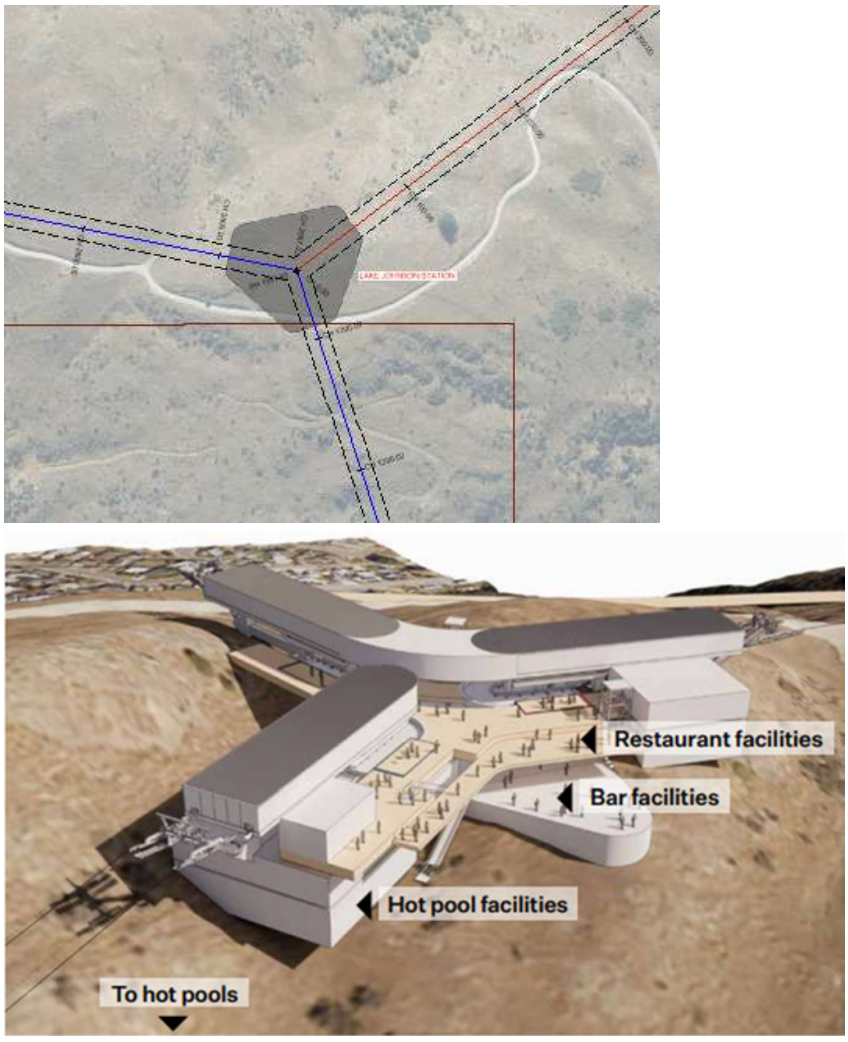

Figure 8: Lake Johnson Station Location & Indicative Render

The proposed station location is adjacent a proposed hot pools development consisting of a commercial open air hot pool activity with 12 tubs and access via an existing track off Hansen Road. At the time of writing, a resource consent application (RM250013) has been lodged with QLDC by Altitude Hot Pools Ltd and this is currently being processed. It is anticipated that the Lake Johnson Station will provide alternate access to this facility.

5.2 Water - Potable

Currently, the nearest suitable connection point to the QLDC water supply network is via an existing 150mm main on the initial portion of Hansen Road. A connection via small diameter pressure pipe in conjunction with booster pump could be made to this main.

At the time of writing, a resource consent application for a 100 residential unit development (RM250258) has been lodged with QLDC by Hansen Qt Ltd. As part of this development, it is proposed to extend the 150mm main further north to the boundary of the development. If this extension has been completed prior to the construction of the Lake Johnson Station the piped distance to the station can be reduced. The indicative layout of the 150mm main extension is as shown in Figure 9 below.

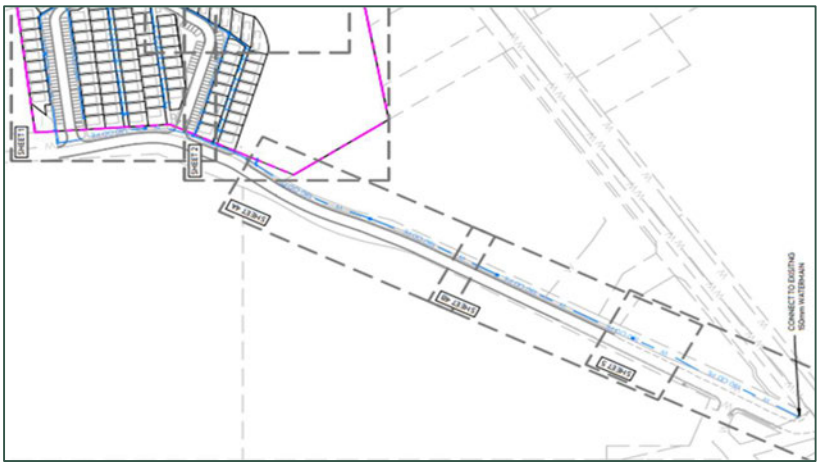

Figure 9: Proposed Hansen Qt Ltd (RM250258) Water Supply Network Extension

Alternatively, an existing 32mm private pipe connects to the SH6 QLDC 355mm trunk main and crosses 26 Hansen Road. Under the Altitude Hot Pools Ltd resource consent application, it is proposed to extend this private pipe north in conjunction with a private booster pump to service the hot pools. See Figure 10 below.

Figure 10: Proposed Altitude Hot Pools (RM250013) Water & Network Extension

If this connection has been completed prior to the construction of the Lake Johnson Station, with the agreement of the owner, a connection via small diameter pressure pipe in conjunction with booster pump could be made to this private pipe.

The above supplies will be a trickle feed supply and therefore buffer tanks will be required at the station. The supply will then be locally boosted at mains pressure into the buildings from these tanks.

Other potential supply options such as a localised bore or partial roof water collection could be feasible.

The provision of a suitable reticulated potable water supply is deemed feasible, and alternative supply options such as localised bore and / or roof water collection are deemed possible.

5.3 Water - Fire Fighting

Given the significant distance to the QLDC water supply network and associated hydrants, the firefighting supply will need to be provided via static on-site storage in accordance with PAS SNZ4509:2008 (New Zealand Fire Service Firefighting Water Supplies Code of Practice).

Given the nature and scale of the proposed buildings, and the inclusion of commercial cooking facilities, the fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 could be as high as FW5 or possibly FW6. However, the structures will be suppression sprinklered and therefore only 45,000 litres (FW2) of localised storage will be required over and above the sprinkler demand.

The sprinkler demand is likely to be that of an ordinary hazard (OH) or possibly an extra high hazard in localised areas such as the commercial kitchens. Assuming ordinary hazard (OH), a flow rate of 25 l/s will be required for a period of 30 or possibly 60 minutes. This equates to a water storage requirement of 36,000 - 72,000 litres. Combined approximately 80,000 – 120,000 litres of firefighting static storage will be required. This could be accommodated at the station in the form of above or below ground tanks or potentially via natural storage via a FENZ approved design if practical.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

5.4 Wastewater

Currently, the nearest suitable connection point to the QLDC wastewater network is via an existing 150mm main on the initial portion of Hansen Road. This main flows to a QLDC pump station at 1 Hansen Road, which pumps flows into the wider wastewater network.

The Hansen Qt Ltd development (RM250258) proposes extending this 150mm main further north to the boundary of the development. If this extension has been completed prior to the construction of the Lake Johnson Station, a connection via pressure pipe in conjunction with booster pump could be made to this main, otherwise connection would need to be made further down Hansen Road.

Alternatively, as per Figure 10, the Altitude Hot Pools Ltd (RM250013) development proposes a 40mm pressure wastewater connection to the QLDC network via 26 Hansen Road. If this connection has been completed prior to the construction of the Lake Johnson Station, with the agreement of the owner, a connection via pressure pipe in conjunction with booster pump could be made to this main.

In both instances the flows would be buffered on-site and trickle fed back to the QLDC network.

