Franz Josef WWTP Technical Memorandum #7 Comparative Options Report

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Comparative Options Report

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Contents

1 Introduction

The Franz Josef WWTP has been non-compliant with resource consents for a number years.

Westland District Council (WDC) has asked Opus International Consultants (Opus) to prepare a comparative options report to address Order 3b of the Environment Court Order number ENV-2015-CHC-066, and ENV-2015-CHC-067 dated 14 October 2016.

This report briefly presents comparisons of a number of different possibilities for siting WWTPs to serve the town of Franz Josef. The options considered are oxidation ponds on expansive sites outside the town area and small, intensive plant on a section of land within the town area.

2 Background

2.1 Waiho River

The Waiho River bed is aggrading and migrating towards the Franz Josef wastewater treatment plant (WWTP) oxidation ponds. As well as a very large gravel outwash volume from the upper catchment, there is a terminal moraine (the Waiho Loop) which severely constricts the river valley and forces flow the river to skirt around is south western end. As a result of ongoing aggradation the Waiho River fan has reached the point where it is readily able to flow across land to the north that it has not occupied in geologically recent time (if at all). The river took this course partially in 2010 and joined the Tatare River immediately upstream of the northern end of the terminal Moraine.

The resulting flow patterns can be seen the aerial image, Photo 1 below. The true right bed of the river is no more than 2m below bank level (and WWTP level) and the true left bed level is now approximately 4m higher than the true right at cross section 19 adjacent the treatment plant. This is tending to force the flow northward. As a result, the Franz Josef Airfield has been permanently destroyed and the current flood flows, such as that at Easter have now moved through the Scenic Circle Hotel and the WWTP.

Photo 1: 2012 Image of the Waiho reach from Scenic Circle to the Waiho Loop

The following figure shows the aggradation that has occurred at the treatment plant site (right hand side) since 1983. i.e approximately 4m.

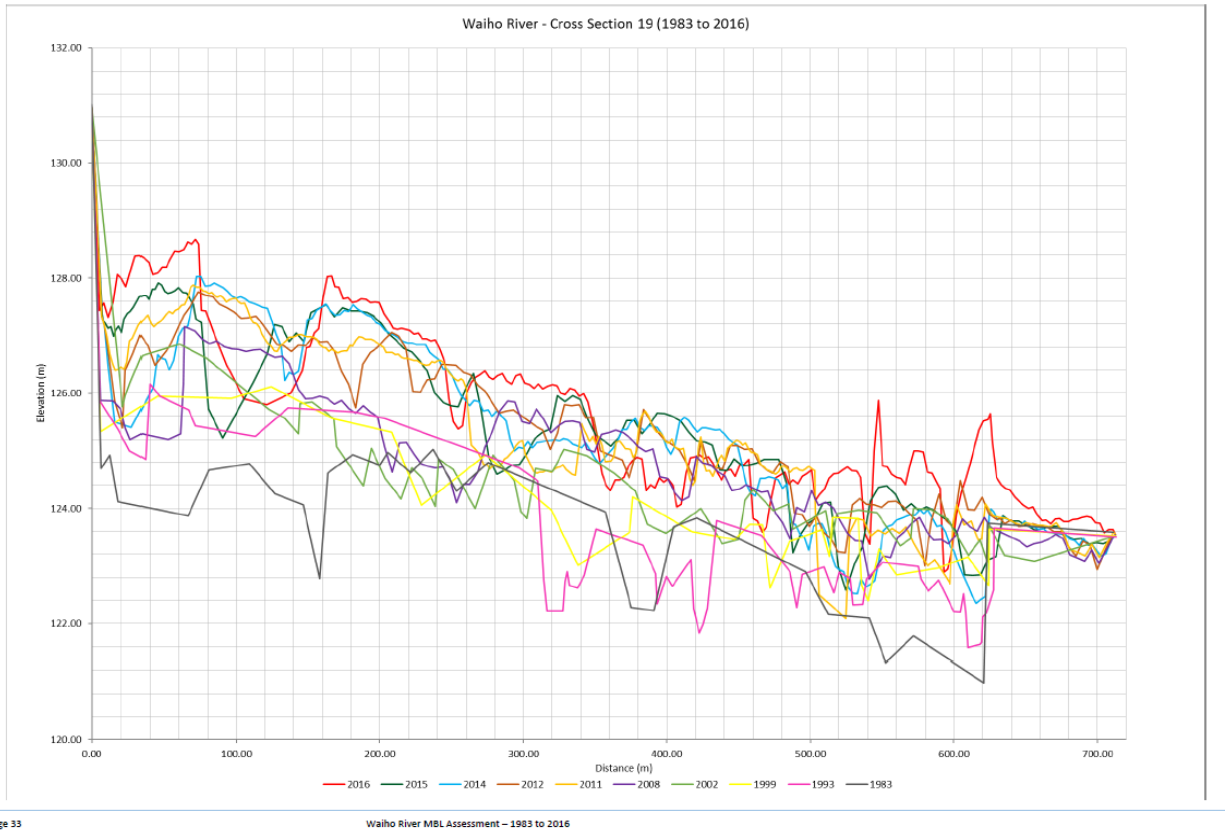

Figure 1: Waiho River Cross Section 19 (adjacent WWTP) from 1983 to 2016[1]

Current flood protection works are only sufficient to protect the state highway.

In January 2012, Hall, WCRC reported[2] the following: *"Present aggradational trends on the river in the reach extending downstream from the SH 6 bridge through to the Waiho Loop is such that in the absence of human intervention an avulsion of the Waiho River into the Tatare River resulting from overflows in times of flood across the true right natural river bank at and below the oxidation ponds is imminent. It is noted that overflows of this kind occurred during the December 2010 flood on the Waiho River and initiated headward erosion along the overflow corridor commencing from the true left bank of the Tatare River. This erosion did not progress any great distance back towards the Waiho River during that event but it is expected that further erosion will occur in subsequent floods that spill water down this overflow corridor."*

In June 2014, Opus prepared a report[3] that considered the risks to the WWTP, associated with the Waiho River. That report predicted that, within 5 years of that date, the aggrading behaviour of the Waiho River would result in the WWTP being inundated by the River. On

[1] 2016, Gardner, Land River Sea, Waiho River MBL Assessment 1983 – 2016 for Westland Regional Council
[2] 2012 Hall, WCRC Waiho River Future Management
[3] 2014 Webby, Opus, Franz Josef Wastewater Treatment Planning

that basis, WDC, in December 2015 commenced the process of procuring a new WWTP on a new site that would not be susceptible to the encroachment of the river.

