WATER WAYS
CONSULTING LTD

Albert Burn Fisheries Values and Residual Flows

PREPARED FOR: LANDPRO LIMITED

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1 INTRODUCTION

1.1 Background and Report Scope

Queensbury Ridges Limited (the applicant) has a single water take from the Albert Burn below the confluence with Alfern Creek. The applicant is seeking replacement of deemed permits to enable continued abstraction from this location. The purpose of this report is to provide up to date information on the freshwater fish community of the Albert Burn and Alfern Creek in the vicinity of the water take and at upstream and downstream reaches. The report then makes residual flow recommendations as relating to the point of take.

1.2 Residual Flow Policy

The Otago Regional Water Plan has a residual flow policy – Policy 6.4.7.

> ***6.4.7 The need to maintain a residual flow at the point of take will be considered with respect to any take of water, in order to provide for the aquatic ecosystem and natural character of the source water body.***
>
> ***Explanation***
>
> *This policy requires an assessment of whether there is any need to apply a condition on any consent to take water requiring the passing of a residual flow at the point of take. Such a residual flow condition may be applied in addition to a minimum flow applied under this Plan.*
>
> *A residual flow condition may be applied to any take for community water supply purposes, or on a take from a tributary stream that has different flow characteristics from the main stem.*
>
> *Residual flows will be applied and monitoring arrangements made on a case-by-case basis having regard to any effects on aquatic ecosystem values and the natural character of the source water body.*
>
> ***Principal reasons for adopting***
>
> *This policy is adopted to enable the taking of water while providing for instream values of the source water body, particularly with respect to community water supplies and takes from tributaries that have different flow characteristics from the main stem under low flow conditions.*

2 METHODS

An electric fishing fish survey was conducted at sites in the Albert Burn and Alfern Creek on the 7 November 2019. Electric fishing was conducted using a NIWA EFM 300 backpack electric fishing machine along reaches 70-100 m long. Sampling included pool, riffle, run and cascade habitat when present. All fish caught were identified to species level and lengths were measured for all fish captured before they were returned to the stream. While electric fishing was the main survey method, at each site backwater and low water velocity pool habitat was checked for the presence of larval non-migratory galaxiids. The Clutha flathead galaxias is present in some streams draining the Pisa range and larval fish are present in spring and may drift downstream from adult populations further upstream.

Physical habitat descriptions were made for each site including the size of the stream, the state of the riparian vegetation and the nature of the stream bed substrate. Water colour and turbidity were also noted at each site. A Garmin GPS was used to record the location of each site. To provide further data and to assess historic fish communities the New Zealand Freshwater Fish Database (NZFFD) was also searched for fish records for the catchments.