A non-reticulated wastewater servicing option is feasible in the form of on-site treatment and localised treated effluent disposal to ground. Given the prevalence of shallow rock, proximity to the sensitive Lake Johnson receiving environment, and relatively large volumes of high strength blackwater, this option would require detailed design to confirm feasibility.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible, and onsite treatment and disposal to ground is deemed likely feasible.

5.5 Stormwater

The stormwater runoff produced by the Lake Johnson will be limited to impermeable roof areas and access pathways and levels.

There is no existing QLDC stormwater infrastructure within the vicinity of the Lake Johnson Station, therefore stormwater disposal will likely be via the ephemeral flow path towards Lake Johnson.

The requirement for treatment and / or attenuation will be established through developed design and if necessary, treatment and / or attenuation can be provided via proprietary subsurface devices/galleries or ponds incorporated into the greater landscape.

The provision of a suitable solution for stormwater discharge to ground to service this station is deemed feasible.

6. Queenstown Hill Station

6.1 Location & Intended Function

Queenstown Hill Station is located at an approximate elevation of 840m within a depression on the top of Queenstown Hill plateau. This station is an intermediary station and will include two large cabin storage buildings, staff parking facilities, and associated operations related facilities. Service requirements will be limited to toilets for staff and through patrons, noting that this station could be used for access to recreational activities in future, at which point additional servicing may be required.

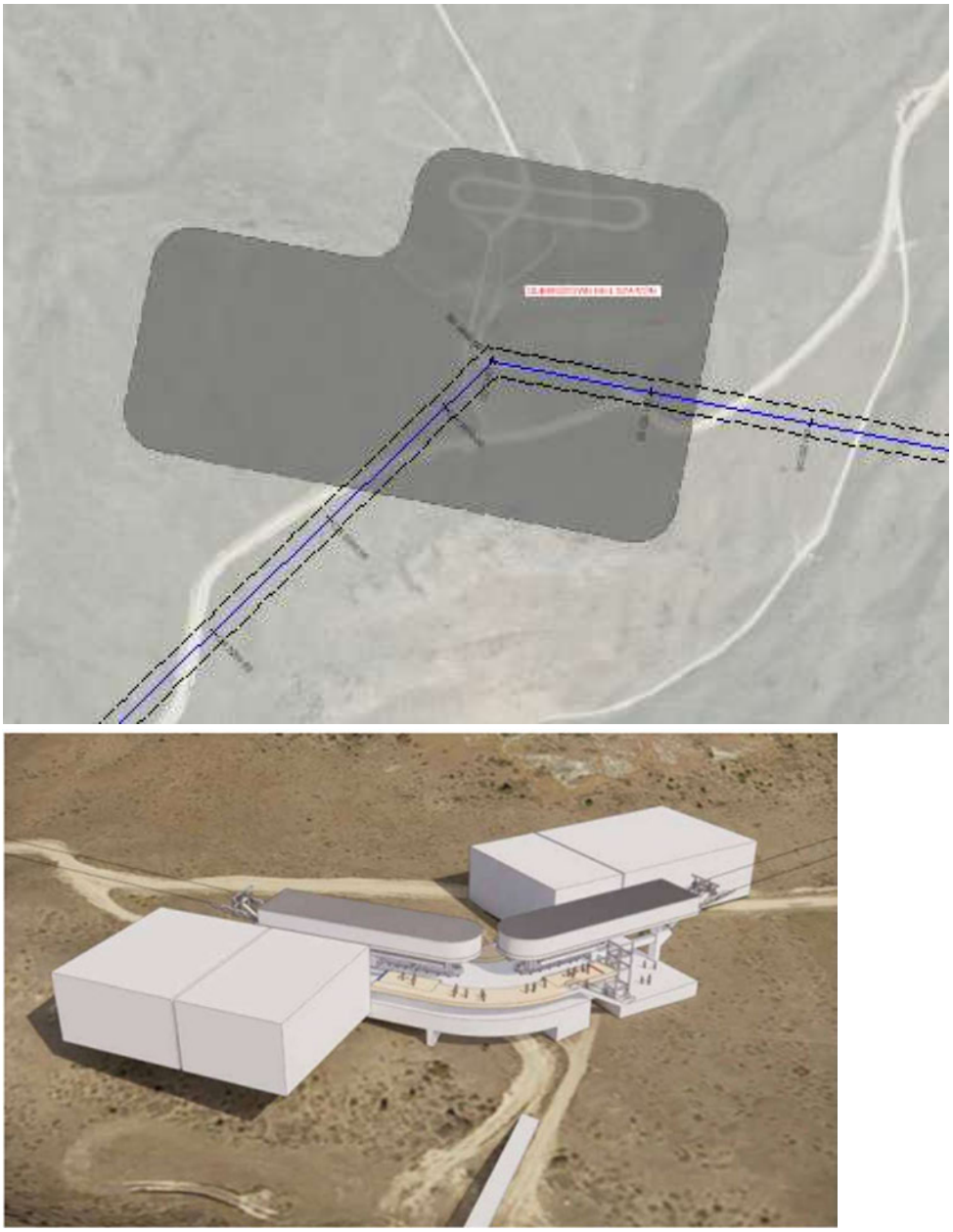

Figure 11: Queenstown Hill Station Location & Indicative Render

6.2 Water - Potable

The majority of potable water demand from the Queenstown Hill Station will be related to a series of toilets to be used by operational staff and patrons. The demand for these toilets will be low due to the through and temporary nature of patron movements.

The water required to service the station could be supplied via the construction of an approximate 1,400m long private small diameter pressure pipe including booster pump off QLDC's reservoir above Middleton Road.

Alternatively, with QLDC's agreement this limited demand could be supplied via roof water collection and buffering storage tanks. Given this supply will be used for hand washing and drinking water, this option would require flows to be treated on-site to comply with the minimum requirements of the Drinking Water Standards for New Zealand and Taumata Arowai.

The provision of a suitable potable water supply to service this station is deemed feasible.

6.3 Water - Fire Fighting

Given the significant distance to the QLDC water supply network and associated hydrants, firefighting supply demand will be via static on-site storage in accordance with PAS SNZ4509:2008. The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified.

If hydrants are required and/or a sprinkler supply, this can be catered for through the installation of static tanks in accordance with PAS SNZ4509:2008 and supplied via an approximate 1,400m long private small diameter pressure pipe including booster pump off QLDC's reservoir above Middleton Road. Alternatively, with QLDC's agreement, supply by roof water may be possible.

The provision of a suitable firefighting water supply is deemed feasible.

6.4 Wastewater

Given the limited flows, likely soil types, and available discharge areas, wastewater treatment and disposal will be via on-site treatment and disposal to ground in accordance with NZS1547:2012.

Treatment requirements and disposal location will be established through developed design.

The provision of wastewater disposal to ground to service this station is deemed feasible.

6.5 Stormwater

The stormwater runoff produced by the Queenstown Hill Station will be limited to impermeable roof areas and access pathways and levels.

There is no existing QLDC stormwater infrastructure within the vicinity of the Queenstown Hill Station, therefore stormwater disposal will likely be via the various ephemeral flow paths leading away from the station location.

The requirement for treatment and / or attenuation will be established through developed design and if necessary, treatment and / or attenuation can be provided via proprietary subsurface devices/galleries or ponds incorporated into the greater landscape.

The provision of a suitable solution for stormwater discharge to ground to service this station is deemed feasible.

7. Queenstown Station

7.1 Location & Intended Function

Queenstown Station is located on the QLDC Boundary St carpark in the Queenstown CBD. This station is the western termination of the Airport to Town Centre Line and provides the key Queenstown CBD connection point.

The station will feature supporting infrastructure including parking and drop off facilities.

Other supporting facilities such as retail / hospitality may be incorporated in the future so are not addressed below. However, we expect the surrounding services will have adequate capacity to cater for these activities.

Figure 12: Queenstown Station Location & Indicative Render

7.2 Water - Potable

The majority of potable water demand from the Queenstown Station will be related to a series of toilets to be used by operational staff and patrons. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 13: Existing QLDC Water Supply Network

As per Figure 13 the station will be located close to 150mm and 300mm PVC QLDC watermains on Gorge Road to the east, and an older 80mm Iron QLDC watermain to the south. Given the low water demand, connection could be taken from any of one of these QLDC mains.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible.

7.3 Water - Fire Fighting

As per Figure 13, the station is located close to several existing QLDC fire hydrants. The location of these hydrants complies with QLDC's minimum distances based on PAS SNZ4509:2008.