In July 2016, Professor Tim Davies (UC) reported[4] the following: *"Further aggradation of the Waiho will increase the present flood spill eastwards into the Tatare River upstream of the Waiho Loop. This may lead to diversion of substantial water and sediment flows into the Tatare during floods, and since the Tatare river bed is 10-15 m lower[5] than the Waiho bed at this location, nick-point recession may occur in the Waiho. While this will probably lead to degradation in the presently aggrading reach this will be uncontrollable, potentially putting riverside assets (including the SH 6 Bridge) at risk. In addition, further microscale model work (Davies et al., 2013) suggests that this degradation is likely to be short-term and will be followed by aggradation of both the Tatare and Waiho river beds to the current level within a decade or so as the Waiho fills in this low spot".* Prof. Davies reports that the Waiho is transporting a near constant 800,000m^3 of sediment annually out of its catchment (This is equivalent to the near constant 5mm per year tectonic uplift over the entire 160km^2 catchment area).

Matthew Gardener Land River Sea Consultants, who has undertaken much recent observation and hydro-dynamic modelling of the Waiho River stresses[6] "*... that bed levels adjacent to the oxidation ponds are very likely to continue to rise, and based on the recent behaviour the alignment of the river has a strong potential to align itself so that a main channel is directed at the oxidation pond bank putting it under considerable pressure. Also based on current bed and bank levels, the bank is very likely to overtop in a major flood event which will likely cause bank failure. The bed level adjacent to the Mueller Hotel* ***increased by approximately 2 metres between the 2015 and 2016 surveys****, and it appeared most of this bed level rise occurred within a number of months. I would strongly caution against rebuilding in this location* – it would seem to be very short sighted!".

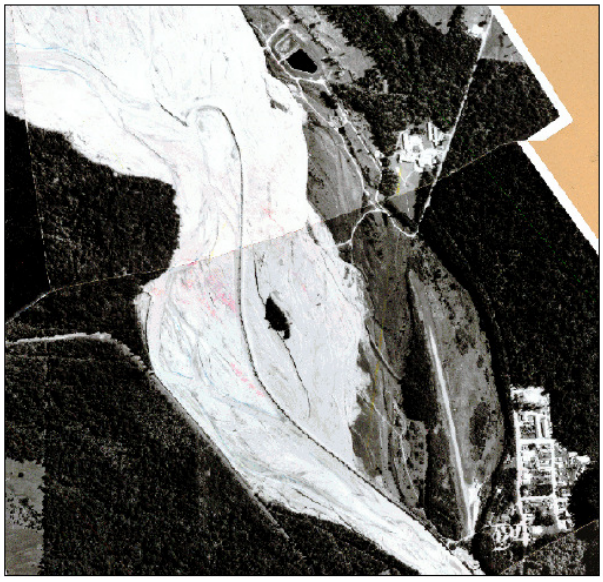

Photo 2: 1982 Airfield, Ponds, Stop Bank and Hook Groyne in 1982[7]

[4] 2016, Davies, Behaviour of the Waiho river: A geomorphological perspective.
[5] Actually 13m lower based on 2016 LiDAR survey information.
[6] 2016 Gardener, Pers comms, Crawford - Opus
[7] 2016, Gardner, Land River Sea, Waiho River MBL Assessment 1983 – 2016 for West Coast Regional Council

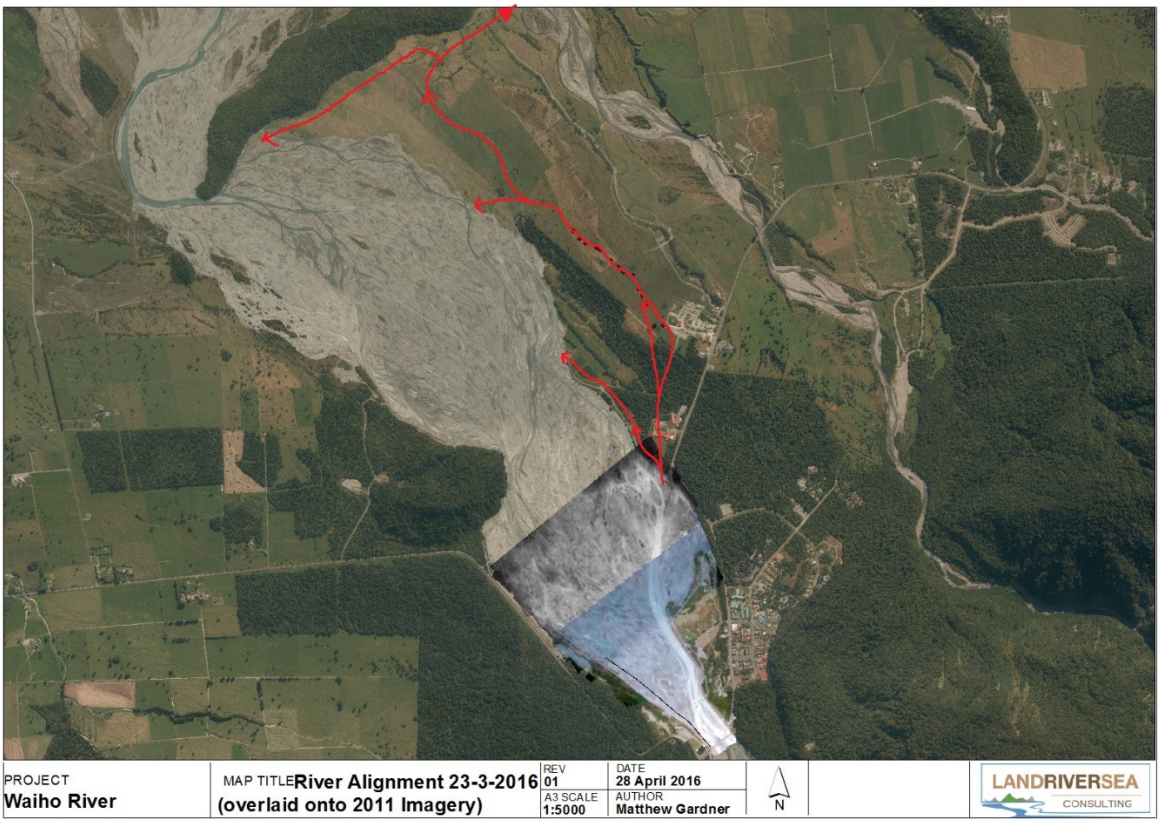

Figure 2: Flow paths of the March 2016 Flood.

All of this suggests that the Waiho will continue to aggrade at a comparatively rapid rate and that it will continue to modify the alluvial fan between the Waiho and Tatare rivers and present a significant ongoing risk to property and infrastructure located on the fan.

What is of note is the considerable body of work which has been published since at least the early 1990s and very recently in 2016 regarding the ongoing behaviour of the Waiho River and the associated risks relating to infrastructure development on the Waiho River fan.