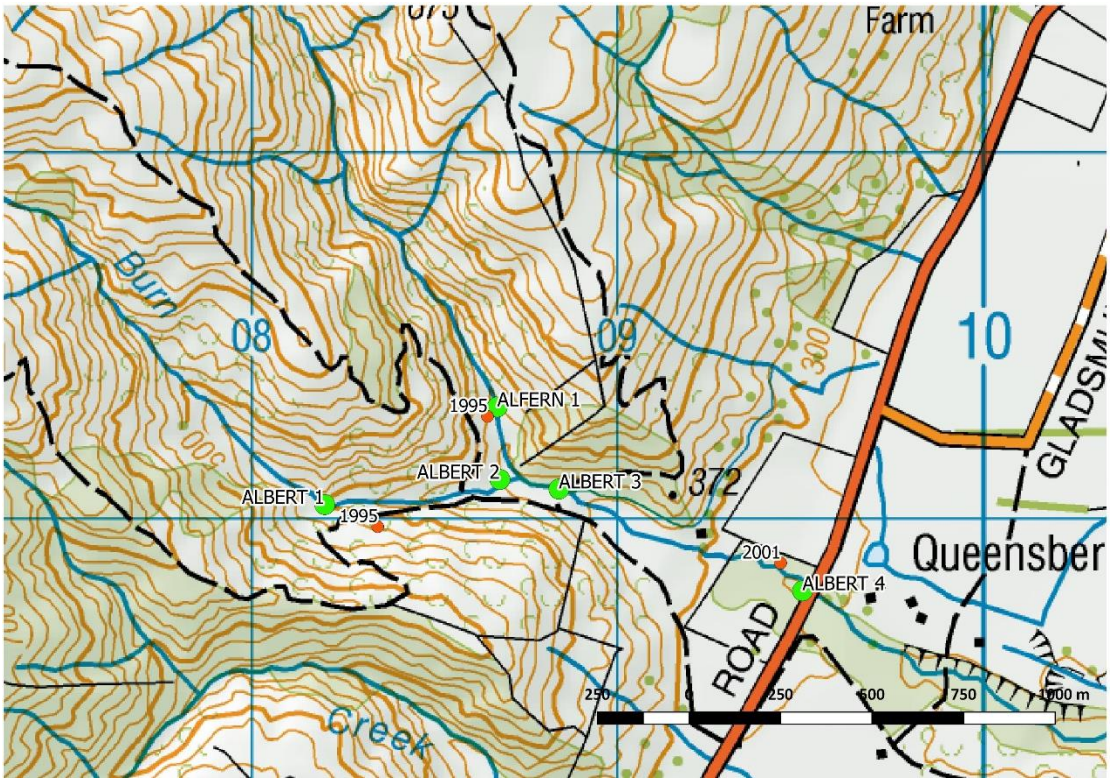

Figure 1: Albert Burn and Alfern Creek fish survey sites (green circles), November 2019, with historic NZFFD sites shown (red circles).

3 RESULTS

3.1 New Zealand Freshwater Fish Database Records

The NZFFD has three records for the Albert Burn and Alfern Creek. The earliest two are from 1995 and report brown trout in the Albert Burn and Alfern Creek. A later fish survey in 2001 on the Albert Burn near State Highway 6 in 2001 reported no fish present.

3.2 2019 Fish Survey

3.2.1 Brief site descriptions

The fish survey fished two sites in the Albert Burn above the water intake, one in Alfern Creek above the water take and then two sites downstream of the water take, one immediately downstream and one 30 m upstream of the State Highway 6 bridge (Figure 1).

Site Albert 1 was the smallest stream reach sampled with an average width of 1.5 m and a maximum depth of 0.5 m. The stream was partially shaded by riparian shrubbery and there was abundant cover amongst the stream bed substrate and undercut banks (Figure 2).

Figure 2: Site Albert 1

Site Albert 2 had a highly modified riparian zone as the vegetation had been removed for a vehicle crossing. The banks included areas of exposed soil and a vehicle track. The stream was approximately 1.5 m wide and had a maximum depth of 0.5 m. Pool habitat was more common that at the upstream

Albert 1 site, in part because the gradient was more gently sloping. Fish cover was provided by boulder substrate along the stream reach (Figure 3).

Figure 3: Site Albert 2.

Site Alfern 1 had an average width of 3 m and a maximum depth of 0.8 m. It had riffle, run, pool and cascade habitat. The riparian zone had dense riparian shrubbery that shaded 65% of the stream. Fish cover was provided by the boulder and cobble substrate and undercut banks and overhanging vegetation.

Figure 4: Site Alfern 1.

Site Albert 3 was the stream reach immediately downstream from the water abstraction. The riparian zone vegetation had been cut in some sections along the reach and as a result the reach had almost no shade. The stream width was approximately 3 m and the maximum stream depth was 0.7 m. Habitat was predominately run and riffle with approximately 10 % of the reach fished being pool habitat (Figure 5).

Figure 5: Site Albert 3.

The downstream site at State Highway 6 was nearly completely overgrown by broom and the stream was well shaded. The stream width was approximately 1.5 m and the stream maximum depth was 0.4 m. There was good fish cover under the undercut banks, under overhanging vegetation and amongst the substrate. The habitat was dominated by run, riffle areas in equal proportions with approximately 20 % of the habitat being pool habitat (Figure 6).

Figure 6: Site Albert 4.

Only site Albert 4 had no stock access and all four upper sites were grazed along the stream margins.

3.2.2 Fish collected

Brown trout were caught at all five sites. The trout were abundant at the four upstream sites, but only a single trout was caught at the downstream site near State Highway 6 (Appendix A summary data). The length frequency distributions of the brown trout present at the four sites upper sites ranged from freshly emerged fry 22-29 mm long to stunted adult fish 160-210 mm long. (Appendix B). The fish densities indicated healthy brown trout populations were present at the four upper sites, although the density was noticeably lower in the steeper gradient higher flowing Alfern 1 site.