Given their location, these hydrants will likely only be guaranteed by QLDC to supply an FW3 (50 l/s) firefighting classification.

The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified. If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to one of the QLDC mains in Gorge Road.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

7.4 Wastewater

The wastewater produced by the Queenstown Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

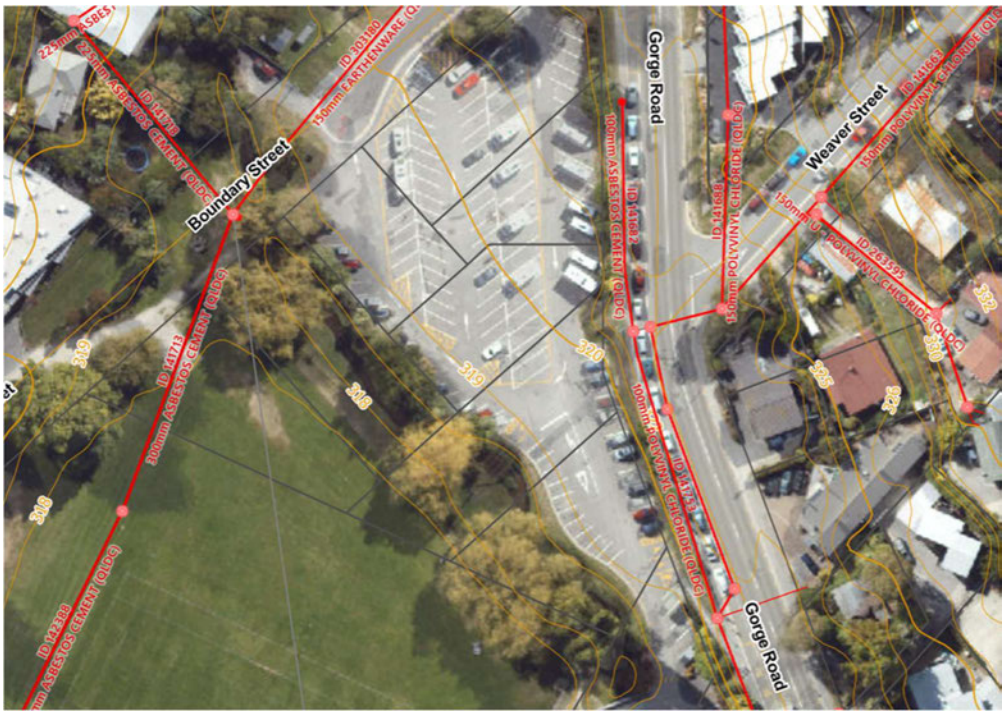

Figure 14: Existing QLDC Wastewater Network

As per Figure 14, the closest branches of the QLDC gravity wastewater network are a 150mm PVC QLDC main located in Gorge Road to the east and a 150mm PVC QLDC main upsizing to a 300mm main located on Boundary Street to the north. A gravity or pressure sewer connection to any one of these mains is possible.

The wastewater production from the Queenstown Station is likely to be relatively low and concentrated outside of suburban diurnal peaks. Both the Gorge Road and Boundary Street branches of the QLDC network appear to have sufficient capacity to accommodate worst case peak flows. The greater network and QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible.

7.5 Stormwater

The stormwater runoff produced by the Queenstown Station will be limited to impermeable roof areas, parking / drop off facilities, access pathways and levels.

The increase in stormwater runoff will be relatively small, given the existing ground surface is an impermeable carpark and impermeable surfaces make up a significant portion of the surrounding area.

Figure 15: Existing QLDC Stormwater Network

As per Figure 15, the Queenstown Station is located adjacent Horne Creek. As per Figure 15, the closest branches of the QLDC gravity stormwater network are a 375mm PVC main, a 450mm PVC main, and a 800mm PVC main.

Any one of the above branch mains are feasible points of connection to the QLDC network and can drain the stormwater runoff from the Queenstown Station.

The requirement for treatment and / or attenuation will be established through developed design and if necessary, treatment and / or attenuation can be provided via proprietary subsurface devices/galleries prior to discharge to Horne Creek or the QLDC stormwater network.

The provision of a suitable reticulated stormwater connection to service this station is deemed feasible.

8. Ferry Hill Station

8.1 Location & Intended Function

Ferry Hill Station is located at the southern end of Quail Rise and at an elevation of 450m. This station is an intermediary station on the Frankton North Line and the main operations depot. Facilities here include cabin storage, maintenance workshops, and spare parts warehouse.

This is the point where the primary electrical supply would be fed to the greater cable car system. The proposed containerised battery back-up would be located here.

This station will also act as a new ORC electric-bus hub, which can be accommodated alongside the cable car providing shared services and infrastructure between the two transport systems.

The site will include operational staff, visitor and contractor carparking for 60+ cars, and a significant bus parking area including maintenance workshop and cleaning facilities. It is anticipated that a significant number of toilets will be required, and wastewater requirements will include provision for bus washdown.

If the Alternative Frankton Flats alignment is pursued, the Ferry Hill Station wouldn't be constructed.

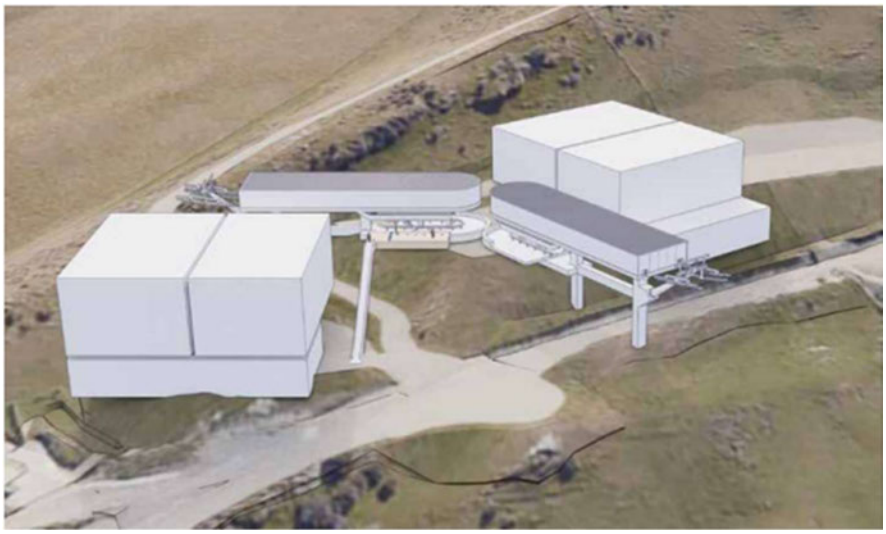

Figure 16: Quail Rise Station Location & Indicative Render

8.2 Water - Potable

The Ferry Hill Station is located directly above the QLDC Quail Rise reservoir. Potable water demands can be accommodated via connection to this reservoir, or it's associated falling mains.

This will require the installation of a small diameter pressure pipe and booster pressure pump.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible.

8.3 Water - Fire Fighting

The required fire classification for the structures and associated bus parking area based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity. This risk and classification is likely to be relatively high due to the presence of a large number of electric buses and associated charging stations, significant backup network batteries, and maintenance areas likely containing oils and lubricants. The unique nature of the electrical fire risk may necessitate the need for a bespoke firefighting solution, such as a foam suppression system. This solution would be developed further through the detailed design process but is unlikely to negate the need for a significant fire water supply.

There are no existing QLDC reticulated hydrants located in the vicinity of the proposed station The station and associated bus park can feasibly be serviced in part for firefighting via new hydrants installed off the large diameter falling mains directly below the QLDC Quail Rise reservoir. However, given the location and footprint of the bus parking facility, it is possible that a new pipe and fire booster pump will need to be installed off the reservoir or associated falling mains, with hydrants on this new pressure zone as required to comply with the minimum flow and distance requirements of PAS SNZ4509:2008.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified.

If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to the QLDC reservoir or associated falling mains.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

8.4 Wastewater

The wastewater demand from the Ferry Hill Station will be relatively high

Currently, the nearest suitable connection point to the QLDC wastewater network is via an existing 150mm main in Trench Hill Road. A gravity or pressure sewer connection to this main is possible.