2.2 Wastewater Treatment in New Zealand

a. Prior to the 1970's in New Zealand most municipal and industrial wastewater was discharged untreated, treated in individual septic tanks or treated in communal septic tanks (or Imhoff tanks) before discharge to waterways.
b. The first modern, compact, high rate, secondary wastewater treatment plant to be used in New Zealand was built at the Waikeria Prison in Waikato in approximately 1967. It is very much the same as many of the high rate treatment plants being constructed around the world today. This was to serve a total population of 3,000 persons. There were some small trickling filter installations prior to that.
c. During the 1970's and 1980's there was a major drive to sewer as many urban settlements in New Zealand as possible. A cost effective solution was sought which would do a reasonable job of removing major pollutants (BOD, Solids and heavy metals) from the wastewaters. This was to derive both public health and environmental benefits. Some 200 oxidation pond systems were built the length and breadth of New Zealand. Many of these were partially funded by central Government grants or subsidies. These pond systems were generally targeting approximately 80% removal of

biochemical oxygen demand (BOD_5) and Total suspended solids (TSS) or an effluent quality of approximately 40:40 BOD_5:TSS.

d. Almost all of the ponds were designed based on a standardised (by Government, through the Ministry of Works and Development) loading rate of 84kg BOD_5/ha/day for the primary pond. As a single person produces approximately 80g of BOD_5 per day, this equates to primary pond sizing of 1,050 persons per ha for the primary pond. The 84kg/ha/day was toward the lower (more conservative) end of acceptable loading rates for New Zealand but was adopted as a standard that would cater for most (non-alpine) climatic conditions in New Zealand.
e. From 1990 onward, the discharge consent processes associated with the Resource Management Act, increasing populations and increasing public demand for improved environmental performance have led to improvements being required to most wastewater treatment facilities around New Zealand. These improvements range from the construction of completely new, high rate plants, to hybrid installations to simple inlet/outlet and hydraulic improvements to pond systems.
f. In recent years, with the very rapid increase in tourist interest in New Zealand and the current implementation of the 2014 National Policy Statement for Freshwater Management, a number of communities around the country have taken the step of moving away from more basic pond based treatment to advanced systems that produce a significantly cleaner product and present a significantly cleaner image to visitors. Some examples include Coromandel Peninsula resort communities, Turangi, Queenstown/Arrowtown, Wanaka and Curio Bay in the Catlins.

2.3 Existing Franz Josef WWTP

The current WWTP is a two pond system of 1.0 ha (0.57 + 0.43ha) of typical 1970's Ministry of Works and Development configuration, design to their, then, 84kg BOD_5 /ha/day loading guideline for the primary pond and 1,800 persons per ha for the secondary pond. It was constructed in 1977/78 and the design population at the time was approximately 600.

The WWTP is constructed west of Franz Josef township right on the true right bank of the Waiho River.

The WWTP has, in recent years, regularly contravened (since about 2010) the conditions of the West Coast Regional Council (WCRC) discharge consent amendment RC00387[V1]. Following the issue of abatement notices by WCRC, an Environment Court Order (ENV-2015-CHC-066, and ENV-2015-CHC-067) has been issued requiring the WDC to comply with the consent conditions. WDC estimate that the existing peak population equivalent is approximately 5,000 persons based on water consumption and other tourism related statistics.

In March 2016, the Waiho River flooded and inundated the existing pond based WWTP. Pond one was filled with river silt. Pond 2 was entirely breached in one corner and the contents emptied into the river. The Pond Two breach has been reinstated. The Pond One silt has not been removed. Wastewater flow has been reinstated to the ponds and a rudimentary form of primary treatment is being applied.

In March 2016 the oxidation pond system was overtopped and inundated by a comparatively small flood of the Waiho River. Refer photo 2. Significant damage resulted.

Photo 3: March 2016 Inundation of Franz Josef Oxidation Ponds

2.4 Seismicity

Franz Josef Township is located directly on the Alpine Fault F2K.

GNS has provided an overview[8] of the estimated seismic hazard at Franz Josef concentrating on the nearby Alpine Fault as a scenario. The most likely and most severe earthquake scenario in the NSHM in proximity to Franz Josef is rupture of the AlpineF2K source in a Mw =8.1 earthquake. MMI 9 shaking is likely for the Alpine Fault rupture event which has an estimated conditional probability of 27% in the next 50 years. Shaking intensities in the MMI 7-8 range as aftershocks or from other local sources will be more frequent. Horizontal displacements of 7 – 9 m are to be expected. Vertical displacements of 1 – 2m are to be expected. Liquefaction and lateral spread of the near surface soils are to be expected.

2.5 Reasons for upgrade

There are currently two key reasons for the upgrade to the inlet works:

- The Waiho River bed is aggrading and has migrated through and inundated the existing WWTP. There are therefore significant risks of further outflanking and or inundation of the treatment plant by the river as it spreads toward the north.
- The ponds are overloaded and are periodically discharging non-compliant effluent into the Waiho River. The West Coast Regional Council have issued abatement notices to the Council.

However, looking to the future, it is unlikely that future consent conditions will be as generous as those currently held, or that they will in fact permit a pond system on the Waiho delta, and if planning upgrading or rebuild works, it would be prudent to make as much provision as possible for accommodating future needs.

[8] Langridge et al, GNS, July 2016, Natural Hazard Assessment for the Township of Franz Josef, Westland District

3 Basis of Design

3.1 Flows and Loading

As there is no existing flow metering or waste characterisation of sewage entering the Franz Josef WW pond system, design flows and loads have been estimated. Flows have been estimated based on typical per capita contributions to wastewater flow in New Zealand. While potable water consumption is an indication of contributing population, it does not all go to the sewer system and potable water use does not account for inflow and infiltration that enters the sewer system.

Table 1: Design Flows for New/Upgraded WWTP (excluding septage)

Parameter	Unit	Flows
Average Dry Weather Flow, ADWF (Off- peak)	m^3/day	363
Peak Dry Weather Flow, PDWF (Peak 3 months, summer period)	m^3/day	1,325
Peak Wet Weather Flow, PWWF (day)	m^3/day	2,500
Peak Wet Weather Flow, PWWF	m^3/hr	220
Peak Instantaneous Flow, PIF	l/s	61
Peak Instantaneous Flow plus 25% *capacity, PIF	l/s	76

* This is a factor of safety applied to key hydraulic structures and pipelines

It should be noted that the ADWF (off-peak) is the estimated flow to the WWTP in the winter of 2015. The flows for the summer period have been based on future flow estimates to the WWTP.

The following table represents design loads applied to development of the compact, high rate treatment plant proposal. Because there is no characterisation available, it is based on the wastewater characteristics measured at Queenstown over a period of five years.

Table 2: Design Loads (excluding septage)[9]

Parameter (kg/day)	Proposed Loadings			
	Average Winter	95% Winter	Average Summer	95% Summer
$cBOD_5$	88	105	322	384
Dissolved $cBOD_5$	25	36	92	130
Total COD	240	301	876	1,098
Dissolved COD	57	74	208	269
Flocc and Filtered COD	40	55	146	201
Ammoniacal nitrogen	13	13	47	49
TN	18	20	67	72
DRP	2	2	6	7
TP	3	4	10	13
TSS	115	145	418	530
Fats, Oils & Grease	40	78	146	286

[9] Opus, February 2016, Franz Josef WWTP – Request for Proposals

A high level comparison can be made on a per capita basis, since each person produces approximately 80 grams of BOD_5 per day. So, if the peak population is 5,000 PE, at 80g/hd/d, this gives a peak period daily load of 400kg BOD_5/day which is very close to the 95th percentile estimated in the table above.