While electric fishing it was noted that invertebrates, mayflies, stoneflies and caddisflies were common at the upper four sites. However, invertebrates were very rare at the bottom site.

The very low density of brown trout at site Albert 4 and the near absence of invertebrates at site Albert 4 indicates this site provides poor habitat and is part of the drying reach that supports few if any

permanently resident fish. No native fish, either larval or adult galaxiids, bullies or eels were observed at any of the sites.

4 DISCUSSION

4.1 Fish community

The fish community of the Albert Burn and Alfern Creek in the survey area is limited to brown trout. The size range of brown trout present indicates a spawning population is present and the occurrence of fry at all four upstream sites indicate spawning is likely to be widespread in the reaches around the confluence of the two streams. The largest brown trout caught was 210 mm long, indicating that the resident adult brown trout are stunted individuals with little if any sports fishery value.

The absence of any native fish in any of the reaches fished and also the absence of native fish in the NZFFD records demonstrate that the Albert Burn and Alfern Creek from at least 500 m upstream of the water take downstream past State Highway 6 have no fisheries conservation value. Similarly, the lack of any eels in the fish surveys indicates that the streams are presently not supporting significant customary fishery values.

4.2 General Residual Flow Considerations

The combination of NZFFD records and fish survey results from this fish survey provide key ecological information for the two catchments:

- The Clutha flathead galaxias, a critically threatened fish (Dunn et al 2018) has not been found in either the Albert Burn or Alfern Creek, nor have other threatened or at risk species such as koaro and longfin eel;
- Brown trout are the only fish species recorded in both stream catchments;
- Common native fish have not been reported from the Albert Burn or Alfern Creek;

A further significant consideration for the lower Albert Burn is the natural summer low flow conditions. Stream gauging studies conducted by Landpro Limited[1] have found that the lower Albert Burn loses surface water to ground and there is a natural drying reach in the lower Albert Burn. The flow loss to groundwater is substantially higher than the 7dMALF for the Albert Burn. Therefore, a connecting flow cannot be provided even when natural flows are provided. A residual flow at the abstraction point in the Albert Burn will not be able to create a stream that flows from above the abstraction to the Clutha River and fish passage is not available during the summer low flow period.

[1] Landpro Ltd (2019). Hydrological assessment of the Albert Burn and Schoolhouse Creek for Queensbury Ridged Ltd.

Therefore, a residual flow is only required to protect aquatic ecological values at the point of take. This fisheries assessment found that the fisheries communities above and below the water take are essentially the same – an abundant, healthy, but stunted brown trout population. In addition, observations of the macroinvertebrate community, which are abundant and diverse above and below the take, indicates that the present water abstraction regime provides for the ecological values of the Albert Burn/Alfern Creek at the point of take.

No flow record has been kept for the Albert Burn below the intake. However, the current abstraction infrastructure while capable of taking up to 103 L/s is constructed in such a way that all the water passing through the intake structure cannot be taken. Therefore, if no changes are made to the intake structure a residual flow will continue to be provided downstream of the water intake that supports healthy fish and invertebrate population. Two options exist for the recognition of the residual flow, firstly a consent condition that requires no changes are made to the intake structure that will alter the balance between water taken and water left in the Albert Burn. Alternatively, the residual flow presently provided by the take can be gauged during the summer low flow period and the gauged flow can be used in a consent condition.

5 REFERENCES

Dunn, N. R., Allibone, R.M., Closs, G.P., Crow, S.K., David, D.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. (2018). Conservation status of New Zealand freshwater fish. New Zealand threat classification series 24. Wellington, Department of Conservation.

6 APPENDIX 1: SITE LOCATIONS AND CATCH

Site	Latitude	Longitude	Area fished (m^2	Number of brown trout caught; and length range
Albert 1	-44.841332	169.307842	150	57; 22-168 mm
Albert 2	-44.840911	169.313924	150	34; 22-208 mm
Alfern 1	-44.839133	169.313949	200	26; 23-188 mm
Albert 3	-44.841213	169.315945	210	41; 22-212 mm
Albert 4	-44.843976	169.324189	120	1; 197 mm