Alternatively, under resource consent RM210213, wastewater reticulation over Section 2 SO 502556 is proposed. If deemed appropriate and with relevant landowner permissions, flows could be piped to this proposed wastewater reticulation.

Wastewater production from the Ferry Hill Station is likely to be relatively high but concentrated outside of suburban diurnal peaks. Given the proximity to the Shotover Wastewater treatment plant and relatively limited wastewater catchment reliant on the downstream Quail Rise wastewater network, it is expected suitable downstream network capacity will be available.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible.

8.5 Stormwater

Impermeable roof areas, hard surfaces and paved areas will result in significant runoff at this site. The concentrated flows can be managed on site through a series of attenuation ponds before discharging into the existing ephemeral overland flow path to the south and into Section 2 SO 502556.

Alternatively, under resource consent RM210213, stormwater reticulation over Section 2 SO 502556 and capture of the relevant ephemeral flow path is proposed. If deemed appropriate and with relevant landowner permissions, the attenuated flows could be piped to this proposed stormwater reticulation and south to the 1400mm Hawthorne Drive trunk stormwater main.

Discharged flows will need to comply with both ORC and QLDC quality discharge requirements. Treatment solutions will be established through developed design. If necessary, some flows, including the bus washdown areas may need to discharge to the wastewater network.

The provision of a suitable solution for stormwater discharge to service this station is deemed feasible.

9. Frankton North Station

9.1 Location & Intended Function

The Frankton North Station is located north of Margaret Place and Glenda Drive and directly south of the SH6 cutting to the Shotover Bridge. The Frankton North Station will form an intermediary station on the Frankton North Line. This station is intended to function as a foot traffic transport hub only and no pick-up/drop off facilities are anticipated. Therefore, infrastructure service requirements will relate to staff and through patrons only.

If the Alternative Frankton Flats alignment is pursued, the Frankton North Station wouldn't be constructed

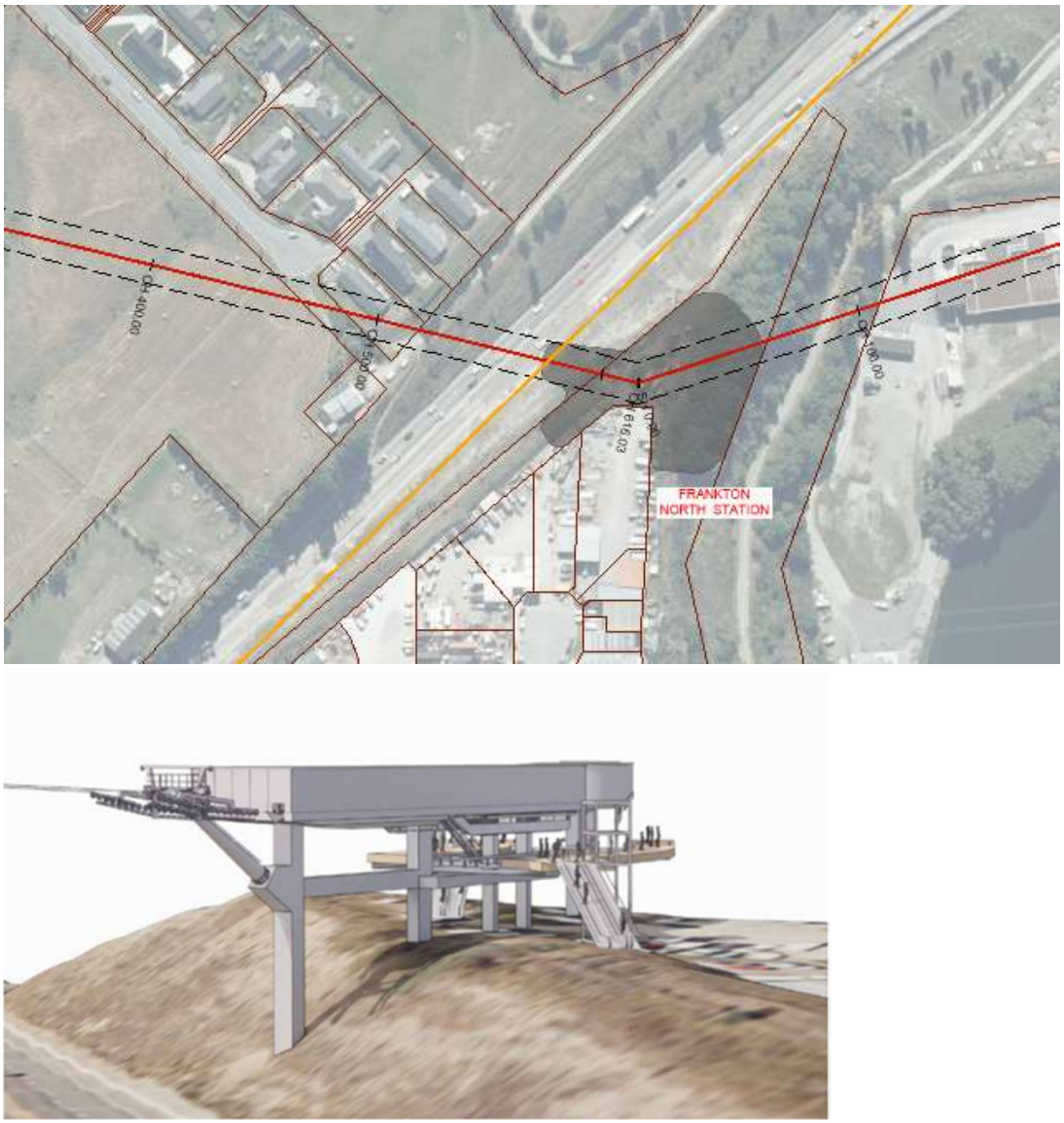

Figure 17: Frankton North Station Location & Indicative Render

9.2 Water - Potable

The majority of potable water demand from the Airport Station will relate to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

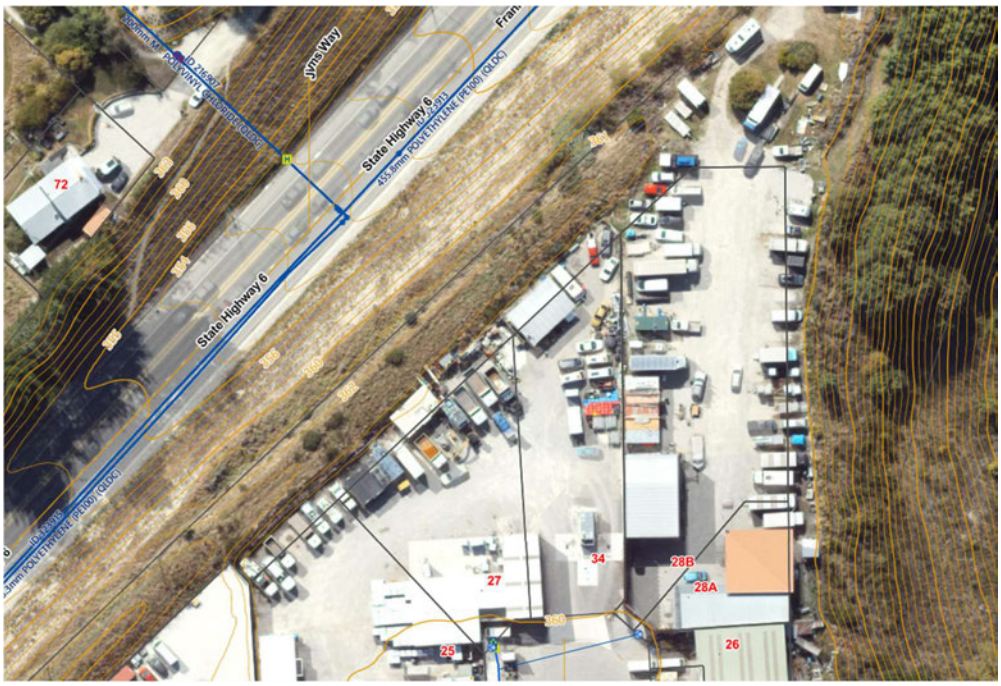

Figure 18: Existing QLDC Water Supply Network

As per Figure 18, the station is located close to a 450mm PE QLDC trunk watermain and a 200mm PVC QLDC watermain located within the south-eastern shoulder of SH6. While direct connection to 450mm trunk watermain is possible, generally QLDC seek to avoid minor connections to trunk mains due to their strategic importance. The 200mm watermain is the feasible point of connection to the QLDC network and can service the low water demands of the Frankton North Station.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible.

