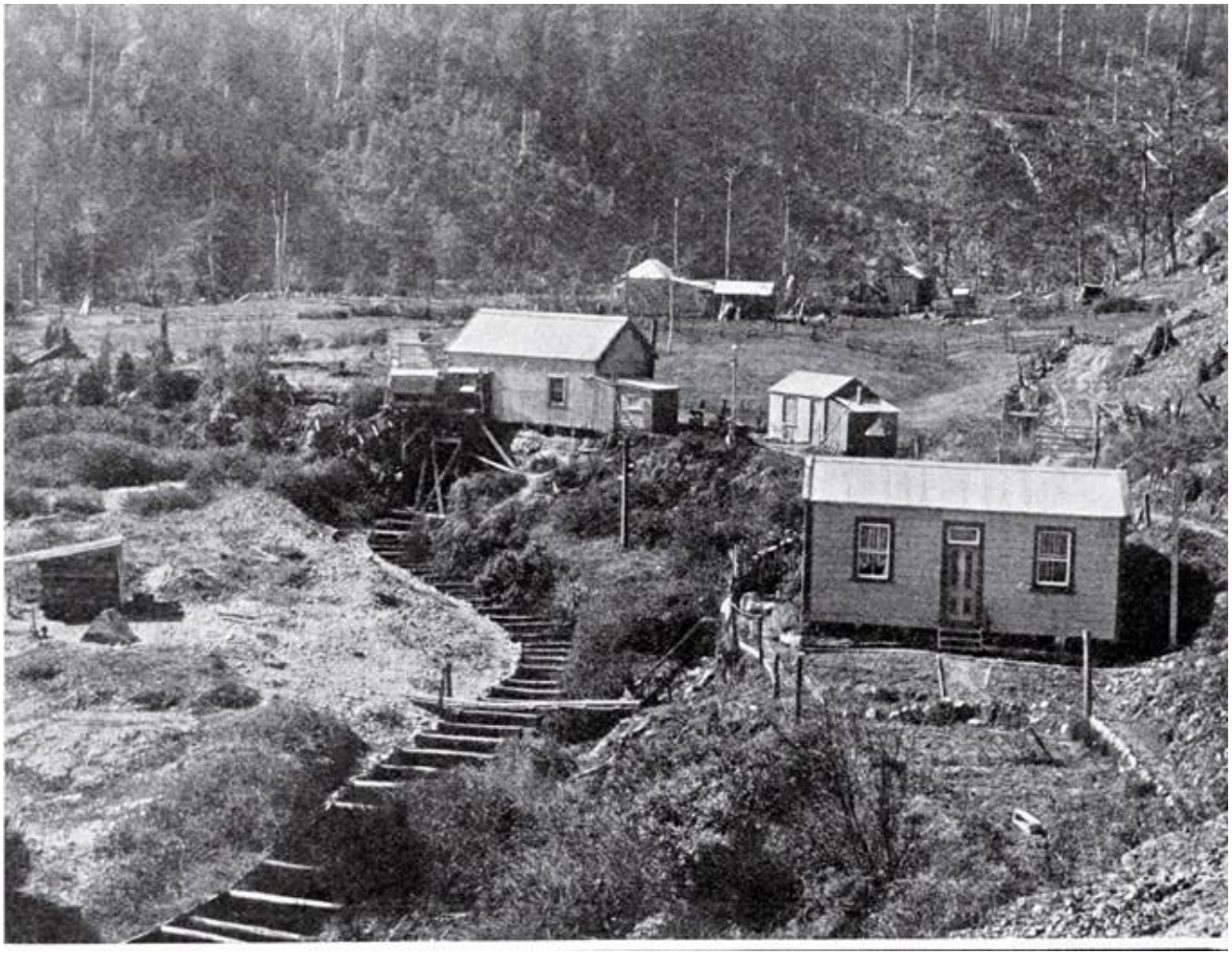
Reefton Powerhouse Charitable Trust Incorporated

Reefton Powerhouse Scheme

Application for Resource Consents and Assessment of Environmental Effects



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1.0 Introduction

1.1 Overview

Reefton's historic hydro-electric power scheme ('The Scheme') was commissioned in August 1888 and became the first public electricity supply in New Zealand, and the first town in the southern hemisphere to have a street lighting system. Hence the reason for Reefton being known as the 'Town of Light'.

The Scheme is located on the south bank of the Inangahua River, detailed in **Figure 1** below. It consisted of a run-of-river hydro-power system which diverted a portion of river flow via an intake at Blacks Point into a 2km water race to a powerstation opposite Reefton township, at which point water was returned to the Inangahua River. The Scheme was decommissioned in 1961 when Reefton was connected to the National Grid.

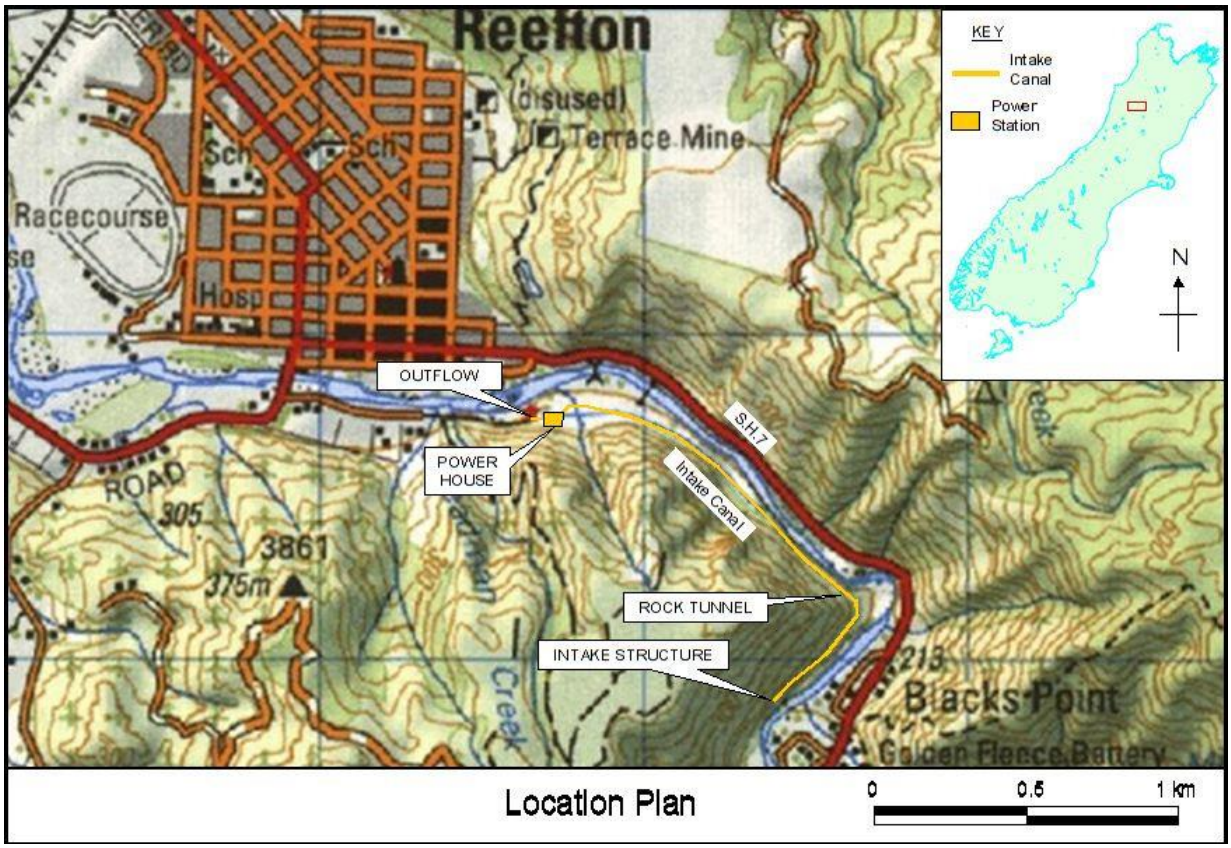

Figure 1: Location of the Scheme

The Scheme comprised the following key elements:

- A concrete intake structure founded in rock on the south bank of the Inangahua River, opposite Blacks Point;
- Approximately 1850m of water race that conveyed water from the intake to the powerhouses;
- Powerhouses containing turbines and generating sets, switchboards and controls; and
- A tailrace that discharged the water back to the Inangahua River, and a spillway by-pass that enabled flows to be diverted past the power stations and discharged directly to the tailrace.

The intake is located at an elevation of 201.74m RL with the inlet to the historic power houses located at 199.05m RL, giving a fall of 2.7m. The gradual gradient of the water race ensured water flowed slowly (<1m per second) and did not result in any scouring or erosion of the channel. The effective head of the scheme was around 5m at the turbines.

The Applicant proposes to restore the Scheme as a community initiative to promote tourism and to generate revenue through hydro electricity. The project involves rebuilding two of the early powerhouse buildings, the 1908 and the 1935. The foundations of these power houses, some of the plant and the 2km water race and associated features remain. The earliest power station, the 1888 power house was lost through development of the1908 power house but will be interpreted on site.

As for the original hydro scheme, the proposal will utilise a maximum take from the Inangahua River of 3.5m³/s. A minimum flow of 2.3m³/s will be maintained below the intake over the months of February and April inclusive and 2m³/s at all other times. This is in order to maintain instream habitat within the affected reach of the Inangahua River given it is an important trout fishery.

It is intended to install a modern turbine and generator adjacent to the rebuilt historic powerhouses, with the modern plant to be the primary generator and expected to produce approximately 150kW. Electricity generated by the scheme will be injected into the existing Westpower 11kV distribution network.

1.2 The Applicant

In 1986 a group of like-minded people formed the Reefton Electrical Centenary Committee. The purpose of the committee was to look at ways in which the community could benefit from recognition of Reefton's significant history as the first place in the Southern Hemisphere to have a public and reticulated supply of electricity, with the focus around protecting and promoting the historic generating site.

Around 2000 another, but different group of like-minded people, decided to build on what by then the disbanded 1986 Reefton Electric Centenary Committee had achieved and the incorporated society of Inangahua Tourism and Promotions (ITP Promotions) was formed. The organisation considered that significant community benefit would accrue through protection of the historic scheme and they were concerned that the various features would further degrade through weathering, land movement and vegetation intrusion.

The volunteer committee of the ITP Promotions believes that the best way to protect and promote the historic scheme was through restoration to generate electricity again. Creation of a revenue stream through electricity generation would ensure on-going maintenance and repair costs of the scheme could be meet and provide a source of potential funds for other community projects.

The project gained momentum as the 125th anniversary of the historic scheme approached (1st August 2013). In 2011 a separate entity, Reefton Powerhouse Charitable Trust Incorporated ('The Applicant') was formed. The stated purpose of the Trust is: *'To protect, conserve, promote and educate the public regarding Reefton's history as the first site in the southern hemisphere to have a municipal system of electrical power generation and supply'*. This is to be achieved through the following:

- *'Repair, restore, operate and maintain Reefton's historic Powerhouse site and associated infrastructure. ('the Site').*

- *Generate electricity at the Site and sell that electricity for the purposes of generating income for the charitable purposes of the Trust.*
- *Provide interpretative and visual experiences that help educate the public about the Site and its supply of electricity to the Reefton community.*
- *To provide other support and assistance consistent with this charitable purpose'.*

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1.3 Resource Consents Required

The Applicant is seeking all necessary resource consents under the Resource Management Act 1991 (RMA) for the reinstatement, operation and maintenance of the Scheme. Resource Consents are required from the West Coast Regional Council (WCRC) and Buller District Council (BDC) with this document being a combined application to both consenting authorities.

The resource consent required from BDC is summarised as:

- **Land use consent** – to rebuild, operate and maintain the Scheme to generate electricity and as a visitor attraction. Associated activities include removal of approximately 1.5 hectares of indigenous vegetation, disturbance within the riparian margins of the Inangahua River, installation of one power pole, transformer and overhead transmission line, forming sections of legal road, modification to recorded historic sites and temporary storage and use of hazardous substances.

The resource consents required from WCRC are summarised as:

- **Land use consent -** for earthworks and vegetation disturbance within riparian margins associated with restoration of the Scheme.
- **Land use consent** – for disturbance to the Inangahua riverbed associated with construction of a rock groyne and placement of rock riprap
- **Water permit -** to take and use up to 3.5m^3/s of water from the Inangahua River at Blacks Point for hydro generation purposes.
- **Water permit** – the diversion of water from the Inangahua River by means of approximately 1850 metres of water race for hydro generation purposes.
- **Discharge permit** – to discharge accumulated sediment from the gravel sluice into the Inangahua River on an intermittent basis.
- **Discharge permit** – to discharge up to 3.5m^3/s of water via a tailrace into the Inangahua River at Reefton following hydro generation**.**

The Applicant is seeking that the resource consents do not lapse for a period of seven years after the date of commencement of the consents. The Trust also seeks a duration of 35 years for all the

WCRC water and discharge permits.

1.4 Land Ownership and Other Approvals

The legal description and ownership of the properties to which these resource consent applications relate are listed in **Table 1**. Attached as **Appendix 1** is a land tenure plan prepared by Cotton and Light Ltd and a copy of the relevant Certificates of Title.