3.2 Target Effluent Quality

The proposed effluent quality for the new/upgraded WWTP is as shown in Table 3. This standard was developed at the outset of the procurement process for the new treatment plant. It is the basis on which design and build Proposals were received for the new treatment plant. These criteria are based on the existing Franz Josef WWTP consent limits and the results from an ecological assessment in 2014. They are likely an intermediate step toward the conditions that could be set in the next full consent renewal process and the proposals were required to be readily upgradable to produce a higher standard of effluent. Meeting these requirements will provide a reasonable level of medium term future proofing of the facility.

Table 3: Proposed Effluent Quality[10]

Parameter (mean)	Unit	Proposed Consent	
		Upper 95%ile	Median Limits
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	50	20
Suspended Solids	mg/L	50	20
Ammonia Nitrogen	mg/L	25	10
Faecal Coliforms	cfu/100mL	5,000	500
Discharge Volume	m^3/day	2500	1,325

3.3 Odour

In general, in New Zealand, discharge consent conditions require that a wastewater treatment plant produces no offensive or objectionable odour beyond its boundary. Other consents require that there is no detectable odour at the boundary. The former condition is reasonably readily achieved by most small, compact, high rate WWTPs by the inclusion of covers on odour generating parts of the plant and purpose built odour destruction facilities through which extracted air is passed to destroy the odorous chemical compounds. The latter condition is difficult for any WWTP to comply with, but some manage it.

Because systems are so expansive and there are generally few particularly odorous areas (apart from the screen), it is generally considered that it is not practical to cover these for the purpose of management of odour incidents (they are very unlikely to be continuous). For this reason, when planning new pond systems, it is a generally accepted principal that 300m of buffer distance is allowed between the nearest edge of the pond and existing, designated or planned residential areas and existing dwellings or commercial areas.

3.4 Inlet Works

Regardless of the type of treatment plant, an up-front reception facility will be required.

[10] Opus, February 2016, Franz Josef WWTP – Request for Proposals

This will include:

- Flow metering. Creates instantaneous control ability and long term records of instantaneous, hourly, daily and seasonal flow statistics for plant operation, management and planning purposes.
- Screening to a nominal screen orifice size of 3 to 6mm. Removes smelly, difficult to manage detritus from the wastewater stream.
- Grit removal (for small high rate plants only, not ponds). Prevents excessive sand build up in tanks
- Septage receival system. Measures septage loads, removes stones, routes all septage through a screening facility where it will be mixed with liquid sewage.

3.5 Effluent

Quality: Target effluent quality is to be as stated in section 3.2.

Quantity: All effluent should be flow metered to provide a measure of the effluent quantity condition and the effects of rainfall, evaporation and leakage. For small, high rate systems, the influent and effluent flow meters will record very much the same results. For pond systems, there can be large discrepancies between effluent flows and influent flows.

Disinfection: Small, high rate treatment plants, because of the very formal clarification process, are very readily able to be disinfected (to the standards indicated in table 3.2) using UV light irradiation. Very expansive oxidation pond based systems, where the water is exposed to many days of UV irradiation from the sun, naturally do a better job of disinfection that a non-disinfected high rate system. However achieving a median effluent faecal coliform standard of 500 cfu/100ml is beyond most oxidation pond systems and some form of enhancement is required. This can be provided by a clarification process and a UV dose. In some locations, particularly those with very high sunshine hours this standard can be achieved (just) by adding further maturation ponds, subdivided with earth embankments, making continually smaller cells in a attempt to disrupt the algal growth cycles. Proliferating algal cells block the penetration of UV light into the water regardless of whether natural of mechanically derived UV light is being used.

BOD_5 and Suspended solids: These two standards are readily achieved in compact high rate treatment plants using standard mixed liquor or fixed growth reactors and various different forms of mechanical clarification. Pond systems typically can achieve average performance of 40mg/l for TSS and $cBOD_5$. Most pond systems could achieve the BOD standard, if it was based on filtered BOD_5. i.e the BOD_5 associated with the biological algal cells is filtered out. However, while it is occasionally seen, that interpretation is not the norm and does not apply at Franz Josef. For these standards to be achieved in a pond system, some form of enhanced treatment will generally be required. For example, Actiflo ballasted clarification such as that used at Gore, Warkworth and Feilding.

Ammonia: Conventional Ponds are typically bad at oxidising ammonia to low levels, although some do manage it where temperature is consistently warm and hydraulic retention time is long. While there is not currently a requirement for significantly reduced ammonia in the final effluent discharge to the Waiho, it is an acute toxicant in the riverine system and contributor of nitrogen as a eutrifying nutrient and such a condition could well be imposed at the next consent renewal, given the increasing pressure to maintain pristine waters in pristine condition.

Considering the much smaller size, it is expected that any discharge to the Tatare River would be required to be fully nitrified from day one.

Total Nitrogen: As above, there is currently no requirement for a low total nitrogen discharge to the Waiho but nitrogen reduction will likely be a requirement of subsequent consent renewals and would almost certainly be a requirement of a new discharge to the Tatare River. If they are able to nitrify, oxidation pond systems tend to be quite good at simultaneously denitrifying as there is normally (but not always e.g Leeston) a large anoxic volume fraction near the bottom of the water column. In compact, high rate plants, the denitrification must occur rapidly and so a specifically configured anoxic zone is required, and there must be an adequate source of readily biodegradable carbon substrate available to allow the process to proceed rapidly.

Discharge Location: The wastewater effluent discharge will need to be either to the Waiho River in the south (as per the existing arrangement) or to the Tatare River in the north.

It is likely that discharges to the Waiho will be able to retain an amended form of the existing consent.

Discharges to the Tatare will require new discharge consents. No consultation has been undertaken with likely affected parties. The river is very much smaller (in discharge flow rate) than the Waiho and it would be expected that consent conditions would be significantly stricter than the existing Waiho River discharge consent. At this time, a very high degree of risk and cost contingency would need to be applied to any pond system being conceptualised for discharge to the Tatare (because of lesser ability to meet high effluent standards). This might allow for an appeal to the environment court and or a high degree of tertiary 'polishing' and or disposal via a rapid infiltration system to ground. For example, an Actiflo process followed by UV disinfection would cost of the order of $1M plus associated P&G (contract preliminary and general costs) fees and Council costs.

A pumped transfer across to the Waiho River and the associated costs.

As discussed above, discharges to the Waiho River will also need to allow for some disinfection which includes some form of clarification plus UV light irradiation.

3.6 Seismicity

The treatment plant is to be designed to an Importance Level 3 standard (IL3), with regard to seismic resilience.

Foundation zones will need to be improved to prevent liquefaction. In the case of the compact plants, this is an area of the order of 50m x 25m. In the case of the oxidation ponds, this is the area under the embankments which is approximately 18m wide by 2000m long. Thus, the compact plant is more easily protected.