9.3 Water - Fire Fighting

As per Figure 18, the station is located close to several existing QLDC fire hydrants. The location of these hydrants complies with QLDC's minimum distances based on PAS SNZ4509:2008, however it may be that an additional secondary hydrant is required to be installed on the 200mm main located within the south-eastern shoulder of SH6, which is feasible.

Given their location, these hydrants are likely only guaranteed by QLDC to supply an FW3 (50 l/s) firefighting classification and flow. The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified. If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to the 200mm main located within the south-eastern shoulder of SH6.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

9.4 Wastewater

The wastewater produced by the Frankton North Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 19: Existing QLDC Wastewater Network

As per Figure 19, the site is located directly west of the QLDC Shotover Treatment Plant. The closest suitable branch of the QLDC wastewater network is the 300mm PVC gravity trunk main located within the south-eastern shoulder of SH6. A gravity or pressure sewer connection to the trunk main in SH6 is possible.

The wastewater production from the Frankton North Station is likely to be relatively low and concentrated outside of suburban diurnal peaks. The SH6 truck main will have sufficient capacity to accommodate the limited worst case peak flows. The QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible.

9.5 Stormwater

The stormwater runoff produced by the Frankton North Station will be relatively low due to the elevated and semi-permeable nature of the structure. The stormwater runoff produced will be limited to impermeable roof areas and access pathways and levels.

Figure 20: Existing QLDC Stormwater Network

As per Figure 20, there is a 380mm QLDC stormwater main to the south that drains Margaret Place east to an open swale that flows through the Shotover Wastewater Treatment Plant site to the Shotover River. There is also extensive NZTA surface and piped stormwater infrastructure associated with SH6 that exists, although this is not shown.

There are two potential options to discharge stormwater from the Frankton North Station.

Option one involves connection to the 380mm QLDC main.

Option two involves surface disposal into the greater SH6 network with NZTA's permission.

The requirement for treatment and / or attenuation will be established through developed design and if necessary, treatment and / or attenuation can be provided via proprietary subsurface devices/galleries prior to discharge to a surrounding network.

The provision of a suitable solution for stormwater discharge to service this station is deemed feasible.

10. Lower Shotover Station

10.1 Location & Intended Function

Lower Shotover Station is located at the corner of Spence Road and Lower Shotover Road, and west of the SH6 Stalker Road roundabout. The Lower Shotover Station is an intermediary station on the alternative Frankton Flats alignment and will service existing Shotover Country and the western end of the future Ladies Mile master plan development area.

The station will feature supporting infrastructure including drop off facilities and servicing requirements will relate to limited operational staff and through patrons only.

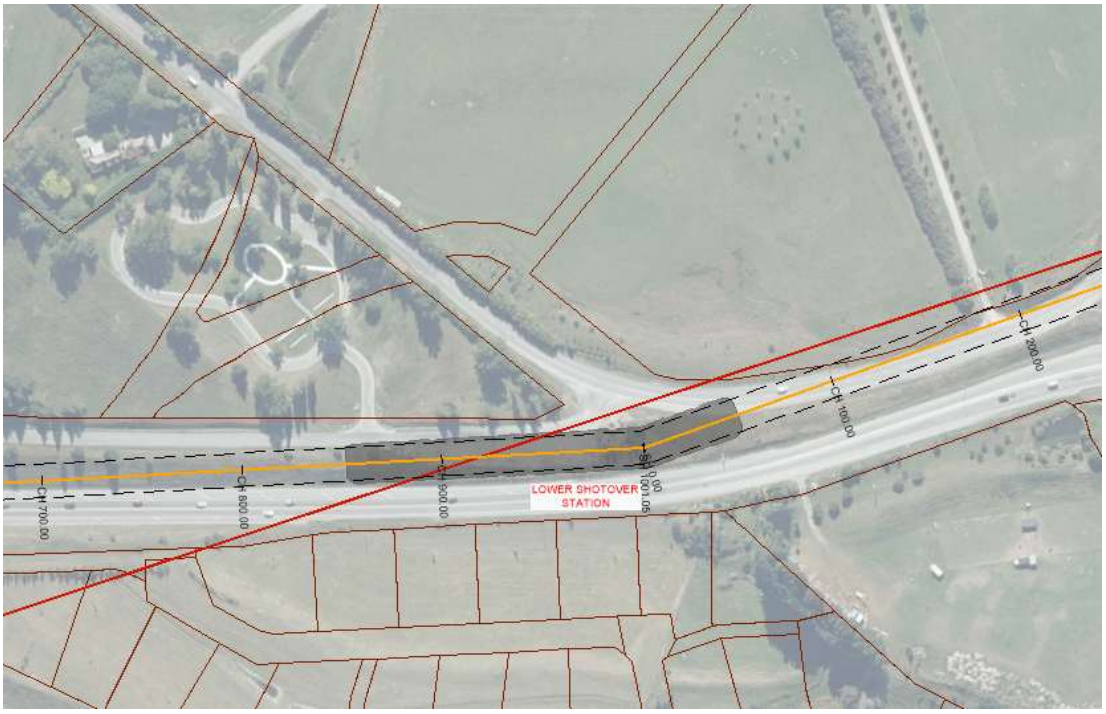

Figure 21: Lower Shotover Station Location & Indicative Render

10.2 Water - Potable

The majority of the potable water demand from the Lower Shotover Station will be related to a limited number of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 22: Existing QLDC Water Supply Network

As per Figure 22, the station will be in proximity to the existing Shotover Country water supply network. A 150mm branch of this network is located on the northern side of SH6 directly to the east of the Stalker Road roundabout and could be extended west under Lower Shotover Road to service the station. Alternatively, a 180mm water main is located directly to the south on Kahiwi Drive. Both options may require buffering water storage and localised pressure boosting at the station due to pressures that may be below QLDC minimum requirements at these outer extents of the network.

While it is possible to service this station for water from existing infrastructure, the future development of the Ladies Mile master plan area directly to the east will result in a new large diameter rising main from the Shotover bores, QLDC vested reservoir, and vested falling mains. This infrastructure is anticipated within the next few years and would be suitable to service the station.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible

10.3 Water - Firefighting

There are two potential options to service the Lower Shotover Station for firefighting water supply.

Option one involves extending a minimum 100mm main from the Stalker Road roundabout or from Kahiwi Drive, confirming a minimum 100kpa of water pressure and 25 l/s of flow, and installing two new hydrants on this new main in the vicinity of the station.

Option two involves providing a low-pressure connection from the QLDC network to a series of static on-site storage tanks installed in accordance with PAS SNZ4509:2008. The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life. The risk associated with loss of structure and operation of the cable car itself will be addressed through the design of the system and if required additional bespoke fire suppression will be specified.

While it is feasible to service this station for firefighting water from existing infrastructure, the future development of the Ladies Mile master plan area surrounding the station will likely result in significant new water infrastructure that will include hydrants and suitable mains.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

10.4 Wastewater

The wastewater produced by the Lower Shotover Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 23: Existing QLDC Wastewater Network

As per Figure 22, the station will be located to the north of the existing Shotover Country gravity wastewater network. The station will also be in proximity to the QLDC pressure and gravity trunk mains that are located on the opposite side of the SH6 carriageway.

Servicing of the station toilets would likely need to be via a localised pumpstation with a low diameter pressure connection back into the existing QLDC wastewater network. Three potential points of connection to the QLDC network are available.

Option one involves a pressure connection via manhole to the QLDC 375mm gravity trunk main on the opposite side of the SH6 carriageway. This connection may be unacceptable to QLDC given the significance of the trunk mains in this area and their desire to limit minor connections into trunk mains generally.

Option two involves a pressure connection to the QLDC 150mm gravity main located to the south on Kahiwi Drive. This connection would feed flows back into the QLDC Shotover Country wastewater network.

Option three involves a pressure connection to the 150mm pressure pipe located directly to the north-east of the Stalker Road roundabout. This 150mm pressure pipe feeds flows into the QLDC 375mm trunk gravity main on the south-western side of the Stalker Road roundabout. This option would require a low diameter pressure pipe to be installed under the northern (Lower Shotover Road) arm of the Stalker Road roundabout and west to the station. This could be achieved via directional drilling to limit disruption and is considered the most feasible and less disruptive option.