Table 1: Land Ownership Summary

Legal Description	Owned/Administered By
Legal road adjoining Section 198 Square 131, Lot 1 DP 15036 and Section 4, Block XIV, Reefton Survey District	Administered by Buller District Council
Section 198, Square 131 and Section 10 Block XIV, Reefton Survey District	D Boothman-Burrell and J P James-Ashburner.
Crown land Survey Office Plan 7979 - Water Race Reserve	Administered by Land Information New Zealand
Crown land Part Section 247, Block XIV, Reefton Survey District	Administered by Department of Conservation
Section 4, Block XIV, Reefton Survey District	J C Farnham
Crown land situated in Block XIV, Reefton Survey District	Administered by Land Information New Zealand

A summary of the Scheme footprint as it relates to the various land parcels follows:

- The intake at Blackspoint and proposed rock groyne are in the bed of the Inangahua River, on crown land administered by LINZ.
- From the intake working downstream - the water race extends along LINZ administered land and legal road, then crosses the Farnham property. The race then enters a tunnel that is on crown land administered by DoC and extends along Water Race Reserve. A short stretch of legal road is crossed, with the water race then extending down to the powerhouse site across the property of Boothman-Burrell and James-Ashburner.
- The powerhouse complex, including the tailrace, is located predominantly on legal road, but landscaping and interpretation may extend into the property of Boothman-Burrell and James-Ashburner.
- The service road, extending upstream from the site of the powerhouses, is located on legal road for approximately 300m before extending along the Boothman-Burrell and James-Ashburner property for a stretch of around 450m. Following which, it extends along legal road for a short stretch and then onto Water Race Reserve.

The necessary permissions will be sought from LINZ and DoC to authorise those aspects on crown land. A Licence to Occupy will be sought from BDC for those aspects on legal road, along with the required building consents for the project.

The proposal also requires Archaeological Authority from Heritage New Zealand Historic Pouhere Taonga (HNZPT) to authorise modifications to an archaeological site. This Authority is in the process of being sought.

1.5 Structure of the Document

This document is intended to provide all the necessary information related to the project. Accordingly, it addresses matters associated with both the regional and district authorities, to allow a comprehensive assessment of the proposal. It is also supported by technical reports and plans provided as Appendices.

2.0 The Existing Environment

The following section details the environmental setting of the Scheme.

2.1 Historical Context

The historical context of the Scheme is outlined in the archaeological assessment prepared by Underground Overground Archeology Ltd, attached as **Appendix 2** ('The Archeology Report'). The Scheme remains are recorded as L30/5, Reefton Electric Light Company, on the NZ Archaeological Association (NZAA) recording scheme. The original site record covered the powerhouse remains but was up-dated to include the water race and associated features.

The 1888 powerhouse foundation is recorded in the District Plan as historic structure #286, the Scheme generally is recorded as historic site #133.

The Archeology Report sets out the history of the Scheme. The original components included an intake structure constructed of timber, while the water race was mostly open ditching, incorporating a stretch of tunnel with timber fluming at each end and a section of timber fluming leading to the powerhouse. A short section of race ditching was also covered over at some point in response to concerns from a landowner and became known as the 'earth tunnel' (i.e. the section through Farnham's property).

Walking access along the race for inspections and maintenance was mostly via the walls of the water race. Where wooden fluming occupied a narrow side cutting downstream of the rock tunnel, there was a walkway on top of the cross timbers and a narrow ledge in the hillside provided access around the tunnel itself.

The first powerhouse was located at the edge of the river terrace and was commissioned in 1888. Flumed water discharged into a penstock that supplied a vertical turbine which had a belt drive to the generator in the powerhouse above. After passing through the turbine, water dropped into a tail race running along the foot of the terrace until it reached the Inangahua River. Over the 20-year period of service the original power house grew with its range of equipment.

By 1906 demand had exceeded generating capacity to the point where an entirely new generating plant was required. A new powerstation was constructed behind the 1888 power house, with water diverted from the race via a new concrete penstock. Tail water escaped via a tunnel driven through to the existing tail race beneath the original penstock and turbine. (Note, the Archeology Report dates the powerhouse as 1906 and considers the often referred to 1908 date as being erroneous. For the purposes of this application, the powerhouse is referred to as the 1908 powerhouse given much of the documentation uses this date).

To secure electricity supply against river fluctuations and various breakdowns a steam plant was installed in the early 1900s. Coal was delivered via the Rosstown road to a bin at the south end of the powerhouse from which point a tramway delivered to the coal shed and boiler. The boiler was the source of an early morning fire in 1913 that destroyed the three dynamos and the 1908 building, necessitating re-build of the powerhouse. Steam was particularly important for a lengthy period in the 1920s while the water race was being upgraded with two boilers on site between 1918 and 1923.

During the 1920s there was a major reconstruction of the water race, causing power to be generated by steam for an extended period. The concrete intake and gravel sluice at the upper end and

concrete water race walls are thought to have been built during this period. Directing water into the race at times of low river flow also caused difficulties overcome by building temporary rock-and-manuka weirs across the river at the intake.

In 1930 the steam plant was replaced with a diesel plant and all the steam plant removed. The coal tramway made way for the diesel plant foundations, while the boiler room and bunker at the northern end of the 1908 powerhouse were removed.

The third powerhouse was built in 1935, situated below the terrace immediately north of the top end of the tail race. The new equipment and associated switching gear were housed in a timber framed weather-board building with a west sloping corrugated iron lean-to roof and an upper-level east side veranda. Steps led from the 1935 powerhouse up to the workshop, diesel plant and 1908 plant.

A new concrete head wall was built, incorporating a gate so flow could be directed to the penstock of either the 1908 or 1935 powerhouse. In later years the 1935 powerstation became the sole hydro generator, likely due to insufficient water volumes to run both plants and there being ample diesel back-up.

Electricity was conveyed through overhead cables to the switchboard in the older building and from there to a pair of railway iron power poles on the north side of the building, the starting point for transmission across the river. The last electricity generated at the site was late 1946, when a flood caused extensive damage to the water race.

Major hydro developments in conjunction with expansion of nation-wide power reticulation following the Second World War led to the end of generation at Reefton. The Grey Electric Power Board bought the entire Scheme from the original owners (Reefton Electric Light Company) in November 1946 and closed it down the following year when connection to the National Grid was completed.

2.2 Scheme Remains

In terms of values, the Archeological Report considers that the overall condition of the remains to be moderate and a rare example of hydro generation. The contextual, information and amenity values are considered to be moderate to high. The overall conclusion is that the Scheme remains have high archaeological value and the site is a nationally significant complex historically.

The concrete intake structure is largely intact but requires repair. The water race was constructed of various materials including sections of concrete walled canal, earth race, timber flume, tunnel and concrete wall/earth bank. The dimensions of the race varied over its length, with the canal being approximately 2.5m wide and 1.3m high, the earth race and tunnel approximately 2m wide x 1.8m high, with the remaining sections of timber flume and concrete wall/earth averaging around 2.6m wide x 1.4m high. With the exception of the timber fluming that has long since disappeared, the water race is substantially intact but in varying states of disrepair.

Two small slips have impacted the water race. The first of which is approximately 30m downstream of the intake and has filled a 20m stretch of the canal. The second slip has affected the tunnel which has a localized slump extending approximately 12 m through the centre of the tunnel.

The canal section of the water race is within the bed of the Inangahua River. Nowadays water only enters the canal during significant flood events due to lowering of the riverbed since the Scheme

was abandoned. At the downstream end of the canal is an existing concrete gravel sluice, which was designed to allow water to flow over the top and continue down the race while trapping gravel in the lower section. Gravel was periodically flushed out during high flows via a pair of gates into the river.

The original powerhouse buildings (1888, 1908 and 1935) have disappeared, with only the foundations of the 1908 and 1935 remaining. However, the tailrace and by-pass channels are still evident but poorly defined. The service road that followed the water race up to the tunnel is largely over-grown.

2.3 Existing Terrestrial Ecology and Landscape Setting

The Scheme footprint and surrounds have been subject to modification related to farming, forestry and hydro activities. Historically the river flats on the south bank were cleared of vegetation and farmed while the adjoining hillsides were regularly burnt (refer **Photo 1)**, this practice continued until the early 1970s (pers. comm Greg Topp). These activities have resulted in indigenous vegetation within the application site being relatively low stature interspersed with exotic species such as gorse and broom.

Photo 1: 1904 View of Water Race and Surrounds

The lower reaches of the Scheme are within an area of privately owned forest. Forestry covers approximately 14 hectares of relatively flat land on the true left bank of the Inangahua River. Approximately 950m of the water race traverses through the forestry block hence this portion of the scheme is not visible from any public viewpoints, refer **Photo 2.**

Photo 2: Overgrown Section of Water Race

A walking track follows the true left bank of the Inangahua River from the Reefton swingbridge upstream to the entrance of the tunnel. The track traverses along a side cutting that originally carried a section of timber flume, refer **Photo 3**.

Photo 3: Side Cutting Downstream of the Tunnel

In the lower reaches of the Scheme, riparian vegetation is predominantly tutu and willows. Remnant river protection in the form of rock and blocks of concrete (being sections of water race) extend approximately 80m along a section of the true left bank downstream of the tunnel. In the upper reaches of the Scheme, riparian vegetation comprises regenerating beech-podocarp forest. The intake and canal are a feature of the river valley and visible from a number of viewpoints including the Blackspoint swingbridge, refer **Photos 4 and 5.**

Photo 4: Intake Structure with the Blackspoint Swingbridge in the Background

Photo 5: Canal Structure

Existing suspension bridges over the Inangahua River at Blackspoint (near the intake) and upstream from Reefton (start of Powerhouse walk) are notable features. The age of these swingbridges is not known but both structures are evident in photographs dating from the early 1900s.

The powerhouse track is accessed from the Reefton swingbridge and follows the true left bank for approximately 200m to reach the site of the historic powerhouses. It is 130 years since the Scheme was commissioned and over 70 years since it was abandoned. In the intervening period, the powerhouse buildings and most of the plant have either been removed or disintegrated. The site is covered with lank grass and weeds with a section of deer fence having been erected to provide some protection to the historic remains as vandalism is an on-going issue, refer **Photo 6**.

The tailrace and by-pass channels are still evident but covered in long grass, blackberry and broom, refer **Photo 7**.

Photo 6: Powerhouse Site

Photo 7: Tailrace Channel

2.4 Inangahua River Hydrology

The existing hydrological environment of the Inangahua River is described in the hydrology report prepared by URS and attached as **Appendix 3** ('The URS Report'). Flow data for the site was obtained from the Inangahua River at the Blacks Point flow gauge. At the time of writing this report, the gauge was owned by the National Institute of Water and Atmospheric research (NIWA) but has since been handed-over to the WCRC.

As the flow gauge is located approximately 1 km downstream of the proposed intake, with no significant flow additions between the intake and flow gauge site, the historical flow data was assumed to be representative of the expected flows at the intake. The flow characteristics of the Inangahua River are based on an extended flow record that covers approximately 47 years from May 1965 to November 2012 with no significant gaps.

Based on key statistics from historical daily mean flows (refer **Table 2**), the mean flow is estimated at 17 m^3/s with a mean specific runoff of 0.073m^3km^2 for the contributing catchment. The median flow, at 8m^3/s is approximately half of the mean flow. This is consistent with the general flow characteristics where the peak flow, at 575m^3/s is significantly higher than the 75th percentile flow of 18m^3/s, indicating the susceptibility of the river to occasional flash floods up to an order of magnitude higher than its regular flows.

The 7 Day Mean Annual Low Flow (7MALF), calculated at 2.3m^3/s, is based on a hydrological year running from 1st September to 31st August each year. The 7MALF for the length of the flow record does not display significant long-term trends, hence the 7MALF calculated from this record is considered to be a reasonable representation of the expected minimum flows.

Table 2: Summary Statistics for Daily Mean Flows at Inangahua River at Blacks Point

Catchment Area (km^2)	Mean Specific Runoff ($m^3/s/km^2$)	7-Day Mean Annual Low Flow (m^3/s)	25th Percentile Flow (m^3/s)	Median Flow (m^3/s)	Mean Flow (m^3/s)	75th Percentile Flow (m^3/s)	Peak Flow
233.4	0.07	2.3	4.4	8.3	17	18.5	574.8

2.5 Inangahua River Ecology

Assessment of the instream habitat and hydrological effects from construction and operation of the Scheme was carried out by Freshwater Solutions Environmental Consultants in conjunction with Jowett Consulting Ltd. The later report provided a more in-depth analysis of the flow related effects of the Scheme to inform the ecological assessment. The two reports are attached as **Appendices 4 & 5** ('Freshwater Solutions Report' and 'Jowett Report').

The reports are summarised as follows:

2.5.1 Catchment Over-view

For approximately 30km the Inangahua River flows through native bush from its headwaters near the Rahu Saddle. It then flows through a short (6km) section of open valley floor, which is farmed, before entering a more constrained section of valley approximately 3km upstream of Blacks Point down to Reefton. The river joins the Buller River at Inangahua Junction, about 70km from its headwaters. The Inangahua River is excluded from the Water Conservation (Buller River) Order 2001.

2.5.2 Instream and Riparian Habitat

Upstream of the proposal, in the vicinity of the Garvey Creek confluence, the Freshwater Solutions Report describes the Inangahua River as providing moderate to high in-stream and riparian habitat but that the riparian habitat has been reduced in places as a result of the proximity of the river to the State Highway. Riparian vegetation on the true right bank, within the impacted reach of the River (approximately 2kms), is also affected by the proximity of the State Highway, particularly on a sharp bend known as 'whirlpool bend'.

Stream bed substrate is dominated by boulders (60%) and cobbles (30%) with a small proportion of gravels (10%). Approximately 1% of the substrate within the affected reach appears suitable for brown trout spawning and no spawning behaviour or redds where observed during the site visit of 11 April 2013, typically a time when spawning is expected to peak. The Jowett Report concluded that there is very little suitable brown trout spawning habitat in the affected reach.