7 APPENDIX 2 BROWN TROUT LENGTH FREQUENCY GRAPHS

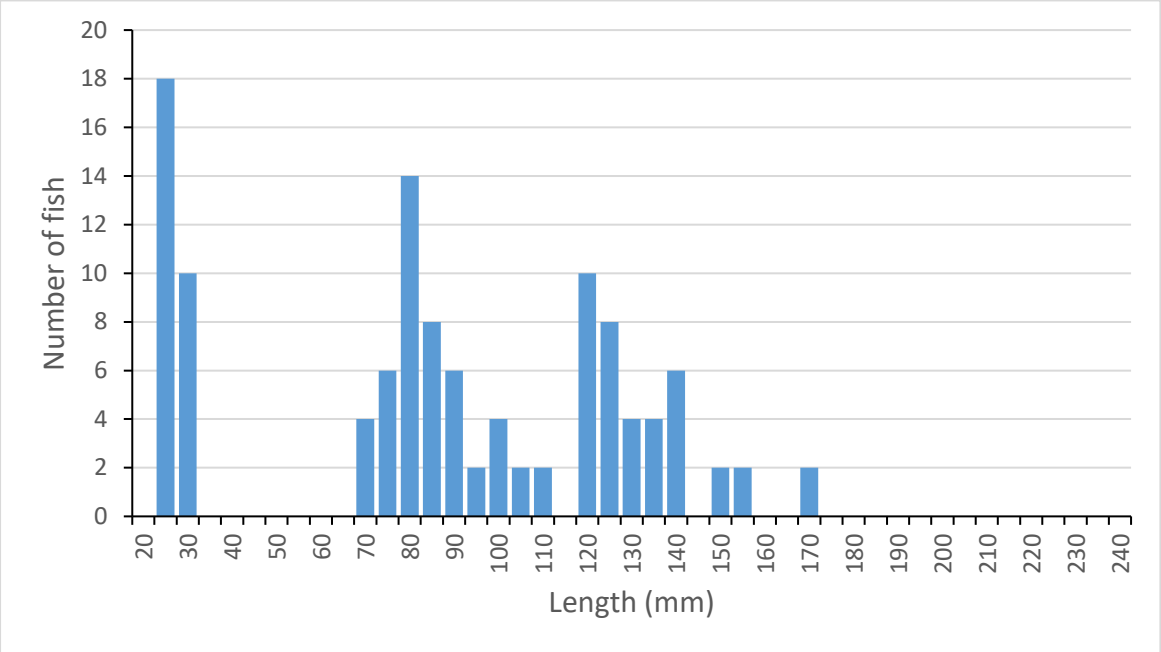

Figure B1: Length frequency of brown trout at Site Albert 1.