The wastewater production from the Lower Shotover Station is likely to be relatively low and concentrated outside of suburban diurnal peaks. The local QLDC network and SH6 trunk mains will have sufficient capacity to accommodate the limited worst case peak flows. The QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

While it is feasible to service this station for wastewater via existing infrastructure, the future development of the Ladies Mile master plan area directly to the east will result in a new large diameter pressure pipe down the northern side of SH6, a new pumpstation on the northern side of SH6, and a comprehensive localised gravity network. This infrastructure is anticipated within the next few years and would be suitable to service the station.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible

10.5 Stormwater

The stormwater runoff produced by the Lower Shotover Station will be relatively limited due to the elevated and semi-permeable nature of the structure. The stormwater runoff produced will be limited to impermeable roof areas, drop off facilities, access pathways and levels.

Figure 24: Existing QLDC Stormwater Network

As per Figure 24, there is very limited QLDC vested stormwater infrastructure in the vicinity of the station. There is however, formalised NZTA surface and piped stormwater infrastructure associated with SH6, although this is not shown.

Two stormwater disposal options are available to service the station.

Option one involves surface disposal into the greater SH6 network with NZTA's permission.

Option two involves stormwater disposal via engineered soakage to ground. In this regard the ground conditions are known to be generally suitable and there is suitable space for a disposal system within the land surrounding the station.

The requirement for treatment will be established through developed design and if necessary, treatment can be provided via proprietary subsurface devices/galleries prior to discharge to ground.

The provision of a suitable solution for stormwater discharge to service this station is deemed feasible.

11. Ladies Mile Station

11.1 Location & Intended Function

Ladies Mile Station is located at the intersection of SH6 and Howards Drive. The Ladies Mile Station is the eastern termination of the Frankton North Line (and alternative Frankton Flats alignment) and will service existing Lake Hayes Estate, Shotover Country, the Queenstown Country Club, and the middle and eastern end of the future Ladies Mile master plan development area.

The station will feature supporting infrastructure including parking and drop off facilities and servicing requirements will relate to operational staff and through patrons only.

Figure 25: Ladies Mile Station Location

11.2 Water - Potable

The majority of the potable water demand from the Ladies Mile Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 26: Existing QLDC Water Supply Network

As per Figure 26, the proposed station is significantly distanced from any existing branch of the QLDC Shotover Country/Lake Hayes Estate water supply network. The closest branches of the QLDC network are a 180mm main located 700m south at the corner of Jones Avenue and Eleventh Avenue, and a 150mm main located 600m west in the vicinity of the SH6 Stalker Road roundabout. A low-pressure connection from these branches of the QLDC network is feasible via 600-700m of pipe laid within the SH6 and/or Howards Drive berms and with necessary approvals. Both potential points of connection would require buffering water storage and localised pressure boosting at the station due to known pressures being below QLDC minimum requirements at these outer extents of the network.

An alternate water supply solution is available via a localised bore and/or roof water collection with associated treatment. Groundwater on the northern Ladies Mile is known to have potential elevated arsenic issues, which can be treated. It is feasible that toilet water could be supplied untreated, and potable handwashing could be supplied via treated roof water supply.

Whilst it is deemed feasible to service this station for potable water from existing QLDC infrastructure to the south and west, and also potentially via a treated localised bore and/or roof water, the future development of the Ladies Mile master plan area directly to the east will result in a new large diameter rising main from the Shotover bores, QLDC vested reservoir, and vested falling mains. This infrastructure is anticipated within the next few years and would be suitable to service the station.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible, and alternative supply options such as localised bore and / or roof water collection are deemed possible.

11.3 Water - Firefighting

Given the significant distance to the QLDC water supply network and associated hydrants, firefighting supply demand will be via static on-site storage in accordance with PAS SNZ4509:2008.
The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life. The risk associated with loss of structure and operation of the cable car itself will be addressed through the design of the system and if required additional bespoke fire suppression will be specified.

The static tank could be supplied via a low-pressure connection to either the 150mm or 180mm QLDC branch mains, or alternately via a localised bore and/or roof water collection.

While it is feasible to service this station for firefighting water through static storage tanks, the future development of the Ladies Mile master plan area surrounding the station will likely result in significant new water infrastructure that will include suitable mains and hydrants

The provision of a suitable firefighting water supply to service this station is deemed feasible.

11.4 Wastewater

The wastewater produced by the Ladies Mile Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements.

Figure 27: Existing QLDC Wastewater Network

As per Figure 27, the proposed station is significantly distanced from any existing branch of the QLDC Shotover Country wastewater network. The closest branches of the QLDC network are a 150mm gravity main located 600m south at the corner of Jones Avenue and Howards Drive, and a 150mm pressure main located 600m west in the vicinity of the SH6 Stalker Road roundabout. A low-pressure wastewater connection to these branches of the QLDC network is feasible with necessary approvals but would require approximately 600m of pipe to be laid within the SH6 and/or Howards Drive berms. Both potential points of connection would require a localised pump station to be installed at the station to convey flows.

The wastewater production from the Lower Shotover Station is likely to be relatively low and concentrated outside of suburban diurnal peaks. The local QLDC network and SH6 trunk mains will have sufficient capacity to accommodate the limited worst case peak flows. The QLDC treatment capacity will be unimpacted as the flows will originate from residents or visitors who would otherwise be present and utilising wastewater capacity regardless.

An alternate wastewater disposal solution is available in the form of on-site treatment and effluent disposal to ground in accordance with NZS1547:2012. The local ground conditions are known to be suitable for soakage disposal.

Whilst it is feasible to service this station for wastewater via existing infrastructure or disposal to ground, the future development of the Ladies Mile master plan area directly to the east will result in a new large diameter pressure pipe down the northern side of SH6, a new pumpstation on the northern side of SH6, and a comprehensive localised gravity network. This infrastructure is anticipated within the next few years and would be suitable to service the station.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible, and onsite treatment and disposal to ground is deemed likely feasible.

11.5 Stormwater

The stormwater runoff produced by the Ladies Mile Station will be relatively limited due to the elevated and semi-permeable nature of the structure. The stormwater runoff produced will be limited to impermeable roof areas, drop off facilities, access pathways and levels.

Figure 28: Existing QLDC Stormwater Network

As per Figure 28, there is very limited QLDC vested stormwater infrastructure in the vicinity of the station. There is a QLDC 1050mm stormwater gravity trunk main on Howards Drive 200m to the south, however recent discussions with QLDC have indicated that capacity within this trunk main is limited and generally reserved for the servicing of future attenuated flows from very select development areas along Ladies Mile. While attenuation via tanks or ponds and disposal to this main is a possibility, this cannot be assumed a feasible option at this stage.

The future development within the Ladies Mile master plans area is for the most part intended to be serviced for stormwater disposal via engineered soakage to ground. In this regard the ground conditions are known to be generally suitable. On-site stormwater disposal to ground is therefore appropriate.

The requirement for treatment will be established through developed design and if necessary, treatment can be provided via proprietary subsurface devices/galleries prior to discharge to ground.

The provision of a suitable solution for stormwater discharge to ground to service this station is deemed feasible.

12. Five Mile Station

12.1 Location & Intended Function

5 Mile Station is located on the southern berm of SH6 and directly north of the Five Mile Shopping Centre. This will be an intermediary station on the alternative Frankton Flats alignment and will service the 5 Mile and Queenstown Central commercial areas and the associated high density residential developments within the area. This station is intended to function as a foot traffic transport hub only and no pick-up/drop off facilities are anticipated. Therefore, infrastructure service requirements will relate to staff and through patrons only.

Figure 29: 5 Mile Station Location

12.2 Water - Potable

Most of the potable water demand from the 5 Mile Station will be related to a series of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements and proximity to alternate services within 5 Mile/Queenstown Central.

Figure 30: Existing QLDC Water Supply Network

As per Figure 30, the station is close to 300mm, 200mm, and 150mm PE QLDC watermains. While direct connection to the 300mm trunk watermain is possible, this connection may be unacceptable to QLDC given their desire to limit minor connections into trunk mains generally. However, the 200mm and 150mm watermains offer feasible points of connection to the QLDC network and can service the low water demands of the 5 Mile Station.