Depending upon the return period chosen, the design event will likely be of a magnitude of at least M_M=8.1.

Dr Alexei Murashev, an expert in seismic engineering, who has had no other knowledge of or involvement with this project has provided opinion[11] that a small, compact site is likely to

[11] Murashev / Crawford email 13/11/2016

be more easily prepared and controlled seismically than a large expansive site and that a pond option is likely to experience heavy damage during a design event and be expensive to repair.

That is, significant wide scale deformations could occur with the pond systems that take a long time and considerable expense to repair. For example, ground rupture beneath the ponds, widespread embankment settlement and stop bank failure. i.e where the solution is not nearly as simple as providing a small amount of embankment top up and where embankment breaching may have resulted due to overtopping following settlement of part of an embankment.

3.7 Physical Design – Compact, High Rate Plant

Detailed requirements for the design and construction of this plant are included in the formal Request for Proposals.

The proposed plant is situated on a concrete slab on improved foundation material. The proposed tanks are stainless steel. Inlet screening, grit removal and septage receiving are included as is an influent lift station and an influent balancing tank.

A sealed access road is provided for from Douglas Drive. 2.0m high security fencing is provided for around the property.

The plant unit processes include screening, septage receival, grit removal, flow balancing, secondary moving bed bioreactor, clarifiers, tertiary filtration, UV disinfection and sludge dewatering.

A formal odour scrubbing facility is provided for and a minimum of 10m of existing bush buffer is provided for between the site ring road and the boundary.

3.8 Physical Design – Oxidation Ponds

For the purpose of making cost estimates for various options for locating alternative oxidation pond systems, a number of assumptions have been made. There are no particular consents or conditions in place dictating this design at present. Therefore, the pond design has been assumed to follow contemporary New Zealand oxidation pond designs.

The process and mechanical requirements are discussed above.

Pond configuration:

- Unsealed access road and stock fencing.
- Inlet screening, flow metering and septage receival
- Water Depth: 1.5m. Freeboard 1.0m.
- Embankments 2H:1V internally, 3H:1V externally
- Liner system A: 1.5mm HDPE membrane over non-woven geotextile over 100mm fine single graded gravel (gas/water migration layer), over 110mm diameter herringbone novaflo drains which double as gas relief, ground and leakage water drainage, **OR**
- Liner system B: 300mm compacted clay with concrete wave band.
- Embankment material: Insitu alluvial gravel soils, where possible used on a balanced cut to fill basis except in areas where significant build up is required to stay above projected medium term (15 years) river bed aggradation.

- Supplementary aeration at the rate of 1.2kg O_2 / kg BOD_5 above that provided for by the 84kg/ha/day natural aspiration
- Effluent flow metering.
- Tertiary clarification and UV disinfection largely aimed at facilitating disinfection, but also reducing suspended solids and phosphorus. Examples of contemporary oxidation pond sites using such 'add-ons' are Gore, Marton, Woodville and Pahiatua. In some situations it is possible to get 'just enough' disinfection with a UV system alone or by creating multiple additional maturation cells to control hydraulic residence time very rigorously.

4 Options Assessment

The following sub-sections 4.1 to 4.9 provide an assessment of 8 combinations of alternative treatment plants and sites in the vicinity of Franz Josef Township. Six sites are assessed for construction of oxidation ponds. Two sites are assessed for construction of compact, high rate WWTPs.

Section 5 makes a comparison of those options.

4.1 Site 1 Oxidation Pond – Existing WWTP site

Table 4: Site 1 site inspection information

Item	Title	Description	Comments
1	Land ownership / status	Council owned land.	Surrounded by Council land. Waiho riverbed adjacent is DOC (Conservation Land – "Stewardship" status).
2	Available area (<>10ha)	1.86ha current pond site. 10ha additional area available and owned by Council.	Approximately 4ha of already cleared grass & scrub land adjacent to existing ponds. Council owns adjacent land parcels of 10.5ha and 3.4ha. See site 2.
3	Distance to Franz township	2.2 km	Centre of Franz (The Landing) to existing WWTP via SH6 and access road.
4	Distance to closest wastewater connection.	0 km	Existing connection.
5	Distance to Waiho or Tatare River (for discharge).	50m	Existing discharge to riverbed (currently buried). Discharge to Waiho River.
6	Distance to closest HV powerline.	630m	
7	Distance to nearest dwelling.	380m	Nearest dwelling – allowed for houses on currently subdivided land east of SH6.
8	Road access and cost estimate.	Existing road access.	Access road would be along enlarged river stopbank.

Item	Title	Description	Comments
9	Terrain / slope	Alluvial river fan.	Low gradient, old river channel with grass, scrub and forest cover. A sloping wedge of approximately 1m (LiDAR) will need to be built out after clearing before any level platform is raised for construction of ponds at a reasonable level.
10	Site soils	River gravels, silt/sand, glacial till.	
11	Construction issues	No major issues.	Risk of flood damage to stopbank and inundation by flood water. Ready supply of gravel on site. Ability, or not, to construct the necessary high stop banks and embankments in a manner that will survive the design seismic event.
12	Site layout constraints	Bounded by Waiho River to the West. Low lying. Old flood channels throughout the area.	Area used by walkers, recreational motorbikes and possibly hotel guests? Note: Mueller Hotel is now closed due to flood damage.
13	Size of WWTP	Pond 1 is 0.57ha and Pond 2 is 0.43ha	Current ponds are inadequate for design loading. New, larger ponds would be required.
14	River protection	This site will require additional river protection works. Cost TBD.	The Waiho has aggraded at an average of 0.2m/year over the past 30 years[12] or so and continues to rise. Some areas of the bed adjacent the right bank have recently risen at a much accelerated rate of approximately 2m in one year (see 2.1 above).
15	Consent status	Utilize existing discharge consent.	Amended conditions likely. WCRC cannot guarantee a pond system would be consentable at next renewal.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV	Not future proofed for ammonia reduction or nitrogen removal

[12] 2016 WCRC Waiho River – Long Term Management Strategy, October 2016.

Site entrance from stopbank

Stopbank between Waiho River and existing WWTP's.

Flood damage – Easter 2016

Sediment deposit from Easter 2016 flood

l – Mueller / Scenic Circle Facility

n

escription	Comments
ouncil owned land	Small parcel of land in northern corner – ownership unknown.
o to 10 ha	Council owned land. Mostly covered in forest. Approx 2 ha of open ground adjacent to un-named road.
6 km	400m further than existing ponds.
3 km	Following SH6 then along no-name road.
0m to Waiho 50m to Tatare	New discharge to Waiho River.
0m	Nearest HV line is alongside SH6.
0m	The site is entirely within the 300m of the Holiday Park.
0	Road access to site already.
at	Very flat site. Flood channels present in bush beside open ground.
vampy silt/sand over river gravel	Approx 1.8m deep of swampy sludge & silt over gravels.
xcavation of swampy ground. Poor ainage, Perched water table.	Area close to main flood path and has been flooded recently. Would require flood protection works.
ative forest removal would be required to	High risk as close to / in flood path.