The substrate is characterised by low % embeddendness (5%) and low compaction reflecting the high energy nature of the river and lack of significant sediment inputs. The periphyton community is typically dominated by thin brown films and mats.

Over-all, the reach to be impacted by the Scheme provides moderate to high in-stream habitat quality.

2.5.3 Benthic Macro-invertebrates

Benthic macro-invertebrate indices scores from the survey carried out in April 2013 and a survey carried out by Freshwater Solutions upstream of Blacks Point in 2012 for another project were presented in the Freshwater Solutions Report.

The total taxa number recorded within the affected reach in April 2013 was modest compared to the total taxa number recorded upstream of Blacks Point in 2012 (range 15-16 taxa) and downstream of Reefton between 2005 and 2007 (range 12 -16 taxa) by Kingett Mitchell in 2007. The EPT taxa number, % EPT and MCI (Macro-invertebrate Community Index, Stark 1985) scores recorded within the impacted reach in April 2013 were also lower compared to upstream of Blacks Point in 2012. The lower indices scores in the impacted reach compared to past surveys upstream and downstream were not readily explainable but may relate to differences in sampling and sorting methods or the timing of surveys.

The Freshwater Solutions Report concluded that the results of the previous surveys combined with the April 2013 survey indicate that the Inangahua River supports a healthy invertebrate community dominated by water and habitat sensitive EPT taxa. The invertebrate community results indicate that the Inangahua River provides high water quality and in-stream habitat quality.

2.5.4 Native Fishery

The Inangahua River supports at least 6 native fish species including longfin and shortfin eel, upland bully, redfin bully, torrentfish and dwarf galaxia. Native fish species recorded in the affected reach are torrentfish, upland bullies and longfin eels. The density of native species is the 4th lowest recorded among 38 rivers sampled by Jowett and Richardson in 1996. Many native fish are diadromous and require access to the sea to complete their lifecycle. The moderate diversity and low density of the native fish population within the affected reach reflects the long distance to the sea.

2.5.5 Trout Fishery

Trout population surveys have been regularly undertaken within the affected reach by West Coast Fish and Game through drift diving and counting small, medium and large fish. Drift dive results indicate that the affected reach is primarily used by juvenile and small brown trout with adult brown tout moving through the reach to and from spawning habitat upstream.

2.6 Recreational Activities

The Inangahua River is an important brown trout angling river. The Freshwater Solutions Report notes that angler surveys conducted in 1994/95, 2001/02 and 2007/08 (Unwin & Brown 1998, Unwin & Image 2003, Unwin 2009) rank the Inangahua River 6th out of 111 recognised angling rivers on the West Coast.

Published data on the extent of angler use of the River potentially affected by the scheme is not available, hence Freshwater Solutions conducted a telephone survey of 4 long-time anglers that are Reefton residents and regularly fish the river. The survey established that the affected reach is predominantly used by Reefton residents, due to the ease of access and convenience, with the summer months providing the best fishing. All respondents indicated that they see very few anglers fishing between Reefton and Blacks Point, although the reach beside the camping ground does

attract tourists and young anglers.

The Inangahua River is frequently used for swimming over the summer months. Popular swimming areas include Whirlpool bend (downstream of Blacks Point), the Reefton Swingbridge and the stretch of River adjacent to the Reefton Camping Ground and the Strand.

The Bottled Lightning Powerhouse Walk is a popular walk taking around 50 minutes round trip to complete. The walk was established to coincide with the electricity centennial celebrations of 1986-88 and gives access to the historic powerhouse site. The walk starts at the Reefton Visitor Centre and heads up Broadway to the swing bridge over the Inangahua River, returning via Rosstown Road and the State Highway bridge. This walk is promoted by a number of organisations including Reefton i-site and via Reefton's promotional website. Informal carparking is provided off the State Highway at the Reefton swingbridge which enables people to park and undertake the short walk to the powerhouse site.

2.7 Domestic Water Supply

Water from Auld Creek is utilised as a domestic supply by one resident in Blacks Point. A polythene pipeline runs parallel to the canal and crosses the Inangahua River downstream of the gravel sluice, suspended high above the river. The proposal will not impact this water supply in any way.

2.8 Cultural Context

The Inangahua River was used by iwi before contact with Europeans as a transport route and a source of food. A Cultural Impact Assessment was not considered necessary by iwi and no matters of concerns have been raised.

3.0 Project Description

3.1 Scheme Rebuild

The proposal is to restore and rebuild Reefton's historic power scheme. The intake, parts of the water race and tailrace are largely intact but significant repairs are required to re-instate the scheme to generate electricity. The historic 1908 and 1935 powerhouses are to be re-built, replicating the original appearance of these buildings as closely as possible. Associated with restoration of the earlier powerhouses, the Applicant proposes to erect a small building that will house a modern turbine and generator. The modern plant will be the primary generator of electricity.

The physical dimensions of the intake and water race constrain the maximum take from the Inangahua River to 3.5m³/s. A minimum flow of 2m³/s will be maintained in the 2km section of river impacted by the Scheme, with this increased to 2.3m³/s over the February to April period. Automatic gates at the gravel sluice will be used to control flows into the water race. A fish by-pass will also be located immediately downstream of the gravel sluice to enable fish to by-pass the system.

Based on modelling of flow data, the project is expected to generate electricity output of approximately 150kW. Electricity generated by the scheme will be injected into the existing Westpower 11kV distribution network.

Associated with generation of electricity, it is proposed to develop and improve the existing powerhouse walk as visitor attraction. The intention is to create an interpretative walking tour that will educate residents and visitors alike on Reefton's electricity generation heritage, with the powerhouse site being the focus for a range of interpretative displays.

Below is a description of the current state of the various components of the Scheme and what re-building work is required. This is then followed by a description of the construction activities proposed in order to restore the various Scheme components. An aerial overview of the proposed works is provided in **Appendix 6** and design plans are provided in **Appendix 7.** Both Appendices should be referenced when reading this section of the report.

3.1.1 Intake

The intake is located approximately 100m downstream of the Blacks Point swing bridge and is a concrete structure extending 8.5m from the true left bank of the Inangahua River. It comprises concrete apertures that allow water into the race, with steel bars on the outer face designed to prevent debris from entering the race. Two of the apertures have broken away and the steel 'trash racks' are in poor condition and require repair.

Scouring of the riverbed periodically lowers the bed at the point of intake into the water race. The intention is to construct a 40 tonne rock groyne immediately downstream of the intake structure. It is anticipated that the groyne will cause sediment to accumulate on the upstream side to maintain the bed at the same level as the water race.

3.1.2 Water Race and Service Road

The water race is approximately 1850m long, with re-instatement to involve the following (described from the intake, working downstream to the powerhouse):

- ***230m of concrete canal*** – the first section of water race comprises a concrete wall built along the true left bank of the river. The canal is in relatively good condition but the base of the wall has been subjected to scouring and undermining and minor cracks and slumps in the concrete wall require repair. Gravel and rock debris has accumulated within the canal and will be removed. Re-construction of a 'timber roof" is proposed where a small slip has filled a short section (around 20m stretch) of the water race. The timber roof will prevent material from falling into the canal and was a feature of the historic scheme.
- ***Gravel sluice*** – the sluice is in good condition but is missing the gates and control mechanisms. These will be replaced with new components copied from authentic structures elsewhere. Minor repairs to the concrete structure and removal of accumulated silt and debris is also required.
- ***430m of earth tunnel*** – downstream of the gravel sluice is open earth race, of which approximately 110m has been partially filled-in where it crosses Farnham's property. Accumulated debris and growth will be cleared away and timber remnants removed to restore the original profile.
- ***100m of rock tunnel*** – timber fluming within the tunnel is believed to have formed part of the original scheme with remnant timber evident. Most of the tunnel is open and stable, with the exception a short section through the centre where a slip has resulted in collapse of the tunnel. Timber fluming will be re-instated and the slipped section will be bridged with timber fluming.
- ***170m of timber flume*** – downstream of the tunnel is a side cutting that carried timber fluming with a walkway on top. The fluming has largely disappeared and will be replaced with a replicated section.
- ***730m of concrete wall/earth bank*** – this section of the water race comprises concrete wall/earth bank. The race is filled to varying degrees with accumulated material. Reinstatement will require removal of overgrown vegetation and excavation of accumulated soil/gravel. Around 105m of concrete panels has been removed and will require replacing, otherwise the concrete walls appear in good condition
- ***190m of timber flume*** – nothing remains of the timber flume that carried water to the powerhouse penstocks. New wooden fluming will be installed replicating the original design as closely as possible.
- ***Penstock Headwall***- A Y-shaped concrete structure at the bottom end of the water race directed water into either the 1908 or 1935 penstocks. The concrete is in good condition but the control gates and lifting mechanisms have been removed along with the 1935 penstock. These components will be replaced with new components replicating the original as closely as possible.

In conjunction with repair of the water race, re-instatement of the service road will be completed. The road was approximately 900m long and extended from the powerhouse up towards the tunnel. The road will be used to bring construction materials and to enable future servicing of the water race.

3.1.3 Powerhouses

The 1908 powerhouse was the largest and most complex at the site with remains including the concrete lined turbine pit and a series of other concrete floors related to dynamo foundations, the watch room, diesel plant foundations, workshop, veranda and washroom. Part of the 1935 powerhouse floor has been damaged, otherwise the foundations appear to be in reasonable condition. Nothing remains of the 1888 powerhouse but the archeologist's report suggests that some remains could lie beneath the workshop and veranda floor of the 1908 powerhouse building.

The re-built 1908 powerhouse will be constructed over the site of the historic 1908 powerhouse building using historic and new foundations. If any remnants of the 1888 powerhouse are discovered beneath the workshop floor they will be incorporated into the new building floor where practicable. The re-built 1908 powerhouse will contain interpretative displays tracing the history of the Scheme.

As part of the re-construction of the 1935 powerhouse, the Applicant intends resurrecting the turbine and penstock by installing a suitable generator and switchgear of a similar vintage to achieve an operable unit for visitor display purposes.

In conjunction with restoration of the historic powerhouses, a new building is proposed to be constructed which will house a modern turbine, generator, switchboard and controls. The modern plant will be the primary generator of electricity for the Scheme.

Restoration of the 1908 and 1935 powerhouses will replicate the original appearance of these buildings as closely as possible. Concept plans have been provided by conservation architect Chris Cochran, with these contained in **Appendix 7.** Both the historic and modern powerhouse buildings will have timber cladding and corrugated iron roofs, with the concept plans giving an indicative colour scheme for the buildings. The footprint of the respective buildings is summarised in **Table 3** below:

Table 3: Powerhouse Building Dimensions

	Modern Powerhouse	1908 Powerhouse	1935 Powerhouse
Ground floor area	22m²	202m²	33m²
Maximum height	5400mm apex	4370mm apex	6840mm apex

Provision for parking and landscape planting around the buildings will also be undertaken, as detailed in the Site Plan for the powerhouse complex contained in **Appendix 7.**

3.1.4 Tailrace and Spillway By-pass

The tailrace comprises a 150m long channel leading from the historic Powerhouse site into the Inangahua River. The original channel was approximately 3m wide and 1m deep, with some excavations required to achieve the original dimensions.

The original by-pass for the Scheme will also be re-formed and will incorporate the spillway for the modern hydro plant.

3.1.5 Transmission Line

Electricity to the new powerhouse will be provided by means of a new 11kV transmission line spanning the Inangahua River immediately upstream of the proposed powerhouse buildings. Connection will be into the existing Westpower line and will require a new concrete pole with transformer. The new transmission line will cross the State Highway at a height of approximately 25m. Power generated by the Scheme will be injected into the existing Westpower Ltd network via the same line. Details on the location and proposed design of the new pole is provided in **Appendix 8.**

3.2 Construction Activities for Rebuild of the Scheme

Initially, the focus will be on restoration of the Scheme to generate electricity. The Applicant anticipates that construction will be staged as funds allow. **Stage 1** will involve rebuild of the intake, water race, tailrace, construction of a new powerhouse for the modern generation plant and installation of the transmission line and pole for connection into the existing Westpower Ltd network.

Depending on river levels, it is envisaged that work would commence with repair of the intake structure progressing downstream with the rebuild of the water race and tailrace/spillway. Given the service road is required to transport materials to the lower reaches of the water race, it is expected that this will be completed early in the construction phase. At the same time, construction of the new powerhouse building is expected to be undertaken. It is anticipated that Stage 1 will be completed within 9 months (approximately).

Stage 2 will involve repairs to the historic powerhouse foundations, re-build of the 1908 and 1935 powerhouses, installation of refurbished historic generation plant and erection of interpretative display material. Landscape planting around the powerhouse will also be undertaken. Stage 2 is expected to be completed within 6 months (approximately).

Over the construction period it is anticipated that employment will be provided for 4-6 people, with hours of work being Monday to Saturday, 7am to 6pm. No construction activity will occur on Sundays or statutory holidays.

The following describes the proposed construction activities for the various Scheme components in more detail:

3.2.1 Intake Repairs & Groyne Construction

Repairs to the intake will require temporary diversion of the river away from the intake structure to allow the rebuild to be undertaken in dry conditions. The temporary diversion will be undertaken by a 20 tonne digger (approx) during a period of low flow and will involve excavation of a short section of temporary channel away from the intake structure. The same excavator will be used to remove damaged sections of the intake apertures and undertake repairs at the canal slip. Two of the apertures will be rebuilt and all four 'trash racks' repaired to the existing pattern. Steel housing will be placed in all four apertures to accommodate new wooden gates to enable flow into the water race to be shut-off to allow future maintenance.