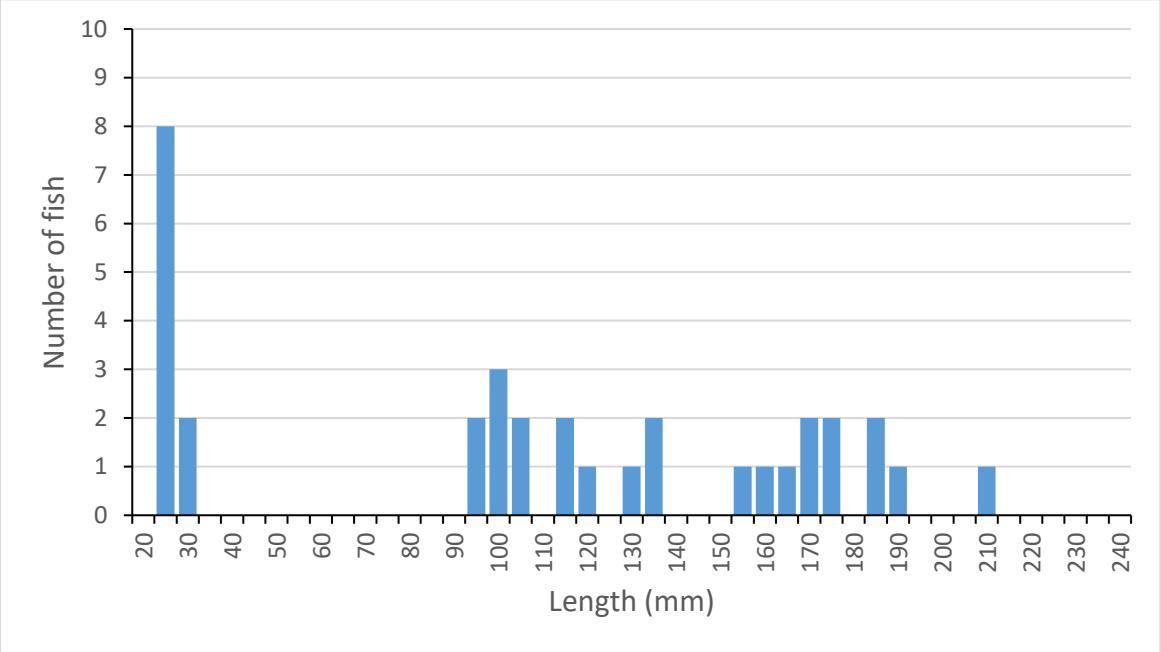

Figure B2: Length frequency of brown trout at Site Albert 2.

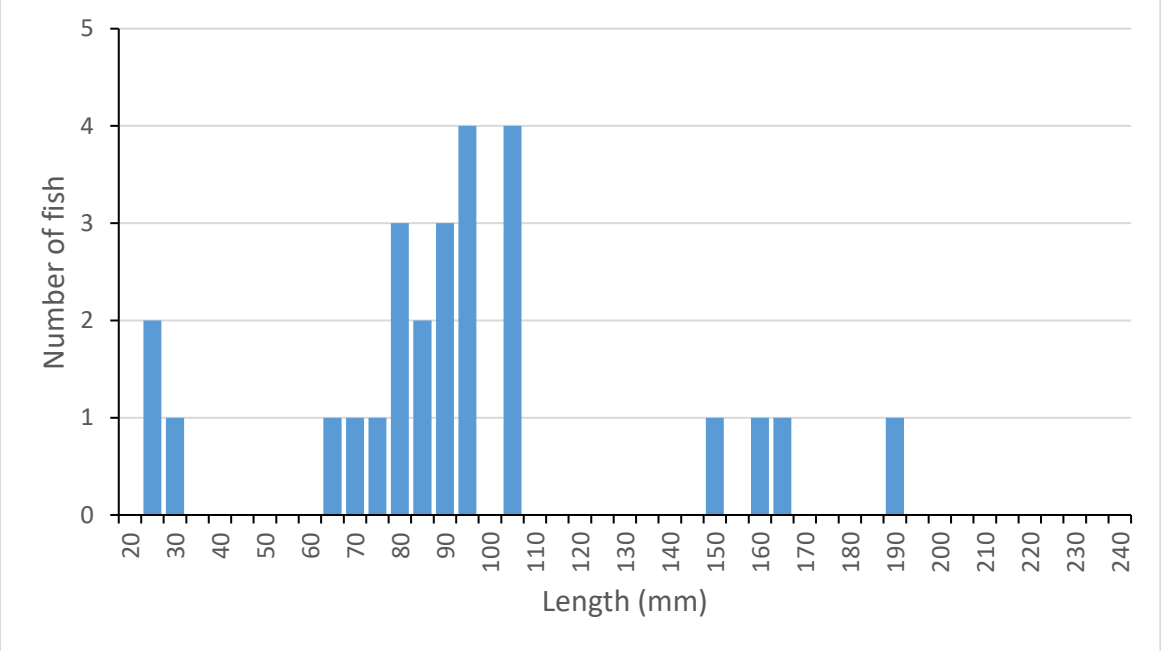

Figure B3: Length frequency of brown trout at Site Alfern 1.