Item	Title	Description	Comments
14	River protection	This site will require additional river protection works.	The Waiho has aggraded at an average of 0.2m/year over the past 30 years[13] or so and continues to rise. Some areas of the bed adjacent the right bank have recently risen at a much accelerated rate of approximately 2m in one year (see 2.1 above).
15	Consent status	Utilize existing discharge consent.	Amended conditions likely. WCRC cannot guarantee a pond system would be consentable at next renewal.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV	Not future proofed for ammonia reduction or nitrogen removal

[13] 2016 WCRC Waiho River – Long Term Management Strategy, October 2016.

Un-named road – looking east

Site 2.

Un-named road – looking west

Site 2 – swampy ground

4.3 Site 3 Oxidation Pond – Top of Cron St

Table 6: Site 3 inspection information

Item	Title	Description	Comments
1	Land ownership / status	Private land.	Owners have indicated he would be agreeable to siting of ponds on this land.
2	Available area (<>10ha)	>13 ha on this title	All land is potentially utilizable however pond sites are constrained by 300m buffer from dwellings.
3	Distance to Franz township	1.77 km	Distance is measured to “downtown” Franz.
4	Distance to closest wastewater connection.	690 m	Distance is measured from centre of ponds to closest wastewater connection in Cron St.
5	Distance to Waiho or Tatare River (for discharge).	200m to Tatare	Waiho discharge is not considered practical due to the long distance and likely pumping required.
6	Distance to closest HV powerline.	Powerlines on site	Powerlines pass through the site
7	Distance to nearest dwelling.	320 m	Ponds have been sited to be outside the 300m buffer.
8	Road access and cost estimate.	Minimum 350 m of new road required.	Road could be constructed along the alignment of the powerline corridor however this would likely require burial of the powerline or moving the poles. The corridor is very narrow (6-7m) legal width and may require boundary adjustment, land purchase or easement to attain enough width. Alternative access from SH6 would require 1.4km of road and an easement.
9	Terrain / slope	Flat to gentle, ~ 1-2 degree slope	Tatare River fan. Old river channels and flood paths.
10	Site soils	Alluvial gravels, up to boulder size. Mixed silt/sand/gravel. Refer photos.	Site is a gravel fan where Tatare River exits the Southern Alps.
11	Construction issues	Area is dissected with multiple old flood channels on a gravel fan. No evidence of recent flooding.	Risk of flooding from Tatare River. Protection works likely required. River appears relatively stable, however it is a large

Item	Title	Description	Comments
			steep catchment with potential for substantial water/gravel/debris flows in the event of a slip in the headwaters.
12	Site layout constraints	Size and shape of ponds are constrained predominantly by buffer distance from dwellings and Tatare River. Reasonably flat ground dissected by old river/flood channels.	May be less constrained if site crossed into adjoining property.
13	Size of ponds	2 ponds at 2.5ha & 1.4ha.	Earthworks in order of 30,000m^3.
14	River protection	This site may require river protection works up to 469m of stopbank.	Cost approximately $140,000.
15	Consent status	New consent required to discharge to Tatare River.	Has not been tested with affected parties or WCRC. Would likely receive some for of objection, when an existing consent exists for Waiho.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV. Gaining consent may require a land disposal system	Not future proofed for ammonia reduction or nitrogen removal

Powerline corridor and possible road access corridor

Tatare River – upstream of site. Potential flood risk.

Site reasonably clear – good gravel soils

Site reasonably clear – shallow swampy depressions over gravels.

4.4 Site 4 Oxidation Pond – North side Waiho Delta

Table 7: Site 4 inspection information

Item	Title	Description	Comments
1	Land ownership / status	Private land.	Owners have indicated he would be agreeable to selling part of the land for siting the ponds.
2	Available area (<>10ha)	5 – 8ha subject to sub-division	All land is potentially utilizable. A QEII covenant exists on a wetland adjacent to the proposed site. Further details still to be determined.
3	Distance to Franz township	2.1 km	Measured from downtown Franz via road to site.
4	Distance to closest wastewater connection.	1.2 km	Current line at SH6 turn-off, to un-named road then short distance to proposed ponds.
5	Distance to Waiho or Tatare River (for discharge).	680m to Tatare 820 from Waiho	Not a great deal of difference in distance so probably discharge to the Waiho to make use of the existing consent.
6	Distance to closest HV powerline.	550m to nearest powerlines	Powerlines adjacent to SH6 at Farm entrance.
7	Distance to nearest dwelling.	320 m	Ponds sited to be just outside 300m buffer.
8	Road access and cost estimate.	104 m of new road allowed for from the end of un-named road.	Road would be constructed from no-name road. Owner has indicated he does not want a road past his house and down his farm access race.
9	Terrain / slope	Flat to gentle, ~ 1-2 degree slope	Flat
10	Site soils	Rounded alluvial gravels, up to 20cm boulder size. The area of interest is variable with a perched watertable and swampy patches. Likely to be silt lenses in places 1 – 2 m deep.	Site is furthest out on the fan and may have more fines/silt present in soil. Nearby exposed gravels are close to surface.

Item	Title	Description	Comments
11	Construction issues	Multiple old flood channels pass to the west of the site – where an access road would pass. Wet swampy ground would need to be investigated further.	There is no evidence of recent flooding and the east of the site drops off a 10m high terrace down to the Tatare River.
12	Site layout constraints	Size and shape of ponds are not particularly limited by terrain. Reasonably flat ground.	According to O a QEII covenant is in place on land to the north west of the site.
13	Size of WWTP	2 ponds consisting of 2.9ha and 1.1ha.	Earthworks in order of 31,000 m^3.
14	River protection	This site may require river protection works up to 500m of reinforced pond embankment.	Additional cost to reinforce pond embankments would be in the order of $50,000.
15	Consent status	Utilize existing consent.	Amended conditions likely. WCRC cannot guarantee a pond system would be consentable at next renewal.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV.	Not future proofed for ammonia reduction or nitrogen removal

Tatare North site – in farm paddocks

Swampy ground in middle of site

Typical gravels on this terrace and expected on site.

Cutting down towards Tatare – potential discharge route.

4.5 Site 5 Oxidation Pond - Hayfields

The owner of this property was not interested in having ponds located on their farm. In order to be 300m from a dwelling the ponds would need to be in the middle of the farm and would make it difficult for the farm.

The site is also the furthest from Franz Township.

4.6 Site 6 Oxidation Pond – East of SH 6, North of Tatare River

Another potential site was identified as a backup. It may have merit as it is flat, well drained farmland with alluvial gravel base. However it is located on the north side of the Tatare River and therefore would require piping and pumping of wastewater across the river.

Advantages of this site are the ability to service the new sub-division, powerlines on site and access to SH6.

Table 8: Site 6 site inspection information.