The anticipated volume of concrete required for repair of the intake and concrete canal (which will be repaired at the same time), is 24m^3, equating to 6 concrete truck trips. Given the volume of concrete required for the repair work, it is anticipated that there will be up to 12 crossings of the river by a concrete truck and 2 crossings for the excavator.

Construction of the 40 tonne rock groyne will occur at the same time as the repairs to the intake. This will necessitate a further 8 crossings of the river (bringing 4 truckloads of rock) with construction of the groyne to be completed over 1 day using the same digger utilized for the intake repairs.

Access for repairs to the intake, canal and construction of the rock groyne will be achieved by crossing the river via existing access off Auld Street (Blacks Point), with machinery crossing the

river at a single crossing point. The total number of crossings associated with the excavator and truck movements is expected to be 22 crossings over a period of 14 days.

3.2.2 Water Race & Service Road Re-instatement

Rebuild of the water race will be undertaken retaining as much of the original features as possible. Timber fluming will be constructed to replicate the original sections and concrete repairs will be limited to repairing missing portions of concrete wall and repairing cracks and slumps.

The following is a description of the works to be undertaken on the various sections of water race. The stretches of earth race and timber flume are approximate only, as these sections may alter slightly depending on final alignment and ground conditions encountered.

- ***230m of concrete canal*** – an estimated 400m^3 of accumulated gravel and rock requires removal over this section of the water race. This will be achieved by a small excavator (approx 7 tonne) working from within the water race. Excavated material will be placed against the base of the outer wall to protect the structure from scouring. Re-instatement of the canal will also require cracks and slumps in the concrete wall to be repaired. Damaged sections will be boxed and concrete carted by means of hand-burrow down from the intake. These repairs will be undertaken at the same time as concrete repairs to the intake over a 2-week period.

  Two options are proposed to be consented for repair of the 20m section of canal impacted by the small slip. Whichever option is selected, work will be undertaken in accordance with the geotechnical engineer's recommendations set out in the Geotech Assessment provided as **Appendix 9.**

  Option 1: Excavation of the filled section of canal by means of 20 tonne digger working from the riverbed with excavated material to be either placed against the base of the outer wall (if it involves rocky material) or trucked off-site. A 'timber roof' will then be constructed over the slipped section to prevent debris from falling into the canal as per the design plan included in **Appendix 7**. Construction of the timber roof will involve progressive installation of timber decking, extending from the concrete wall into the adjacent bank and a section of reinforced concrete along the bank edge of the canal to buttress the wall. This is the preferred option as it maintains the historic integrity of the water race.

  Option 2: In the event that Option 1 does not provide a long-term solution and the slip continues to impact the canal, a new straightened section will be constructed around the slip zone as outlined in the Geotech Assessment.

- ***Gravel sluice*** – reinstatement requires installation of new wooden gates, control mechanisms, removal of accumulated silt/debris and minor concrete repairs. A debris screen will be located immediately upstream of the sluice to prevent large debris entering the system. The sluice gates will be built off-site and installed during the rebuild of the canal. The sluice will include a main flow control gate to control flows downstream, this gate can be closed for maintenance purposes or during extreme flood events. A sluice gate will also be a feature and will allow accumulated sediment to be intermittently flushed back into the River.
- ***Fish Screen & Bypass*** – although not a feature of the original scheme, a fish screen and fish

by-pass will be constructed immediately downstream of the gravel sluice. The purpose of which is to prevent entrainment of adult eels and juvenile trout >100mm. A concept design for the fish screen and by-pass facility has been provided by Riley Consulting with this report attached as **Appendix 10.**

- ***430m of earth race*** – the existing access track will be cleared of vegetation to allow access to this section of race. Rebuild of the earth race will involve clearance of over-grown vegetation and removal of around 200m³ of accumulated silt/soil. Excavated material will be spread adjacent to the race and access track. Sealing of the base of the earth race will be achieved by using a synthetic liner covered with compacted gravel. Approximately 200m³ (equating to 11 loads) of gravel will be bought in for sealing of the earth race. Access will be via the existing routes of Syphon track ford and the Farnham ford, with the anticipated number of crossings for construction materials and machinery in the order of 30 trips.

  Approximately 110m of earth race passes through Mr Farnham's property, this section of the race will be abandoned and a new section constructed on unformed legal road. Final design is yet to be confirmed but is expected to involve construction of an open earth trench and a short stretch of timber fluming to link to the tunnel. Should timber fluming be required, this will be transported across the river in discrete sections.

- ***100m of tunnel*** – the tunnel roof and walls will be supported with sets of timber framing followed by installation of wooden fluming built in-situ. Installation of fluming across the collapsed section of tunnel will require spiraling through the slip debris to create a platform for the flume. The 12m section of bridging flume will incorporate a roof that will allow debris to spill over the top. Large rock riprap will be placed at the toe of the slip to buttress the slip (as detailed in the Geotech Assessment attached as **Appendix 9**). Rock for this purpose will be retrieved from the riverbed in the immediate vicinity of the slip so it blends with the existing rocky outcrop, although it is expected that a further 2 truckloads of rock may also be required. Excavated soil and debris will be backfilled behind the riprap and contoured around the timber flume. Access to the tunnel will be via the Syphon Ford.

- ***170m of timber flume*** – all wooden fluming will be constructed off-site in 6m lengths and transported to the respective sites as required. Installation will require leveling of the narrow cutting and cut-back of the adjacent bank to allow installation of the new sections of wooden flume. Excavated material is expected to be utilised as cut and fill. Sections of flume will be bought in via the service road. Small concrete pads will be poured on-site and the wooden flume will affix to these.

- ***730m of concrete wall/earth bank*** - re-instatement will involve removal of over-grown ferns, shrubs, gorse and broom and excavation of accumulated soil/gravel. It is estimated that 2500m³ of material will need to be removed from within the race and this will be undertaken by a small digger working from within the race. Extracted material will be utilised as part of re-instatement of the service road and to fill depressions adjacent to the water race and access road. Some repairs will be required to sections of damaged concrete walls. This will be achieved by boxing discrete sections to allow new concrete work. As with the earth race, the base of the race will be sealed by using a synthetic liner covered with compacted gravel. It is anticipated that up to 538m³ of gravel will be required for lining purposes to be bought in by 6-wheel road trucks via Rosstown.

- ***190m of timber flume*** – Installation will be as per the upstream sections of wooden fluming

with ground leveling and removal of some pine trees required.

- ***Penstock headwall*** – The inlet flume will be extended to incorporate the penstock of the modern plant. The original concrete structure will be repaired and new control gates and lifting mechanisms installed, replicating the original as closely as possible

In conjunction with repair of the water race, re-instatement of the service road will be completed. The first 400m is in reasonable condition while the remaining stretch requires repair and re-surfacing. Low sections of the road will be built-up to provide support for the water race walls. Gravel for this purpose will be sourced from a gravel fan (approximately 1000m^3) adjacent to the service road, along with suitable material excavated from the water race.

The service road crosses the water race approximately 300m from the Powerhouses, at which point a small wooden bridge (approximately 3m long) will be installed. Culverts will also be installed across three un-named watercourses (<1m bed width).

3.2.3 Powerhouses

The initial focus will be on construction of the modern powerhouse to enable electricity to be re-established as quickly as possible. This will entail minor excavations over the building footprint (22m^2) to establish a foundation slab. A concrete floor will be poured and construction of the building and penstock will then follow. Once the building has been erected, the generation plant and equipment will be installed.

As regards the historic powerhouses, stabilisation of the existing foundations will be achieved by establishing a concrete retaining wall system ('Stone Strong' blocks), as per the concept plans contained in **Appendix 7.** Ground at the foot of the terrace will be excavated approximately 800mm to the natural gravel bed for a foundation slab. The Stone Strong retaining wall will be erected to protect the western face of the terrace from further erosion. The retaining wall will be designed to prevent damage to the historic foundation part way down the face near the original veranda. The workshop floor (which may lie over part of the 1888 powerhouse site) and the floor of the 1908 powerhouse turbine pit will be removed so that the eroded spaces can be filled with pre-cast concrete pipes and compacted gravel. The pipes will enable water to pass under the site if required for some future development such as re-use of the turbine. Both floors will be replaced and the foundation blocks for the 1938 diesel starting equipment will be restored to their correct positions, if they have to be removed for the filling operation.

A new building for interpretive displays will then be built over the site of the 1908 powerhouse complex using historic and new foundations. If any remnants of the 1888 powerhouse are found underneath the workshop floor they will be incorporated into the new building's floor where practicable.

Re-construction of the 1935 powerhouse will require broken concrete foundations, floors, parapets and steps to be repaired and recast using the originals as patterns. A new penstock and draught tube will be installed along with turbine, generator and electrical equipment resembling the originals as closely as possible. On the upper level, the paths running to the north-western corner of the workshop will be relaid along with the adjacent portico floor and up-stands. Construction of the powerhouse buildings will then follow.

Construction access will be via Rosstown road, with storage of construction materials and parking

to be provided adjacent to the powerhouse building. A number of pine trees may be removed to improve the existing turning circle and provide additional room for temporary storage of construction materials, otherwise only minor vegetation disturbance and earthworks are envisaged. On completion of the powerhouse rebuild, landscaping will be undertaken around the site and interpretative displays erected. No lighting is proposed other than security lighting at the entrances of each of the powerhouses.

3.2.4 Tailrace and Spillway By-pass Re-instatement

Up to 170m^3 of sand/gravel is expected to be excavated from the existing tailrace and spillway channels to achieve the required profiles. Excavated material will be deposited in depressions adjacent to the channels and contoured to the surrounding ground level. Due to the low flow velocity, scouring of the channels is not anticipated. However, the last 30m of the tailrace where it enters the Inangahua Riverbed will be lined with rock riprap to ensure the exit point does not scour. Rock riprap will also be placed along the first 20m of the modern plant spillway and at the junction of the spillway and the tailrace.

Up to 250 tonnes of rock will be required for lining purposes, with rock expected to be sourced from Echo Mine and bought in by 6-wheel road trucks via Rosstown.

Excavation of a shallow channel over a short section of dry riverbed may be required from the tailrace discharge point into the active river channel. This will be assessed during works to re-instate the tailrace.

3.2.5 Transmission Line

Construction of the new span of overhead transmission line will require installation of one new power pole, located as per the site plan provided in **Appendix 8**. An excavator will track some 50m from the powerhouse to gain access to the pole site. A number of pine trees may require removal to achieve clearance beneath the line feeding to the power station. The pole and new transmission line will be installed by Westpower Ltd.

3.2.6 Hazardous Substances

A mobile tanker (expected capacity of 1200 litre) will be utilised on-site for re-fueling of construction machinery. All road trucks will be re-fueled in town. No mechanical repairs will be conducted on-site nor will any refueling occur within 10m of the Inangahua Riverbed.

A range of other hazardous substances will also be utilised including small quantities of oil and petrol (for running chainsaws etc) and cement (including pre-mixed concrete) as part of repairs to various components of the Scheme.

3.2.7 Construction Traffic

For **Stage 1,** being a 9-month period for re-instatement of the hydro components and construction of the modern powerhouse, the main access for the project will be via Rosstown Road. However, re-instatement of the upper reaches of the water race up to the intake, will require access via Auld Street at Blackspoint and via Syphon and Farnham Fords off State Highway 7 (near Whirlpool bend). The following vehicle movements have been estimated:

Rosstown
Light vehicle movements associated with contractors and project management in the order of 8 per day (being 16 vehicle movements). With peak movements at the start and end of the work day (Monday to Saturday 7am to 6pm).

Heavy vehicle movements via Rosstown Road are detailed below. (Note: reference to trucks relates to road trucks only and does not include any trailers).

- 20 trucks (40 trips) associated with delivery of sections of wooden flume. Truck movements are expected to be staggered to allow progressive installation of fluming, with around 2 trucks per week expected during this phase of work.
- 76 trucks (152 trips) carting gravel required for lining of the downstream section of the water race. Truck movements will be limited to 2 trucks (4 trips) per hour over a period of 10 days to allow progressive laying and compacting of the material.
- 25 trucks (50 trips) carting rock for lining of the tailrace and spill-way. Truck movements will be limited to 2 trucks (4 trips) per hour over a period of 2-3 days.
- 20 concrete trucks for repairs to sections of concrete wall and construction of the modern powerhouse. Truck movements will be limited to 2 trucks (4 trips) per day to allow preparation for each concrete pour.
- Occasional heavy truck movements associated with delivery of building materials for construction of the modern powerhouse and installation of the generation plant, culverts etc.

Heavy vehicle movements are expected to be staggered over the construction phase as repairs/construction will proceed in a progressive manner. It is anticipated that the most intensive period of heavy vehicle movements will be during cartage of gravel and rock to the powerhouse site, however truck movements will be limited to 2 trucks (4 trips) per hour over this phase of work and completed within a short timeframe.

Blacks Point
Construction access for repairs to the intake, construction of the rock groyne and repairs to the canal will be off Auld Street via a temporary ford through the Inangahua River. Crossings by heavy machinery is expected to be limited to 22 crossings over a period of 2 weeks.

Construction access for the section of water race between the gravel sluice and the rock tunnels will be via Syphon Ford and the Farnham Ford. Crossings by heavy vehicles will include a 30 tonne dump truck carting gravel (for lining purposes) and tracking of excavators utilised for construction/re-instatement of the earth trench and timber fluming. Light vehicles are also expected to utilise the ford to enable access to the south bank. Use of the temporary fords is expected to be for a period of 3 weeks.

For **Stage 2,** being a 6-month period for re-construction of the historic 1908 and 1935 powerhouses and ancillary works, access will be via Rosstown Road. It is anticipated that light vehicle movements will be around 6 per day (being 12 vehicle movements) comprising trade persons involved in construction of the powerhouse building and visits associated with project management.