The provision of a suitable reticulated potable water supply to service this station is deemed feasible

12.3 Water - Fire Fighting

As per Figure 30, the station is located close to several existing QLDC fire hydrants. The location of these hydrants complies with QLDC's minimum distance based on PAS SNZ4509:2008.

The required fire classification for the structure and use based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity, however the open and transient nature of the station use would unlikely result in a low risk to life.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified. If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to one of the nearby QLDC mains.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

12.4 Wastewater

The wastewater produced by the 5 Mile Station will be related to a limited number of toilets to be used by patrons and operational staff. The demand for these toilets will be low due to the through and temporary nature of patron movements and proximity to alternate services within 5 Mile/Queenstown Central.

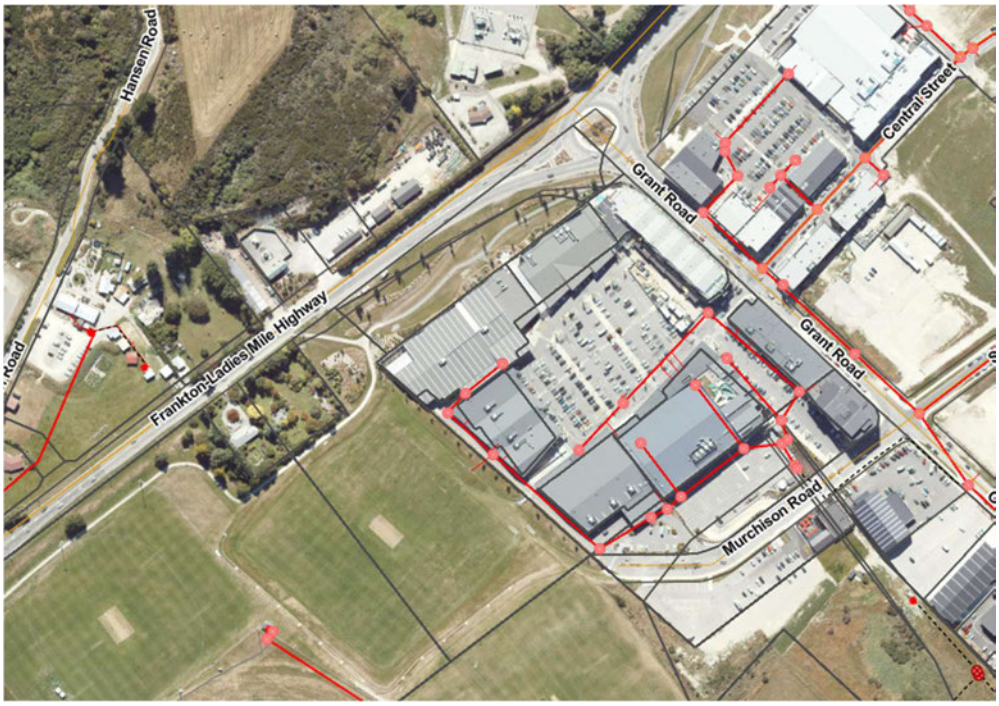

Figure 31: Existing QLDC Wastewater Network

As per Figure 31, the station will be in proximity to the private 5 Mile wastewater network and associated pumpstation. Whilst connection to this private network is possible, it would require third party approval from 5 Mile and therefore alternate options have been considered.

The closest branches of the QLDC gravity wastewater network are a 150mm gravity main within Grant Road, 200m to the east, and a 100mm gravity main servicing a set of public toilets within the Queenstown Event Centre sports fields, 300m to the south-west. A gravity connection to one of these branches may be possible, and pressure connections will be possible.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible

12.5 Stormwater

The stormwater runoff produced by the 5 Mile Station will be relatively limited due to the elevated and semi-permeable nature of the structure. The stormwater runoff produced will be limited to impermeable roof areas, access pathways and levels.

Figure 32: Existing QLDC Stormwater Network

As per Figure 32, the station will be located close to the private 5 Mile stormwater network and associated soakage galleries. While connection to this private network is possible, it would require third party approval from 5 Mile and therefore alternate options have been considered.

Although not shown on the above Figure 32, a recent 1450mm diameter stormwater main has been installed as part of the NZTA/Alliance SH6/SH6A intersection improvement works and terminates within the SH6 carriageway slightly south of the proposed station. This main drains west past the Frankton Bus Hub to Lake Whakatipu. Connection to this main is deemed feasible on the basis that any flows are attenuated to pre-development levels and with the necessary approvals.

An alternative solution involves stormwater disposal via engineered soakage to ground. In this regard the ground conditions are known to be generally suitable and there is suitable space for a disposal system within the land surrounding the station.

The requirement for treatment will be established through developed design and if necessary, treatment can be provided via proprietary subsurface devices/galleries prior to discharge to ground.

The provision of a suitable solution for stormwater discharge to service this station is deemed feasible.

13. Quail Rise Station

13.1 Location & Intended Function

Quail Rise Station is an intermediary station on the alternative Frankton Flats alignment and is located directly north of the western abutment of the Shotover Bridge in the location of the existing QLDC public gravel carpark. This station will service the existing Quail Rise residential area and the Glenda Drive end of Frankton Flats.

If the alternative Frankton Flats alignment is pursued, the Quail Rise Station will replace the Ferry Hill Station as the main operations depot and electric-bus hub. The operations depot facilities here will include cabin storage, maintenance workshops, and spare parts warehouse. The electric bus hub facilities will include operational staff, visitor and contractor carparking for 60+ cars, and a significant bus parking area including maintenance workshop and cleaning facilities.

It is anticipated that a significant number of toilets would be required, and wastewater requirements will include provision for bus washdown. It is likewise anticipated that given the proximity to the Shotover River any stormwater runoff from the bus parking and general trafficked area will require treatment prior to disposal.

Figure 33: Quail Rise Station Location

13.2 Water - Potable

This station will have a relatively high water supply demand.

Figure 34: Existing QLDC Water Supply Network

As per Figure 34, the station will be located in proximity to significant QLDC trunk pressure main infrastructure that crosses the Shotover Bridge. Direct connection to this trunk infrastructure at the bridge is not deemed feasible due to the nature and strategic importance of these pipes. A connection to the QLDC 280mm trunk main within the SH6 shoulder further to the west of the station is deemed feasible subject to further discussions with QLDC.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible

13.2.1 Water - Fire Fighting

The required fire classification for the structures and associated bus parking area based on Table 1 of PAS SNZ4509:2008 is unclear due to the unique nature of the activity. This risk and classification is likely to be relatively high due to the presence of a large number of electric buses and associated charging stations, significant backup network batteries, and maintenance areas likely containing oils and lubricants. The unique nature of the electrical fire risk may necessitate the need for a bespoke firefighting solution, such as a foam suppression system. This solution would be developed further through the detailed design process but is unlikely to negate the need for a significant fire water supply.

The most feasible option to service the station for firefighting would be to extend a minimum 150mm main from the QLDC 280mm trunk main within the SH6 shoulder and place two hydrants on this new main in the vicinity of the station.

The risk associated with loss of structure and operation of the cable car itself will be addressed through the detailed design of the system and if required, additional bespoke fire suppression will be specified. If required, sprinkler demand for any ordinary hazard (OH) can be catered for through the installation of a dedicated connection to the 150mm main discussed above.

The provision of a suitable firefighting water supply to service this station is deemed feasible.

13.2.2 Wastewater

The wastewater produced by the Quail Rise Station will relatively high due to the significant number of toilets and the bus washdown facilities.

Figure 35: Existing QLDC Wastewater Network

As per Figure 35, the station will be located close to the QLDC wastewater trunk pressure main that crosses the Shotover Bridge. Given the nature and strategic significance of this trunk main, a connection will not likely be feasible.

A QLDC 150mm gravity main is located on Tucker Beach Road directly to the west of the station. A low diameter pressure connection in conjunction with pump station is feasible. Alternately, a low diameter pressure pipe connection could be made to the QLDC network directly prior to entering the Shotover Treatment Plant.

The wastewater production from the Quail Rise Station is likely to be relatively high but concentrated outside of suburban diurnal peaks. Given the proximity to the Shotover Wastewater treatment plant and relatively limited wastewater catchment reliant on the Quail Rise wastewater network, it is expected that suitable network capacity will be available.

The provision of a suitable reticulated wastewater connection to service this station is deemed feasible

13.2.3 Stormwater

Impermeable roof areas, hard surfaces and paved areas will result in significant runoff at this site.