Item	Title	Description	Comments
1	Land ownership / status	Unknown.	
2	Available area (<>10ha)	5.0 ha	Constrained by proximity to new subdivision, Tatare River and dwellings, Motel west of SH6.
3	Distance to Franz township	2.5km	Along SH6 and over bridge
4	Distance to closest connection to wastewater trunk main	1.7km	Point where SH6 meets the waiho River.
5	Distance to Waiho or Tatare River (for discharge).	150m	Would need new consent for discharge to Tatare River.
6	Distance to closest HV powerline.	11kV lines through site.	Lines run alongside proposed ponds.
7	Distance to nearest dwelling or subdivided Lot.	Nil	Immediately adjacent existing subdivision and purchase of some lots would be required to create an odour buffer.

Item	Title	Description	Comments
8	Road access and cost estimate.	216m of new access road required from SH6.	Cost for access road estimated at $66,000 (does not include shoulder works for a new entrance off SH6).
9	Terrain / slope	Flat	
10	Site soils	Alluvial gravels	Tatare River fn. Pasture over gravel.
11	Construction issues	Flood protection works required. Access from highway. Adjacent to new subdivision.	Relativelyy straightforward site.
12	Site layout constraints	Only 5 ha available between buffers and Tatare River.	Would require purchase of sections on already subdivided land to maintain 300m buffer. Adding significant cost.
13	Size of WWTP	2 ponds totalling 3.1ha	Significant supplementary aeration will be required.
14	River protection	605m	New stop banking to protect against Tatare flooding.
15	Consent status	New consent required to much smaller Tatare Rv.	Has not been tested with affected parties or WCRC. Would likely receive some form of objection, when an existing consent exists for Waiho.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV. Gaining consent may require a land disposal system	Not future proofed for ammonia reduction or nitrogen removal

	
Tatare south of SH6 site – in farm paddocks	Stopbank protection at rear of property
	
Powerlines on site.	

4.7 Site 7: Oxidation Pond – Makaawhio Land – East of SH6

Table 9: Site 7 Site Inspection Information

Item	Title	Description	Comments
1	Land ownership / status	Makaawhio land	
2	Available area (<>10ha)	Up to 9ha available with 6.3 ha allowed for.	The proposed ponds are sited to minimise exposure to flood risk – however with the proposed stopbank additional pond area would be achievable.
3	Distance to Franz township	2.2km	Via SH6.
4	Distance to closest connection to wastewater trunk main	1.35km	Via SH6
5	Distance to Waiho or Tatare River (for discharge).	Waiho: 1.35km to connect to existing effluent line. Tatare: 180m.	Discharge to Tatare would require new resource consent.
6	Distance to closest HV powerline.	220m	11kV lines are adjacent site.
7	Distance to nearest dwelling or subdivided Lot.	Nil	Immediately adjacent existing subdivision and purchase of some lots would be required to create an odour buffer.
8	Road access and cost estimate.	332m of new access road. Estimated cost $100,000.	
9	Terrain / slope	Undulating	
10	Site soils	Alluvial gravels	
11	Construction issues		
12	Site layout constraints	Only 3.9 ha available between buffers and Tatare River.	
13	Size of WWTP	3.9ha	Significant supplementary aeration will be required.

Item	Title	Description	Comments
14	River protection	746m	New stopbank protection.
15	Consent status	New consent required to discharge to Tatare River.	Has not been tested with affected parties or WCRC. Would likely receive some form of objection, when an existing consent exists for Waiho.
16	Processes Required	ILW (Inlet works – see 3.4 above), 2 stage Ponds + clarification + UV. Gaining consent may require a land disposal system	Not future proofed for ammonia reduction or nitrogen removal

4.8 Site 8: Douglas Drive Compact High Rate Plant

Table 10: Site 8, Douglas Drive site details

Item	Title	Description	Comments
1	Land ownership / status	Private ownership – council would need to purchase land	General agreement has been reached with the land owner to sell this land to council
2	Available area (<>10ha)	15ha	Entire parcel of land. May be able to subdivide and sell surplus or purchase a subdivided portion only.
3	Distance to Franz township	800m	Distance from “downtown” Franz via road.
4	Distance to closest wastewater trunk sewer	150m	
5	Distance to Waiho River (for discharge).	300m	Distance from proposed site to 50m into riverbed. May need to hook into existing sewer to get discharge further downstream for gravity discharge.
6	Distance to closest HV powerline.	250m	Proposed site to nearest HV power pole.
7	Distance to nearest dwelling.	30m to caravan park.	Plant types lends itself to collection and on-site destruction of odorous compounds.

Item	Title	Description	Comments
8	Road access and cost estimate.	20m ($15,000)	Allows for stripping, gravel access track, turn-around/parking and concrete entrance across kerb & channel.
9	Terrain / slope	Gentle	Flat area currently covered in bush.
10	Site soils	Humus topsoil on alluvial river gravel.	
11	Construction issues	Central site needs tree clearance	Tiny area compared to clearance for pond system.
12	Site layout constraints	Few. Keep it central to maintain tree buffer to surrounding properties.	
13	Size of WWTP	45m x 20m = 900m^2	Earthworks in order of 4000m^3.
14	River protection	Nil	

4.9 Compact, High Rate Plant – Top of Cron St

Table 11: Site 3, Compact plant site details

Item	Title	Description	Comments
1	Land ownership / status	Private land.	Owner has indicated they would be agreeable to siting of ponds on this land.
2	Available area (<>10ha)	>13 ha on this title	All land is potentially utilizable.
3	Distance to Franz township	1.2 km	
4	Distance to closest wastewater connection.	400 m	
5	Distance to Waiho River (for discharge).	220m to Tatare	Waiho discharge is not practical from this location as the pumping main would need to be constructed at too great a depth.
6	Distance to closest HV powerline.	Powerlines on site	Powerlines pass through the site.

Item	Title	Description	Comments
7	Distance to nearest dwelling.	160m	Plant types lends itself to collection and on-site destruction of odorous compounds.
8	Road access and cost estimate.	Minimum 180 m of new road required. $70,000 cost estimate for access road (excluding any land purchase, consents, surveying etc)	Road could be constructed along the alignment of the powerline corridor however this would require burial of the powerline or moving the poles. The corridor is narrow (6-7m) legal width and may require boundary adjustment, land purchase or easement to attain enough width. Alternative access from SH6 would require 1.4km of road across Makaawhio land.
9	Terrain / slope	Flat to gentle, ~ 1-2 degree slope	Presence of flood channels requiring protection works.
10	Site soils	Alluvial gravels, up to boulder size. Mixed silt/sand/gravel.	
11	Construction issues	Area is dissected with multiple old flood channels on a gravel fan. No evidence of recent flooding.	Residual risk of flooding from Tatare River. Protection works likely required. River appears relatively stable.
12	Site layout constraints	Size and shape of compact plant is not particularly limited by terrain. Reasonably flat ground.	Good site, near power, near road access, limited flood risk with minimal protection works. Screened from
13	Size of WWTP	45m x 20m = 900m^2	Earthworks in order of 4000 m3.
14	River protection	This site may require river protection works up to 200m of stopbank.	Cost estimate at $50,000

All sites are on river gravels and relatively flat land (maximum slope 1°).