Heavy vehicle movement will also occur over this period associated with delivery of building materials, generation plant and concrete repairs. There will be periods when there will be daily deliveries of construction materials such as the Stone Strong blocks, framing and cladding materials however, truck movements are expected to be intermittent and staggered as building progresses.

3.3 Operation and Maintenance of the Scheme

3.3.1 Power Generation and Flow Regime

Several generator options have been considered for the Scheme. However, selection of a modern plant as the primary generator will maximise revenue flow to assist in achieving a sustainable project. Electrical engineer, Peter N Rue, has predicted generation through modelling of flow data. The modern plant is expected to generate an output of around 150kW, (refer the Project Feasibility Report attached as **Appendix 11**).

Generation modelling predicts that the Scheme will operate at full capacity 65% of the time. The generator will ramp down automatically as river flows reduce. Remote technology from the powerhouse will be used to control flows through Scada telemetry equipment and measurement of river levels at the existing Blacks Point flow gauge. Automatic gates at the gravel sluice (solar powered and controlled from the power station) will be used to shut-off flows into the water race to maintain the required minimum flows (2.3m³/s over February to April inclusive and 2m³/s at all other times).

Total water usage will be gauged by the power output of the generator, as such flow metering is not proposed to be installed. However, records of the water take for the scheme will be maintained to ensure compliance with Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

3.3.2 Maintenance

The gravel sluice is designed to trap sediment to ensure the turbine generation system is not impacted by abrasive material. The sluice will be regularly inspected and the gates opened to flush accumulated sediment back into the river at regular intervals.

A debris screen will be located upstream of the gravel sluice to intercept debris and prevent blockage of the smaller aperture fish screen. The debris screen will require manual cleaning following any significant high flow event. The fish screen will be located immediately downstream of the sluice and will also require manual cleaning but the sluice gates and debris screen upstream will reduce the quantity of sediment and debris at the fish screen. Regular inspections of these screens will be undertaken.

In the event of an unexpected generator fault, the spillway by-pass allows flows to be diverted past the powerstation and discharge directly to the tailrace. Routine maintenance is expected to be scheduled during periods of low flow when the powerstation is not generating or generating minimal electricity.

Regular inspections will be undertaken of the intake, water race and tailrace to ensure the integrity of the respective structures is not impaired in any way. In the event of maintenance being required, the water race will be closed at the gravel sluice, and if necessary, the race de-watered through the power station and tailrace to allow repairs to be undertaken.

3.3.3 Visitor Attraction

The powerhouse walk will continue to be promoted as a walking experience. The intention is to create an interpretative walking tour designed for visitors taking an easy scenic one-hour loop from

Reefton's town centre with the powerhouse site being the focal point.

Anticipated visitor numbers for the walking experience have been estimated utilising visitors to the Reefton i-site (2016 visitor record, covering 10-hour period from 9am to 6pm). The Applicant anticipates that up to 15% of visitors to Reefton i-site may undertake the walking experience as represented in **Table 4** below. The months of December to March are likely to be the busiest period, with numbers dropping off significantly during the colder winter months.

Table 4: Summary of Anticipated Visitor Numbers

Month	Average Daily Visitors Through Reefton i-site	Anticipated Average Daily Visitors to Powerhouse Site
January	242	36
February	264	39
March	244	37
April	196	29
May	133	20
June	127	19
July	129	19
August	129	19
September	179	27
October	173	26
November	191	29
December	211	32

Provision for carparking will be made at the powerhouse site to cater for the occasional visitor that may elect to drive to the site via Rosstown. However, vehicle movements are not expected to be frequent, given promotion of the attraction as a walking experience.

The Applicant is continuing to work on interesting ways to engage visitors with the Reefton Powerhouse Scheme. Consultation and research is on-going on a range of tourism products and interpretation plans, with the eventual aim to link the walking experience with existing historic features at Blackspoint. However, the focus of the current application is on providing interpretative displays at the powerhouse complex. Expansion of visitor opportunities, including the need for any additional consents, will be assessed as development of the Scheme proceeds.

4.0 Assessment of Environmental Effects

4.1 Positive Effects

The project will generate a number of positive effects including:

- Providing economic benefits for the community of Reefton in terms of construction and operational revenue and increased employment opportunities.
- Creation of a visitor attraction that will complement existing visitor attractions/recreational opportunities around Reefton and Blacks Point.
- Providing an opportunity to further educate and inform the public of Reefton's electricity history, its place in world history and how it was achieved.
- Conserving and protecting the historic features of the Scheme.
- Generation of 154kW of electricity for Reefton township.

4.2 Terrestrial Ecology

The activities associated with re-instatement of the Scheme are largely confined to the original footprint. The only new components are the potential new section of earth race around the Farnham property (assuming Option 2 is constructed), and construction of the modern powerhouse. Both locations have been subject to modification with little indigenous vegetation present.

The total amount of indigenous vegetation proposed to be removed through the re-build process is estimated to be around 1.5 hectares. The majority of vegetation to be removed is low stature shrubs and ferns. Access tracking will avoid any large trees where practicable. No threatened or rare plant species are known to exist in the area. Natural regeneration of disturbed margins adjacent to Scheme infrastructure is expected to occur relatively rapidly given the proximately to existing indigenous vegetation.

Various indigenous birds and animals are expected to inhabit the application area and surrounds but due to the modified nature of the site and limited disturbance footprint, no fauna surveys have been undertaken. Fauna within the area have been subject to on-going human influences, with mobile species expected to migrate to adjoining areas during construction activities.

Over-all, the terrestrial ecology effects of the proposal are considered to be no more than minor.

4.3 Landscape and Visual Amenity Effects

The Inangahua River is an important element of the landscape complemented by the surrounding indigenous vegetation. However, the affected stretch of River has been subject to modification through the presence of structures i.e. the intake and canal, swingbridges at Blackspoint and Reefton and river protection works. Landscape features adjacent to the River include State Highway 7 and the settlements of Blacks Point and Reefton. The pattern and structure of the surrounding native vegetation has also been subject to human influences over an extended period.

Construction activities will affect the landscape of the immediate area due to traffic movements, machinery activity, vegetation clearance and earthworks. For the most part, activities will be confined to the footprint of the original Scheme footprint and are anticipated to be completed within a relatively short timeframe. Disturbed vegetation along the margins of the upper section of the Scheme (from the tunnel upstream) is expected to rapidly regenerate given the location within

beech-podocarp forest, and new components of the Scheme are expected to weather and blend with the original features over time.

In terms of visual effects, the powerhouse site is not visible from Reefton residents other than glimpses through the trees from immediately opposite the site or from within the riverbed. The site will be enhanced through the re-build of the powerhouse buildings and creation of a more attractive setting, including landscaping and general tidying of the surrounds. The new powerhouse buildings will be painted in recessive colours.

Around half the length of the water race, extending from the powerhouse up to the tunnel, and the service road is not visible from public viewpoints, being contained within pine forest. This will remain unchanged for the rebuilt Scheme. The proposed new transmission line will not be intrusive given it requires the installation of a single pole with the overhead line being approximately 25m above the State Highway

The upstream portion of the Scheme is predominantly within the Inangahua Riverbed or within or close to the riparian margins therefore these aspects are more visible. The intake and canal are existing features visible from various locations at Blacks Point and from within the riverbed. The remedial work required for the canal slip will result in disturbance to adjoining vegetation but this is expected to rapidly regenerate given the surrounding native vegetation. The collapsed section of tunnel has no riparian vegetation growing on the slipped material. The new section of timber fluming downstream of the tunnel will be a new feature that will visible from within the riverbed and from the State Highway when directly opposite this site but for travelers this is likely to involve glimpses through the roadside vegetation.

In conclusion, rebuild of the Scheme will result in new components which will have landscape and visual implications. However, this infrastructure is situated within a landscape that has been subject to human modification over an extended period and the scheme components are low key structures. Given Reefton's historical association with the Scheme, the project is considered to be appropriate development with no more than minor effects on landscape and visual amenity values.

4.4 Heritage Values

The Archeology Report considers the historic Scheme remains to be a rare example of electric generation dating from the 19th century but acknowledges that few of the original features (some ditching and the rock tunnel) remain in an unmodified condition. The Scheme is considered to rate highly in terms of the criteria that determine the overall value of an archaeological site. This includes being a rare example of an electric generation scheme dating from the 19th century; having a special cultural association with the local community (with Reefton branded as 'The Town of Light'); and high amenity values through potential for public interpretation and education. Over-all, the features of the Scheme are considered to have high archaeological value and to comprise a nationally significant complex historically.

The Archeology Report considers that the impacts of the proposed rebuild on these values will be minor. A great deal of the original fabric of the Scheme was replaced during its working life and the current proposal will affect only a small portion of the remaining 19th and 20th century features. Rebuild of the Scheme is proposed to be carried out in a manner that minimises damage to the historic fabric and to replicate the features as close as possible to the original components.

In undertaking the repair work, the recommendations outlined in the Archeological Report will be

adopted. All historic features of the scheme will be mapped and recorded prior to repairs commencing and a suitably qualified archaeologist will be present on-site during earthworks around the original powerhouse sites to search for any significant remains. An Accidental Discovery Protocol will also be adopted to deal with any unexpected discoveries of historic value.

Without this project, the historic remains are likely to continue to deteriorate through natural processes, vandalism and possibly land development (e.g. forestry activities). The proposed rebuild will prevent further loss to the historic fabric and plant through stabilisation and maintenance. Overall, the effects of the proposed rebuild on historic values are considered to be no more than minor.

4.5 Hydrology Effects

The URS Report provided an initial assessment of the hydrological effects of the operation of the Scheme, with a more in-depth analysis provided in the Jowett Report. The conclusions reached by both reports is summarised below:

4.5.1 URS Report

The URS Report initially assessed the hydrological effects of the Scheme using a minimum flow set at 75% of the 7 day Mean Annual Low Flow (7MALF). This is based on Policy 7.3.2 of the WCRC's Regional Land and Water Plan as being the minimum permitted residual river flow. This base scenario envisaged that no take would occur when the River is at or below 75% of the 7MALF i.e. 1.7m³/s.

For this base scenario, modelling established that there would be a 17% reduction at mean flow and 26% reduction at the 7MALF compared to the pre-scheme conditions. If the base scenario was adopted, the generation plant is expected to operate at full capacity 68% of the time.

Three additional minimum flow scenarios were assessed to determine the potential effects of increasing the minimum flow threshold beyond that required by the Regional Land and Water Plan. This was undertaken to assess the extent to which Scheme viability could be impacted by accepting a greater minimum flow in the river below the intake as set out in **Table 5**.

Table 5: Summary of Scenarios and the Corresponding Minimum Flow

Scenario No.	Description	Minimum Flow (m³/s)
Base	Allow for 75% of 7MALF river flow	1.7
1	Allow for 75% of 7MALF river flow + 0.5m³/s	2.2
2	Allow for 75% of 7MALF river flow + 1.0 m³/s	2.7
3	Allow for 75% of 7MALF river flow + 1.5m³/s	3.2

Based on predicted river flow for these scenarios (refer **Table 6**) no change in flow characteristics is observed above the median flow when compared to the base scenario. A slight increase (up to 3%) of mean flow and an increase of up to 34% of 7MALF flows can be expected when the minimum allowable river flow is increased by 1.5m³/s compared to the base scenario. Flood flows do not vary between these scenarios and the base case.

Table 6: Summary Statistics for Inangahua River for Current Flow and All Scenarios

Scenario No.	7MALF (m^3/s)	25th Percentile Flow (m^3/s)	Median Flow (m^3/s)	Mean Flow (m^3/s)	75th Percentile Flow (m^3/s)	Peak Flow (m^3/s)
Base	1.7	1.7	4.8	14.1	15	571.3
1	2	2.2	4.8	14.2	15	571.3
2	2.2	2.7	4.8	14.4	15	571.3
3	2.3	3.2	4.8	14.5	15	571.3

For scenario 1, raising the minimum flow to $2m^3/s$ lowers the generation at full capacity from 68% to 65% of the time, giving about 3% less generation on an annual basis than the base case.

The Applicant is proposing to adopt a $2m^3/s$ minimum flow regime for operation of the Scheme, increasing to $2.3m^3/s$ over the months of February to April, with this discussed in more detail below.

4.5.2 Jowett Report

Further assessment of the hydrological impacts of the Scheme was undertaken by Jowett Consulting Ltd ('Jowett Report') to inform the assessment of aquatic effects. (Note: the flow data used in this report differs slightly from the URS report as URS used data to 13 November 2012, whilst the Jowett Report used data to 8 January 2013).

The proposed generation turbine cannot operate on very low flows (generally 20-40% of maximum turbine rating) nor during floods when coarse sediment is being carried into the water race. Under these flow scenarios the intake will be shut down via the control gate at the gravel sluice. On this basis the Jowett Report modeled the effect of power generation using a maximum generation flow of $3.5m^3/s$ (the proposed maximum intake capacity) and minimum generation of $1.4m^3/s$ (40% of maximum) with a minimum flow of $2m^3/s$ maintained in the river below the intake. Modeling also assumed closing of the water race when instantaneous river flows exceeds $50m^3/s$.

Under these operational conditions, modelling determined that the changes to the flow regime in the 2km stretch of river affected by the power scheme is expected to be minor, with slightly prolonged periods of minimum flow. The average time between flow events of FRE3 in the residual river is only about 1 day longer than that in the natural river. This is a relatively high frequency of floods and freshes and will remove accumulations of fine sediment and filamentous algae. Large floods will be substantially unchanged and these will maintain the present channel morphology.