Figure 36: Existing QLDC Stormwater Network

As per Figure 36, there is very limited QLDC vested stormwater infrastructure in the vicinity of the station However, given the proximity to the Shotover River, a direct disposal to this waterway or engineered soakage disposal to the associated alluvial gravels is feasible and the most practical solution. Direct disposal to the Shotover River may require flow to be attenuated via on-site tanks or ponds.

Discharged flows will need to comply with both ORC and QLDC quality discharge requirements. Treatment solutions will be established through developed design but could include treatment ponds, swales, or proprietary devices. If necessary, some high risk flows, including the bus washdown areas may need to discharge to the wastewater network.

The provision of a suitable stormwater disposal solution to service this station is deemed feasible

14. Lower Shotover Station

Lower Shotover Station is common to both Routes A and B, therefore refer to Section 10 for the services assessment.

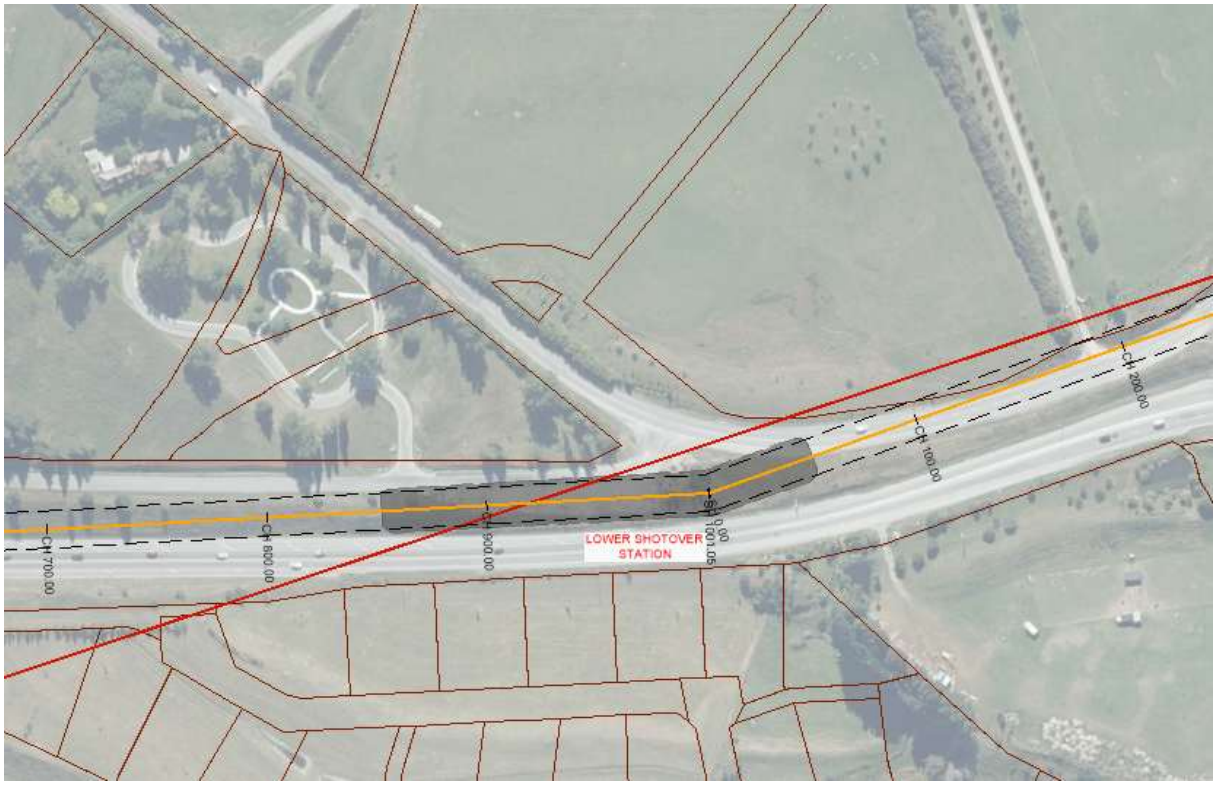

Figure 37: Lower Shotover Station Location

15. Earthworks

15.1 Location and Nature

Earthworks will be associated with the following construction activities:

- Station construction
- Tower construction
- Servicing - trenching, underground storage, stormwater ponds / attenuation
- Access – temporary and permanent

15.2 Station Construction

Bulk earthworks will be required to shape and prepare the ground at each station site for the construction of the station itself and all associate infrastructure including buildings, parking and services.

The location and nature of bulk earthworks, including cut / fill volumes, max cut / fill heights will be different for every station, and dependant on its location, associated facilities and final structural / architectural design.

Earthworks quantities required for station construction will be determined through detailed design.

15.3 Tower construction

The proposed cable car network will require tower foundations up to approx. 50Cu.M in size. Therefore, at each tower location, relatively minor earthworks will be required to prepare each site for tower foundation construction.

It is proposed that where possible, plant and materials would be delivered to the tower sites via helicopter. However, in some instances, land-based access may need to be constructed to facilitate the delivery of plant and materials. Where accesses are required for construction only, they will be deemed temporary and will be remediated, including topsoiling and revegetation as soon as practicable after construction.

Earthworks quantities for tower foundation construction will be determined through detailed design.

15.4 Servicing

Trenching for underground services will be required for the supply of lead in services to station sites. Trenching profiles will vary depending on the nature of services included and utility service provider requirements as relevant. All trenching alignments will be backfilled, compacted and re-vegetated to match surrounding environment.

Trenching locations and profiles will be determined through detailed design.

15.5 Access

Accesses, both temporary and permanent will need to be constructed to:

1. Re-align existing access formations on private land
2. Provide access to construction sites including laydown areas

15.6 Suitably Qualified Professional

All earthworks will be designed and undertaken under the supervision of a suitably qualified geotechnical professional.

15.7 Standards

All earthworks will be designed and constructed in accordance with the relevant QLDC and ORC standards and guidelines.

15.8 Earthworks Management

All earthworks will be undertaken in accordance with conditions of consent, QLDC and ORC requirements and approved Earthworks Management Plans (EMPs) and Erosion Sedimental Control Plans (ESCPs). These measures will ensure that adverse environmental effects, such as dust, silt, and sedimentation runoff are effectively avoided, remedied, or mitigated.

15.9 Noise / Vibration Management

Noise and vibration associated with the proposed earthworks will be appropriately mitigated to ensure compliance with relevant New Zealand standards and QLDC requirements. Construction-related noise will be managed in accordance with NZS 6803:1999 *Acoustics – Construction Noise*, which sets appropriate limits and hours of operation for typical construction activities. Where there is potential for vibration effects on nearby structures or sensitive receivers, mitigation measures will be implemented following best practice guidelines. A Construction Noise and Vibration Management Plan (CNVMP) will be prepared where required, outlining methods for minimising noise and vibration, monitoring procedures, and communication protocols with affected parties. These measures will ensure that adverse acoustic and vibration effects are effectively avoided, remedied, or mitigated.

16. Electricity

Initial discussions have been had with Aurora Energy, one of two local electricity network owners in the project area. Aurora Energy have confirmed that with the appropriate approvals, all cable car stations and associated infrastructure can be connected to the Aurora Energy network.

The design of the connection(s) will be finalised in conjunction with Aurora Energy as the project progresses through the detailed design phase.

17. Conclusions

All twelve stations proposed as part of the 10 km Queenstown Cable Car development have been assessed for three-waters servicing, including potable water, fire water, wastewater and stormwater. With the appropriate approvals there are feasible options available to service all stations to QLDC requirements.

The stations located within the urban boundary can be connected to existing or planned QLDC infrastructure in conjunction with relatively minor construction/upgrade work.

The stations located in rural areas can be serviced through connections to QLDC infrastructure, connections to private networks (with necessary approvals), or via on-site systems designed to meet district and/or regional council standards.

Earthworks will be required for station, tower and access construction and servicing. Earthworks specifics including volumes and cut / fill heights aren't currently known, and they will be determined through developed design.

Earthworks construction will be supervised by a suitably qualified geotechnical professional.

Earthworks design, construction and management will be in accordance with QLDC and ORC standards.

Required electricity to each station and the system as a whole has been confirmed as able to be feasibly serviced via the Aurora Energy network.

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