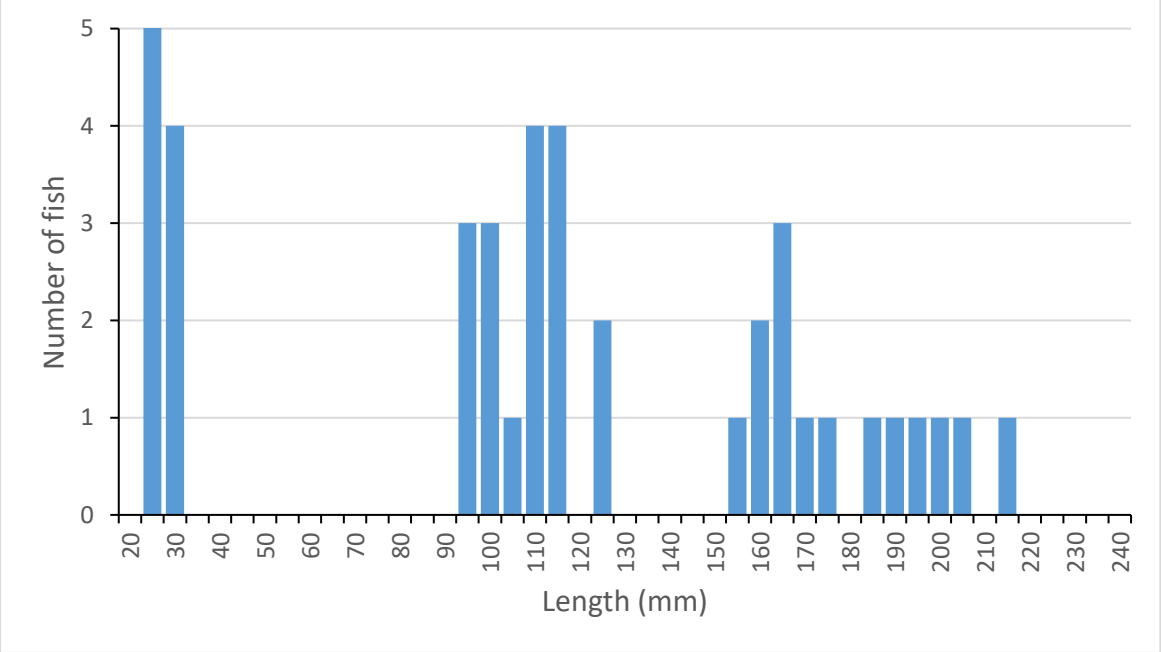

Figure B4: Length frequency of brown trout at Site Albert 3.

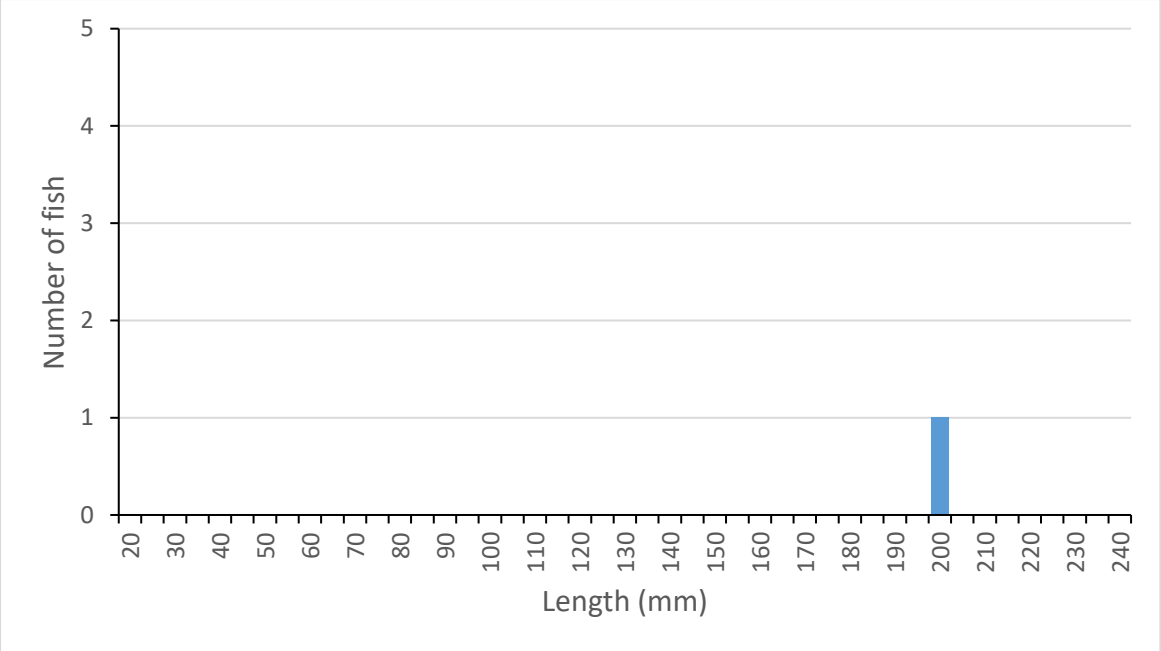

Figure B5: Length frequency of brown trout at Site Albert 4.