Subsequent to the preparation of the Jowett Report, consultation has occurred with West Coast Fish & Game who raised concerns over the duration that the Scheme will result in River flows at or below MALF and the impact this will have on the trout fishery. As a result of this consultation, the Applicant is now proposing a variable flow regime for operation of the Scheme whereby a minimum flow of $2.3m^3/s$ will be maintained between the months of February and April (being a traditional low flow period) and $2m^3/s$ at all other times.

Mr Jowett undertook further modelling to reflect this variable flow regime with this is discussed in a brief Addendum attached in **Appendix 5**. This modelling also included revising the minimum generation flow for the Scheme down to $1.2m/s^3$, following advice from the turbine supplier (the original assessment had assumed a minimum of $1.4m^3/s$). Operating the Scheme under these flow conditions will reduce the number of days the River is below MALF naturally from 14.4 days to an average of 63 days per year. The median daily residual River flow will be reduced from $8.1m^3/s$ to

4.6m³/s. The median length of time when the flow is expected to be below MALF is 3 days and in an average year the maximum duration of River flows less than MALF is expected to be 11 days.

Based on the Jowett Report and the Addendum, the changes to River flows in the 2km stretch affected by the Scheme will be no more than minor with slightly prolonged periods of minimum flow.

4.6 Freshwater Ecology Effects

The Freshwater Solutions and Jowett Reports assessed the potential adverse effects associated with construction and operation of the Scheme as follows:

4.6.1 Construction Effects

The potential adverse effects associated with construction activities are:

- Reduced access for angler and recreational users;
- Reduced water clarity and associated negative effects on swimmers and anglers;
- Negative effects associated with suspended sediment (eg. visual feeding efficiency for trout) and deposited sediment (eg. benthic invertebrate community health).

As regards access for anglers and recreational users, there will be no need to physically exclude the public from accessing the river during construction activities. Existing fords will be used for access with machinery activity focused on the true left bank which is not readily accessible to the public.

In terms of water clarity, construction activities that have the potential to reduce water clarity include river crossings, reinstatement of the intake and canal, placement of the rock groyne and stablisation of the collapsed section of tunnel. Use of the Syphon track ford and repairs to the collapsed section of tunnel will be downstream of Whirlpool bend so will not impact this swimming hole. Construction activities are of short duration and there are other alternative locations for people to swim and fish therefore the effects on swimmers and other users of the river are expected to be no more than minor.

The Freshwater Solutions Report notes that even a small decrease in water clarity can adversely affect the foraging efficiency of trout. Given the anticipated short duration of construction activities within the bed of the River and hence potentially decreased water clarity, the effects on trout foraging is expected to be no more than minor.

4.6.2 Operational Effects

The potential adverse effects associated with operation of the Scheme are:

Instream Habitat

Brown trout spawning habitat was assessed in the Jowett Report and determined that there is very little suitable spawning habitat in the reach of the River proposed to be impacted by the Scheme. Mr Jowett is of the view that a flow of 1.8m³/s provides maximum brown trout spawning habitat thus a winter minimum of 2m³/s should provide a suitable spawning flow with little if any benefit from a higher flow.

A minimum flow of 2m³/s is expected to provide at least 88% of habitat for brown trout (<100mm, juvenile and adults) as well as at least 90% of benthic invertebrate and food producing habitat. A flow of 2m³/s provides over 100% of the amount of habitat at the MALF for brown trout < 100mm, 95% of the habitat at the MALF for juvenile brown trout and over 96% at the MALF for *Deleatidium* and *Nesameletus.* A 10% reduction in habitat for native fish is considered unlikely to affect their numbers due to the densities of native fish, particularly torrentfish, being low with habitat loss of 10% expected to maintain existing population levels.

Although a flow of minimum flow of 2m³/s is expected to retain 88% of trout habitat, the reduction in median flow is likely to reduce the food producing capacity of the affected section of river and reduce the number of adult trout (>20cm). Using the brown trout model (Jowett 1992), the predicted reduction in the number of large and medium trout is 28% compared to 35% if the minimum flow of 1.7m³/s was adopted.

Water Temperatures

The magnitude and rate of change in water temperature depends on meteorological conditions such as radiation, air temperature, shade and flow. The temperature of water in a river is influenced more by climate than by river flow. Flow does not have a large effect on daily mean water temperature, but a reduction in flow will increase diurnal variation by increasing temperatures in the afternoon and decreasing them in early morning.

The Inangahua River upstream of Blacks Point is within an open farmed valley compared to the more constrained forested reach between Blacks Point and Reefton. Therefore, river water temperature is expected to be reducing through the affected reach and operation of the Scheme is not expected to have any significant effect on water temperatures.

Algal Growths

The Inangahua River in the affected reach is characterised by regular freshes and high-water quality that restricts algal growths to thin films and mats. The frequency of freshes and short duration of periods at MALF is expected to prevent accumulation of filamentous algae and fine sediment.

Fish Screen

A fish screen and fish by-pass will be installed immediately downstream of the gravel sluice. The purpose of which is to prevent entrainment of adult eels and trout >100mm. A concept design for the fish screen and by-pass has been provided by Riley Consulting, attached as **Appendix 10.**

The fish screen will be designed to meet the criteria of 10mm mesh/bar spacing and 0.3m/s approach velocity. The screen will be angled across the race to achieve the approach velocity with a sweep velocity towards the fish by-pass back to the River. The orientation and approach velocity of 0.3m/s is expected to assist with diverting fish that are less than 100mm in length towards the fish by-pass and back out into the River.

For those trout that make it through the fish screen, fish can pass through low head turbines with low mortality. The proposed turbine is a low head regulated axial turbine and this type of turbine usually has a large diameter and low rotational speed, both resulting in low fish mortality.

4.6.3 Summary

In summary, the main effect of the Scheme's operation will be on adult trout, where numbers could be reduced by up to 28% within the impacted reach, primarily due to a reduction in food availability. However, the critical consideration is that the proposal will only impact a short (2km) section of the Inangahua River. On this basis, the effects of the Scheme on aquatic ecological values, including on the trout fishery is considered to be no more than minor.

4.7 Recreational Values

The Freshwater Solutions Report considered the potential adverse effects on recreational values during the construction phase. The conclusion reached, is that effects on swimmers and anglers are not expected to be significant given the short duration of construction activities, the relatively low angler use of the affected reach of the River and the fact that there are other alternative locations for people to swim and fish.

Once the Scheme is operational it is unlikely that recreational users will discern any decrease in River flows given the relatively small volume of abstraction. Furthermore, abstraction will cease during low flow periods to ensure a minimum flow of at least 2 m^3/s is maintained in the River below the intake.

In terms of possible disruption to walkers utilising the Bottled Lightning Powerhouse, the only point of interaction between walkers and construction activities will be during the re-build of the powerhouses. A safe by-pass around the powerhouse construction site will be identified with appropriate signage to allow walkers to continue to utilise the loop track.

Over-all, disruption to recreational activities will be short-lived and swimming and fishing activities will be largely unaffected once the Scheme is operational. On this basis, impacts on recreational values are considered to be no more than minor.

4.8 Land Stability

Two sections of the water race have been affected by small land-slips, resulting in a collapsed section of the tunnel and infill of a section of the canal with slip material. Both sites have been assessed by a qualified geotechnical engineer from Geotech Ltd, with the report attached as **Appendix 9** ('Geotech Report').

The conclusions reached in this report are summarised below:

4.8.1 Canal slip

A colluvium slip has come down from the bank above the canal and deposited material in the canal, over a stretch of approximately 20m. Vegetation has established on top of the slip stabilising the surface material for the time being. The concrete canal has acted as bunding stabilising the toe of the slip.

The original Scheme included a timber roof over this section of the canal, allowing slip debris to flow over the top and deposit at the toe of the canal wall. The Applicant proposes rebuilding this component. In the event that this does not prove an effective mechanism and the canal continues to be impacted by slip material, further advice will be sought on possible engineering options to

stabilise the slip and retain the existing canal alignment. Should this not prove viable, then the Applicant will construct a new section of canal around the slip zone as outlined in the Geotech Report.

4.8.2 Tunnel Slip

The slip through the tunnel impacted a 12m stretch and has left 2 portals day-lighting at both sides. The tunnels daylight in blocky but competent greywacke with insitu bedrock approximately 1-2m horizontally back towards the scarp of the slip at the level of the tunnel. There is little vegetation growing on the slip material indicating that the surface is active.

Under natural conditions unaffected by any anthropogenic influence, the Geotech Report considers the slip will continue to fail during heavy periods of rain saturating the colluvium above, along with undercutting of the toe when the river is in flood inducing localised land sliding at the site. Remedial work to address stability at the site will be undertaken in accordance with the Geotech recommendations, including placement of rock riprap at the toe of the slip to buttress the slip. The Geotech report concluded that under careful management, site stability will be improved in the long term.

4.9 Hazardous Substances

A mobile tanker will be used for refueling machinery during construction activity (expected capacity of 1200 litre), however, all road trucks will be re-fueled in town. Management practices will ensure that no refueling occurs within 20m of the Inangahua Riverbed and that re-fueling is undertaken in such a manner that spills do not occur. No mechanical repairs will be conducted on-site
A range of other hazardous substances will also be used including small quantities of oil and petrol (for running chainsaws etc) and cement (including pre-mixed concrete) required for repairs to concrete infrastructure. Hazardous substances will be managed in accordance with regulatory requirements. Contractors will be expected to be trained in the use of hazardous substances along with ensuring appropriate emergency spill kits are retained on-site.

4.10 Amenity Values

4.10.1 Noise

For the most part, noise from on-site activities is unlikely to be discernible for Reefton residents as the majority of machinery activity will be concentrated along the length of the water race, which is in the rural zone removed from residential dwellings.

Construction of the powerhouse buildings will be similar to any dwelling, with low levels of noise generated during the periodic use of hand tools and a small 1.5 tonne excavator. The most likely source of noise for Reefton residents is during re-instatement of the tailrace and by-pass, where a 20 tonne excavator will be required to re-form the channels and place rock riprap. Noise emitted will be similar in nature and extent as that experienced by residents when rock protection is being placed along the river banks.

The closest residential dwelling to the powerhouse complex is approximately150m (1 Broadway), separated by the Inangahua River, whilst the Reefton camping ground property boundary is approximately 120m from the powerhouse site. Machinery noise may be discernible at these

locations but background ambient noise levels are expected to be reasonably high due to the proximity of the river and State Highway 7. Furthermore, noise generated by machinery will be of short duration and limited to day-light hours and expected to comply with the noise limits stipulated in the District Plan.

Some noise is likely to be experienced by Blacks Point residents during re-instatement of the intake, and canal and placement of the rock groyne. The closest residential dwellings to the canal are located along the river front. However, noise generated by machinery will be of short duration and limited to day-light hours and expected to comply with the noise limits stipulated in the District Plan.

Noise from operation of the modern hydro plant is not expected to be discernible beyond the perimeter of the powerhouse building and therefore readily comply with the District Plan noise limits.

4.10.2 Traffic

Vehicle movements have been described in Section 3, along with the expected frequency of movements. Heavy vehicle movements will be limited to the delivery of plant/machinery, construction materials, rock and gravel.

An increase in the volume of traffic will be experienced by Rosstown and Blacks Point residents. As noted above, construction activity at Blacks Point is short duration, whilst heavy vehicle movements through Rosstown will be sporadic with phases of increased activity when rock or gravel is being carted to the powerhouse site and during construction of the powerhouse buildings. Some gravel is expected to be sourced on-site which will reduce truck movements through Rosstown. Signage will be erected at Blacks Point and Rosstown when trucking is occurring so that residents are aware of the potential for encountering heavy vehicles.

Once the Scheme is commissioned, there will only be the occasional light vehicle movement associated with operation of the hydro scheme. Although provision has been made for several carparks at the powerhouse complex, this is in order to meet the District Plan requirements. The expectation is that visitors will walk to the powerhouse site, as is the current practice, and promotion of the attraction will continue to be as a walking experience.

4.10.3 Lighting

No external lighting will be required during the construction phase as activities will be restricted to daylight hours.

For operation of the Scheme, the only external lighting proposed is security lights at the entrance of each of the powerhouse buildings. These will be directed down-wards to illuminate the entrance-ways of the respective buildings and no light spill is expected beyond the immediate powerhouse complex.

Glare and spill is expected to give rise to negligible effects given the separation distances to residential properties and intervening topography and vegetation.

4.10.4 Domestic Water Supply

The only known water supply near the Scheme footprint is a single domestic supply that serves one resident in Blacks Point. The source of the supply is Auld Creek with a pipeline traversing along a historic track above the canal and suspended across the River to Blacks Point. Re-instatement of the canal and gravel sluice will not affect either the water supply line or the source.

4.10.5 Summary

Over-all, the amenity effects related to construction and operation of the scheme are considered to be no more than minor.

4.11 Cultural Values

Consultation with Ngati Waewae has not identified any cultural concerns with the project.

5.0 Planning Documents

5.1 The West Coast Regional Policy Statement (RPS)

The RPS became operative in 2000 and provides an overview of the resource management issues for the region and includes objectives and policies defining the desired environmental outcomes. There is also a proposed RPS which is still going through the development process so little weight can be accorded this document, therefore assessment of the project has been undertaken in relation to the operative RPS only.

Relevant objectives and policies of the RPS are discussed below:

Chapter 6: Heritage

Objective 6 - *To avoid, remedy or mitigate actual or potential adverse effects of resource use, development or protection on heritage and archaeological sites and values that contribute to the West Coast's distinctive character and sense of identity.*

Policy 6.1 - *Promote the identification and protection of heritage values of the region, which include the following:*

(a) Archaeological sites;
(b) Places or areas of special historical, cultural or architectural interest or significance;
(c) Places or areas of intrinsic, recreational or amenity value or of visual appeal.

The anticipated environmental outcome is described as being the protection and conservation of the region's heritage values. Without intervention to preserve the historic scheme, the remaining features, such as the powerhouse foundations and water race will continue to degrade and will eventually deteriorate to a point where refurbishment will no longer be possible. This project is a means to preserve the historic features of the original scheme whilst providing an opportunity to educate and inform people as to Reefton's electricity heritage, therefore the proposal is entirely consistent with the stated objective and policy.

Chapter 8: Water

Objective 8.1.1 - *To manage the quantity of the Region's water resources so as to:*

(a) Meet the needs of a range of uses including the reasonably foreseeable future generations; and
(b) safeguard the life supporting capacity of water and related ecosystems'.

Policy 8.1.1 - *When making decisions over water levels or river flows, or allocating water, the Regional Council will consider the following matters:*

a) The natural availability of the water resource or natural range of levels and/or flows;
d) The relationship of Poutini Ngai Tahu and their culture and traditions with their ancestral lands, water, sites, waahi tap and other taonga;
e) The potential demand for water resources which could have an effect on the following:
(i) Recreational, amenity and intrinsic ecological values,
(ii) Ecological and aquatic values,
(iii) Indigenous flora and fauna.
f) Habitats of trout and salmon;
g) When allocating surface water resources, residual flows are sufficient to maintain or

enhance the life supporting capacity of aquatic habitats and provide for aquatic, amenity and habitat values;

j) The relationship between water quantity and water quality and the effects that water abstraction may have on the ability of a water body to assimilate waste...'

Appendices 4 & 5 contain the technical assessments concerned with hydrology and freshwater ecology. These assessments concluded that the changes to the flow regime in the 2km section of river affected by Scheme will be minor and the resulting impact on water quality, habitat and fish species will also be minor.

Chapter 9: Habitats and Landscapes

Objective 9.3 –*To preserve the natural character of wetlands, lakes and rivers*.

Policy 9.1 - *Preserve the natural character of the West Coast's wetland, lakes and rivers and their margins and protect them, and outstanding natural features and landscapes from inappropriate subdivision, use and development. In deciding whether subdivision, use and development are inappropriate, matters to be considered will include the following: ...*

(b) the extent of sporadic development and its effects on natural character;

(f) the extent to which any subdivision, use or development provides a public benefit.

The Scheme is not located within an outstanding natural feature or landscape.

The Scheme footprint has been extensively modified. Historic photographs of the site and surrounds (dating from 1904) depict the river flats and surrounding hill sides being successively burnt and devoid of any vegetation.

In the intervening period, forestry has been established on the terrace adjacent to the true left bank of the River and indigenous vegetation has naturally regenerated in and around the water race. The proposal will involve removal of vegetation that has over-grown various infrastructure, however, disturbance will for the most part, confined to the footprint of the original scheme. Disturbance to riparian vegetation along the Inangahua River will be minimal ensuring the natural character of the River is maintained.

Policy 9.3 - *Have particular regard to the protection of the habitat of trout and salmon'.*

The instream values of the Inangahua River are considered high and the river is regarded as an important trout fishery for the West Coast. The Jowett Report recommended a minimum flow of 2m^3/s be maintained below the Scheme intake to ensure at least 88% of habitat for brown trout is maintained. This minimum flow has been adopted by the Applicant and will be increased to 2.3m^3/s during the late summer months. A fish screen and by-pass will also be installed to prevent all but very small fish entering the system.

Chapter 14: Energy

In the preamble to this chapter it is stated that*: 'Development of further hydro-electric schemes on some of the region's many suitable rivers should alleviate the degree of its dependence on energy imported from outside the region. This could result in more efficient use of electricity as losses associated with large transmission distances would be reduced. Hydro power also has the perceived advantage of being more environmentally acceptable than production from non-*

renewable sources.'

Objective 14 – *To protect the sustainable management of energy resources*.

Policy 14.1 - *Recognise the importance of an adequate supply of energy resources for the needs of people and communities on the West Coast, provided that this is not inconsistent with other policies in this RPS.*

Although the electricity proposed to be generated is small scale, the Scheme will contribute to the West Coast's power generation capability and support the continued growth of the District.

5.2 The Regional Land and Water Plan (RLWP)

The RLWP became operative in 2014 and provides a framework for the integrated and sustainable management of the Region's water and land resources. The proposal is assessed in terms of the relevant provisions of this plan as follows:

5.2.1 Relevant Objectives and Polices

Relevant objectives and policies of the RLWP are discussed below:

Chapter 3: Natural and Human Use Values

Objective 3.2.2 - *To protect water bodies from inappropriate use and development by maintaining and where appropriate enhancing their natural and amenity values including natural character and the life supporting capacity of aquatic ecosystems*.

Policy 3.3.1 - *In the management of any activity involving water to give priority to avoiding, in preference to remedying or mitigating:*

(1) Adverse effects on:

- *(a) The habitats of threatened species identified in Schedule 7A…*
- *(c) Spiritual and cultural values and uses of significance to Poutini Ngai Tahu identified in Schedule 7C;*
- *(d) The significant natural character of wetlands, and lakes and rivers and their margins…*
- *(g) Existing public access to and along lakes and rivers;*
- *(h) Significant historic heritage.....”*

The application site is not included in the Habitats of Threatened Species listed in Schedule 7A. Nor is the site listed in the Water Supply Values in Schedule 7B. However, the Inangahua River is identified as having cultural value for Poutini Ngai Tahu in terms of kohanga and as a traditional navigation route. The proposal also involves a heritage site.

Objective 3.2.5 – To provide for new and existing renewable electricity generation activities in the region, including small and community-scale generation by:

(a) Recognizing the national significance of these activities;

(b) Recognizing the national, regional and local benefits associated with these activities…

*Policy 3.3.*6 - *Provide for the development, operation, maintenance and upgrading of small and community scale renewable electricity generation activities where the adverse effects on the*

environment are avoided, remedied or mitigated.'

Although small scale, the proposal is consistent with this objective and policy as it will provide community benefits whilst avoiding, remedying and mitigating adverse effects.

Policies 3.3.7 – 3.3.11 require consideration of various qualities and characteristics of waterbodies. All these matters have been addressed by the Jowett and Freshwater Solutions Reports. Of particular consideration is the following policy:

Policy 3.3.11 - *To have particular regard to the following qualities or characteristics of water bodies when considering adverse effects on amenity values:*

- *(a) Aesthetic values associated with the water body;*
- *(b) Recreational opportunities provided by the water body;*
- *(c) Sports fish habitats, as outlined in Schedule 8; and*
- *(d) The extent of use or development within the catchment, including the extent to which that use and development has influenced (a) to (c)'.*

The Inangahua River at Blacks Point and Reefton is included in the Schedule 9 list of swimming areas. The Jowett Report considers that the changes to the flow regime in the 2km impacted reach of River will be minor, with slightly prolonged periods of minimum flow and extreme low flows remaining unaffected. On this basis, the reduction in flow is not expected to be discernible to recreational users.

The Inangahua River is included in the Schedule 8 list of Significant Sport Fisheries with this acknowledged in the Jowett report. Adoption of the recommended minimum flow regime of $2m^3/s$ will ensure that habitat for trout fishery is largely maintained. The number of adult trout present within the impacted reach could be reduced by up to 28% but the Jowett report considers this to be a minor effect.

Chapter 4: Land Management

Land disturbance can cause adverse effects on both the land and water environments.

Objective 4.2.1 - *To avoid remedy or mitigate adverse effects from land disturbance so that the region's water and soil resources are sustainably managed'.*

The associated policies seek to manage land and vegetation disturbance to avoid, remedy or mitigate adverse effects on water quality, natural character, aquatic ecosystems and significant indigenous vegetation and habitats. Earthworks are required as part of re-instatement of the water race, tailrace and to form access. For the most part, earthworks are beyond the riparian margins of the Inangahua River so are not expected to impact water quality. Where activities are being undertaken in close proximity to the River, careful management will ensure water quality within the Inangahua River is maintained.

Chapter 5: Lake and Riverbed Management

Objective 5.2.1 seeks: *'To avoid, remedy, or mitigate the adverse effects of lake and riverbed activities on:*

(a) The stability of beds, banks, and structures;

(b) The flood carrying capacity of rivers;
(c) The natural character of wetland, lakes and rivers and their margins;
(d) Indigenous biodiversity and ecological values, including fish passage;
(e) Amenity, heritage, and cultural values;
(f) Sports fish habitat values;
(g) Water quality…

Re-instatement of the Scheme will involve repairs to existing structures within the bed of the Inangahua River. Activities that have the potential to impact on water quality will be of short duration and are unlikely to generate significant sediment loads. The Jowett and Archeology Reports address effects on trout habitat and heritage values.

Chapter 7: Surface Water Quantity

Objective 7.2.1 - *To retain flows and water levels in water bodies sufficient to maintain them in-stream values, natural character and life supporting capacity.*

Objective 7.2.5 – *To avoid, remedy or mitigate any adverse effects of managed flows in rivers, or form fluctuating levels of controlled lakes.*

The objectives seek to maintain sufficient flow in rivers to provide for their instream values, natural character and life supporting capacity. Based on the expert advice received, maintaining a minimum flow of 2 m^3/s below the intake will achieve these objectives. Of particular importance is the following policy:

Policy 7.3.2 - *Where Policy 7.3.1 does not apply, a minimum flow based on 75% of the mean annual low flow will be applied as a consent condition.*

Detailed flow records are available for the Inangahua River via the Blacks Point flow gauge. The available record runs for approximately 47 years and has no significant gaps. From this record the 7MALF was calculated at 2.3m^3/s, giving a 75% 7MALF value of 1.7m^3/s. However, the Jowett Report recommended a higher minimum flow of 2m^3/s in order to maintain the high instream values. This minimum flow has been adopted by the Applicant, along with an undertaking to increase the minimum flow to 2.3m^3/s over the drier months of February to April.

Policy 7.3.5 is also relevant and states: *'To suspend the taking of water when minimum flows have been reached'*. Automatic gates at the gravel sluice, controlled from the powerstation, will be used to shut-off flows into the water race when the minimum river flow of 2.3 m^3/m is reached over the months of February to April and 2m^3/s at all other times.

Policy 7.3.12 seeks *'To require, where necessary, desirable and practicable, provision for fish mitigation'*. The proposal includes installation of a fish screen and by-pass immediately downstream of the gravel sluice which will provide for fish passage.

Policy 7.3A.1 states that *'When considering any application, the consent authority must have regard to the following matters:*
(a) the extent to which the change would adversely affect safeguarding the life supporting capacity of freshwater and of any associated ecosystem; and
(b) the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of fresh water and of any associated ecosystem resulting from the

change would be avoided'.

The proposal will only affect a short section (2km) of the Inangahua River. The Jowett Report concluded that the main effect will be on adult trout, where the number is expected to be reduced by 28% as a result of reduction in food production over the impacted reach. However, this was still considered to be a minor effect on the trout fishery.

Chapter 8 Surface Water Quality

8.2.1 Objective – To Maintain or enhance the quality of West Coast's water.

Policy 8.3.1 - *The West Coast Regional Council will manage the swimming areas identified in Schedule 9 for contact recreation purposes (Class CR) and all other surface water bodies in the region for aquatic ecosystem purposes (Class AE).*

Construction of the Scheme is not expected to impact water quality to any significant degree. Some sediment may be released into the River during repairs to the water race and fording of the River but these activities are of limited duration.

5.2.2 Relevant Rules and Activity Status

Some aspects of the proposal comply with the permitted standards of the PRLWP as set out below:

- The use of temporary fords within the Inangahua River associated with repairs to the intake and sections of water race is a permitted activity pursuant to Rule 23. All conditions of the permitted activity rule will be meet. This rule also permits placement of culverts and bridging of small waterways, as proposed as part of re-instatement of the service road.
- Repair of the existing intake and canal is a permitted activity pursuant to Rules 20 & 26. These rules allow the repair of any structure and associated deposition of material in a riverbed provided various conditions are adhered to. All requirements of the respective rules will be meet. It is noted that the repairs will not result in any change in the overall dimensions of the existing structures.
- Temporary diversion of Inangahua River during repair of the intake structure is a permitted activity pursuant to Rule 47. This rule allows temporary diversion for the purpose of repair of any lawfully existing structure. The permitted activity conditions will be met, including the requirement that the duration of the diversion will not exceed two weeks and that fish passage will be maintained with any fish stranded during the diversion work to be transferred to the flowing section of the river.
- Earthworks beyond the riparian margin and associated with rebuild of the water race, tailrace and service road are a permitted activity pursuant to Rule 6. This rule allows earthworks for the purpose of repairing roads and infrastructure associated with a hydro-electric generation scheme.

The remaining activities do not comply with all of the permitted standards and are discretionary activities as set out in **Table 7** below:

Table 7: Summary of Relevant Land & Water Plan Rules

Relevant Rule	Activity Status	Explanation
Rule 16	Discretionary Activity	Resource consent is required for earthworks and vegetation disturbance within riparian margins as this is likely to exceed the allowances permitted in Rules 2 and 8. This activity is associated with re-instatement of the water race and tailrace.
Rule 35	Discretionary Activity	Resource consent is required for disturbance to the Inangahua riverbed associated with construction of the rock groyne and placement of rock riprap at the tunnel slip site.
Rule 55	Restricted Discretionary Activity	Resource consent is required for the take and use of up to 3.5m³/s of water from the Inangahua River at Blacks Point for hydro generation purposes.
Rules 58 and 60(d)	Discretionary Activity	Resource consent is required for the diversion of water from the Inangahua River by means of approximately 1850 metres of water race for hydro generation purposes.
Rule 71	Discretionary Activity	Resource consent is required for the intermittent discharge of water containing sediment from the gravel sluice into the Inangahua River.
Rule 60(c)	Discretionary Activity	Resource consent is required to discharge up to 3.5m³/s of water into the Inangahua River following hydro generation.

5.3 Buller District Plan (BDP) Provisions

The BDP became operative in 2000 and contains objectives and policies within Chapter 4, along with descriptions of significant resource management issues. Council is undertaking a rolling review of the BDP, initiating a review of the current objectives and policies. The proposed BDP seeks very similar outcomes to those expressed in the operative BDP with no major shifts in direction. As the proposed plan is still going through the development process, little weight can be accorded this document, therefore assessment of the project has been undertaken in relation to the operative plan only.

5.3.1 Relevant Objectives and Policies

Relevant objectives and policies of the BDP are discussed below:

The Built Environment

Objective 4.3.6.1 -- *To recognise, and where possible, protect the distinctive character and heritage values of Buller settlements from the adverse effects of inappropriate development.*

The Scheme is within the rural zone and removed from the immediate township of Reefton. Construction traffic will necessitate movements through Rosstown and Blacks Point. However, this will be intermittent and of short duration and limited to the construction phase. Noise and lighting is also expected to comply with the District Plan limits so will not detract from the character of Reefton, Blacks Point or Rosstown.

Reefton has a strong association with the Scheme, which has resulted in branding of the township as

the ‘Town of Light’. The proposed rebuild is directly consistent with the objective of protecting the distinctive character and heritage values of Reefton and Blacks Point.

Rural Land and Water Resource

Objective 4.4.13.1 – *Promote land use activities which maintain or improve the water quality of the District's rivers and do not adversely affect water quantity, in order to safeguard the life supporting capacity of water.*

Adoption of measures such as a minimum flow regime will ensure that the natural character and instream values of the Inangahua River are maintained.

Policy 4.4.14.4 – *the protection of water resources from adverse effects of land based activities shall be encouraged and promoted.*

The proposal is not expected to result in any significant release of sediment into the Inangahua River. Temporary fords will be utilised for access purposes with crossings limited to periods of low flow. Repairs to the intake, re-instatement of the canal and work at the tunnel may result in some release of sediment but work is expected to be completed within a relatively short time-frame.

Policy 4.4.14.7 T*o protect and enhance riparian margins adjacent to rivers, streams, lakes, wetlands and the coast for the purposes of:*

(i) *Maintenance of the natural character of waterways, natural habitats and water quality including the mitigation of adverse effects of contaminant discharges and other natural and aesthetic and amenity values associated with the adjacent waterway.*
(ii) *Public recreation.*
(iii) *Public access*
(iv) *Maintainable of bank stability and reduction in sedimentation.*

For the most part, the Scheme will avoid disturbance to indigenous trees within the riparian margins of the Inangahua River. Remedial work on the two slips will require earthworks to stabilise these sites but riparian vegetation is expected to rapidly regenerate along the margins of the water race infrastructure given the surrounding beech-podocarp forest.

Some disturbance will occur to riparian vegetation during installation of the section of new timber fluming immediately downstream of the tunnel. However, indigenous vegetation along this section of riverbank is sparse and vegetation clearance is only expected to involve the removal of the odd small tree/shrub.

Cultural/Historic Resources

Objective 4.6.7.1 – *To protect places and sites of historical and cultural value from the adverse effects of land use activities and to ensure where appropriate, access to historic and cultural sites is maintained and enhanced.*

Policy 4.6.8.4 - *Assessment of resource consent applications shall include their potential impact on known places of historic and/or cultural value.*

The Archeology Report concluded that the proposal will prevent further loss to the historic fabric

and plant through stabilisation and maintenance. Without the Scheme, the historic remains are expected to continue to deteriorate through natural processes, vandalism and possibly land development.

Reefton is branded as 'The Town of Light', being the first town in the Southern Hemisphere to provide an electric street lighting system. This project will provide improved access to the original powerhouse sites and raise awareness of the historical achievements through provision of a variety of interpretative displays.

Hazardous Substances

Objective 4.11.5.1 – *To encourage and promote the safe and efficient handling and disposal of hazardous substances throughout the District.*

Policy 4.11.6.1 – Compliance with approved codes of practice and national guidelines and standards shall be required for all activities involving the use, storage and transport of hazardous substances.

Hazardous substances will be managed in accordance with industry standards. Emergency spill kits will be held on-site and contractors will be appropriately trained. The adoption of industry best practice will ensure there is no significant risk to people or the environment from the use of hazardous substances.

5.3.2 Relevant Rules and Activity Status

A summary of the relevant rules of the BDP and their respective activity status is provided in **Table 8.**

Table 8: Summary of Relevant BDP Rules & Activity Status

Relevant Rule	Activity Status	Explanation
Rule 5.3.2.3.1	Discretionary Activity	Re-instatement of the Scheme to generate electricity and as a visitor attraction requires consent. Of note is that the powerhouse buildings are well within the maximum building height for non-residential buildings (25m) and maximum gross ground floor area for single buildings (1000m^2). In fact, the buildings readily comply with the permitted standards (20m height and ground floor area of 500m^2).
Rule 5.3.2.2.1	Controlled Activity	A significant portion of the water race and service road is over-grown with regenerating native shrubs and ferns. It is estimated that around 1.5 hectares of indigenous vegetation will be removed during the Scheme rebuild and this activity requires consent.
Rule 5.3.2.3.1	Discretionary Activity	Various components of the scheme are located within the riparian margins of the Inangahua River. Consent is required for modification within 10m of the riverbank.
Rule 6.4.2.2	Discretionary Activity	Construction of the new overhead electricity line and associated infrastructure for electricity requires consent.

Rule 6.4.2.6	Discretionary Activity	Re-forming the service road on sections of legal road reserve requires consent.
Rule 6.4.2.7	Discretionary Activity	Complete containment around locations where hazardous substances will be utilised is not practicable therefore this aspect of the proposal does not meet all the permitted activity requirements and requires consent.
Rule 7.7.6.1	Discretionary Activity	Interpretative signage at the Powerhouse complex is proposed as part of the visitor experience and requires consent.

All activities are required to comply with District Wide Rules contained in Part 6 and 7 of the BDP. In this respect noise, lighting, parking and stormwater are expected to comply. Provision for stormwater run-off from the powerhouse buildings will be addressed through the building consent process. Whilst the only lighting proposed is security lighting at the entrance of each of the powerhouses. Given the distance to roads and residential properties, glare, spill and noise limits are expected to be readily meet.

As regards parking, rules 7.5.2 and 7.5.3 require one space per 50m^2 of gross floor area and at least one loading bay is provided for industrial activities. The total gross ground floor of all the powerhouse buildings is 257m^2 therefore a minimum of 6 carparks including 1 loading bay is required. Provision for a minimum of 7 carparks adjacent to the rebuilt powerhouse will be made. This number of carparks is considered sufficient to meet the needs of visitor to the facility given the majority are expected to walk to the site.

6.0 Statutory Framework

This section summarises the relevant provisions of the Resource Management Act (RMA) as they relate to the proposal.

6.1 Part 2 Matters

Section 5 of the RMA involves an overall broad judgement of whether or not a proposal promotes the sustainable management of natural and physical resources. In this respect, the proposed rebuild of the Scheme will protect a significant heritage site and provide an educational experience informing people as to Reefton's electricity heritage. Hydro generation will also be managed to ensure that the natural character, ecological and recreational values of the Inangahua River are maintained.

Section 6 refers to matters of national importance which consent authorities must *'recognise and provide fo*r'. The proposal triggers the following considerations:

(a) Preservation of the natural character of rivers and their margins, and protection from inappropriate subdivision, use, and development.

(b) Protection of historic heritage from inappropriate subdivision, use and development.

The Archeology Report considers the historic scheme remains to be nationally significant representing a rare example of 19th century electricity generation. Rebuild of the Scheme will achieve protection of its heritage values and ensure no further damage occurs to the various features.

The term 'natural character' is not defined in the RMA but it is understood to comprise the extent to which the naturally occurring elements, patterns and processes of a place remain intact. Natural character is generally understood to occur on a continuum from pristine to totally modified.

As regards the application site, the natural character of the Inangahua River is considered to be moderate given the presence of various structures (e.g. State Highway 7, the two swingbridges etc), the modified nature of the vegetation along the River margins and the presence of adjacent settlements (Blacks Point, Rosstown and Reefton). Features of the Scheme also form part of the existing environment. On this basis, the proposed rebuild is considered appropriate development and consistent with Section 6(a).

Section 7 of the RMA provides for '*other matters'* that consent authorities shall have particular regard to. The following are relevant to this proposal:

(a) the efficient use and development of natural and physical resources

(b) the maintenance and enhancement of amenity values

(c) maintenance and enhancement of the quality of the environment

(d) the protection of the habitat of trout and salmon

(f) the benefits to be derived from the use and development of renewable energy.

The proposal is an efficient use and development of natural and physical resources given it will enable renewable energy generation albeit on a small scale. The proposal will result in amenity effects but these largely relate to the construction phase and are of short duration.

Matters (c) and (d) have been addressed in the expert assessments provided by the Jowett and Freshwater Solutions reports. The over-all conclusion being that the project will not result in any unacceptable effects on recreational or freshwater ecology values.

Section 8 of the RMA requires consideration of the principles of the Treaty of Waitangi. The Applicant is not aware of any matters pertaining to the Treaty that require particular consideration.

Overall, given the modified nature of the application site, the ability to manage water abstraction to ensure residual flows are maintained, the anticipated enhancement to heritage values and the economic and social benefits expected to accrue to the Reefton community, the proposal is considered to be consistent with the purpose of the RMA.

6.2 Section 104

Section 104 of the RMA sets out matters a Consent Authority must have regard to when considering an application for resource consent. The matters which must, subject to Part 2, be considered are:

- Any actual or potential effects on the environment (s104(1)(a));
- Any relevant provisions of a national policy statement, regional policy statement or plan (s104(1)(b)); and
- Any other matter the Consent Authority considers relevant and reasonably necessary to determine the application (s104(1)(c)).

6.2.1 Actual and Potential Effects

Actual and potential effects on the environment of allowing the proposal are addressed in Section 4. This assessment is considered to be at a level appropriate to the scale of the respective activities.

6.2.2 Relevant Planning Documents

An assessment of the proposal against the relevant planning provision is provided in Section.5.

6.2.3 Relevant National Policy Statements (NPS)

The 2014 National Policy Statement for Freshwater Management (NPS FW) sets objectives and policies for the management of freshwater quality and quantity, as well as a suite of "national" values for regional councils to apply to freshwater bodies. The NPS FW emphasises the need for safeguarding the values of freshwater, avoiding over-allocation, improving efficiency and providing reasonable opportunity for Iwi involvement in overall freshwater management.

The Jowett Report considers that the Scheme will not result in more than minor effects on the flow regime of the Inangahua River or ecological values. It is therefore considered that the proposal is appropriate in the context of the NPS FM.

The National Policy Statement for Renewable Energy Generation 2011 (NPS REG) sets out the objective and policies for renewable electricity generation under the RMA. Although it is acknowledged that the proposal is small scale in energy generation terms it will contribute to achieving the objective of this NPS.

6.3 Section 105

When considering a discharge permit, Section 105 imposes obligations on Consent Authorities to have regard to the following matters:

- The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
- The applicant's reasons for the proposed choice; and
- Any possible alternative methods of discharge, including discharge into any other receiving environment.

The Jowett and Freshwater Solutions Reports describe the Inangahua River receiving environment and discuss the potential impacts on this environment. There are no alternative locations for the hydro development as the focus of the proposal is on restoration of the historic scheme.

6.4 Section 107

Section 107 imposes restrictions on the grant of certain discharge permits. It precludes a Consent Authority from granting a discharge permit in circumstances which may result in any of the following effects on the receiving environment:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- Any conspicuous change in the colour or visual clarity;
- Any emission of objectionable odour;
- The rendering of fresh water unsuitable for consumption by farm animals;
- Any significant adverse effects on aquatic life.

Sediment contained in the gravel sluice will be flushed back into the river during periods of high flow. The Jowett Report considered the consequences of this discharge and concluded that the additional sediment would not be noticeable during a flood event and would have no effect on River morphology or bed sediments.

The proposed discharge of spilled water following generation is not expected to result in any of the above effects. The Jowett Report considered whether operation of the power station will result in any change in water temperatures in the Inangahua River. The conclusion being that water temperature is likely to be reducing through the affected reach and that operation of the power station will have no significant impact on water temperatures.

7.0 Consultation

The Applicant has consulted with a number of groups and individuals within the community regarding the proposal including:

- Affected property owners
- Interested parties including West Coast Fish & Game, Westpower, NZTA, Heritage NZ
- Te Runanga O Ngati Waewae
- Rosstown, Blacks Point and Reefton residents in close proximity to the Scheme
- WCRC and BDC.

The Applicant will continue to consult with parties as the need arises.

8.0 Summary

The proposal will enable electricity generation with minor effects on the ecological and recreational values of the Inangahua River. Rebuild of the Scheme will protect a heritage site and provide opportunities to interpret on-site the 1888 powerhouse and technology and subsequent developments. Without this project the historic remains are expected to continue to deteriorate.

The proposal is considered consistent with the relevant District and Regional planning provisions and hence the purpose of the RMA.

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