4.10 Locality Plan

Figure 3 below depicts the location and constraints associated with each oxidation pond option. 300m odour buffer zones have been shown around existing dwellings and subdivided and designated sites that will potentially be built on for residential or commercial purposes (some future potential dwellings have been added to help facilitate generation of the odour buffer boundaries. Lot boundaries are shown as are roads

and rivers. At site 6, several existing subdivided lots would have to be acquired to provide any form of odour buffering. The QEII covenanted lot restricting site 4 is not shown.

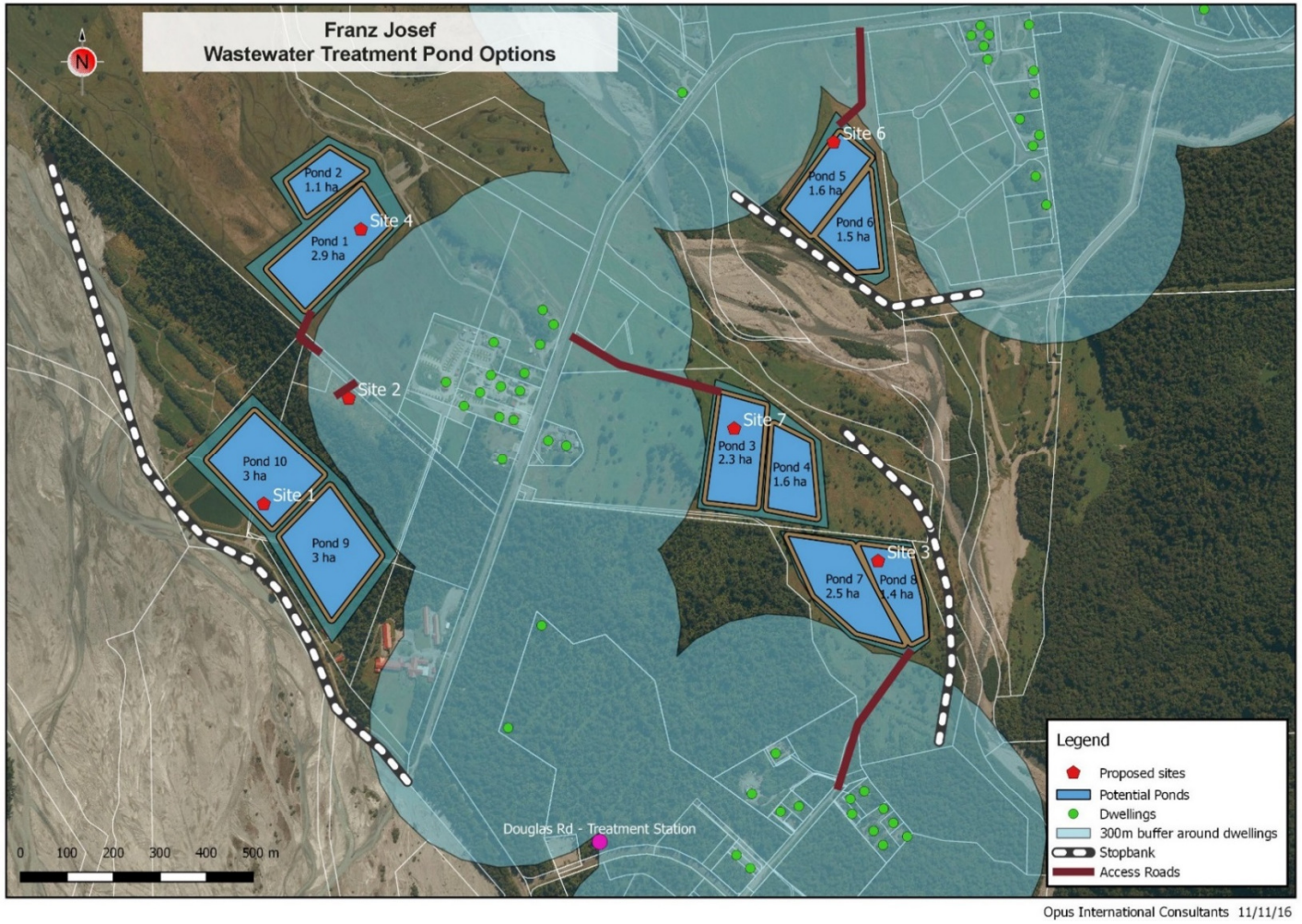

Figure 3: Potential oxidation pond locations and buffer zones

5 Site Assessment

5.1 Advantages, Disadvantages, Key Risks

Based on assessed plant loading, site inspections, knowledge of the local riverine situation and a review of contemporary natural hazards literature, Table 11 below provides an assessment of the advantages and disadvantages of each site and the related treatment option.

Table 12: Advantages and Disadvantages

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
Site 1 Incorporates **Site 1 Existing WWTP** And **Site 2 – Behind Scenic Circle Hotel**	• Land owned by Westland District Council. No land purchase required. • Existing discharge to riverbed (currently buried) • Existing discharge consent • Ready supply of gravel on site. • Adjacent existing trunk sewer pipe • Site reasonably level • Has good road access off the un-named road.	• Extreme risk of flood damage to stopbank and inundation by flood water. • At the current rate of river aggradation, the ponds would need to be built at least 3m higher than they are currently (and possibly as much as 6m)[14] to be in the same relative position in 15 years, OR equivalent river protection works need to be put in place. • Insufficient land outside 300m odour buffer and inside boundary constraints so supplementary aeration system required. • 630m to High voltage power source • At the Scenic Circle end, approx. 1.8m of swampy sludge & silt which will require additional earthworks to clear for construction of ponds, roads and embankments. • Most of the area is covered in bush requiring vegetation clearance and likely consent issues. • Existing trunk gravity sewer is only 150mm dia. Currently undersized and	• Extreme	Not recommended

[14] Healey 2016, Pers comms (appended)

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
		needs replaced now or in near future. Implication is 1200m of 300mm dia. Gravity sewer to new ponds. • Long term accumulation of large sludge volume		
Site 3 – Top of Cron St	• Owner has indicated he would be agreeable to siting of ponds on this land. • The site is close to the township • Greater than 300m to nearest existing resident. • Bush covered hill may reduce the needed 300m buffer zone. • 10ha of land is potentially utilizable. • Powerlines pass through the site. • Flat to gentle, ~ 1-2 degree slope. • Closest connection to waste water line of all sites.	• Waiho discharge not practical from this location unless pumped across. Therefore a new consent, to discharge into the Tatare is likely to be required. • Insufficient land outside 300m odour buffer (to subdividable land) and inside boundary constraints so supplementary aeration system required. • Pumping required to deliver flow to the site. • Road could be constructed along the alignment of the powerline corridor however this would require burial of the powerline or moving the poles. The corridor is narrow (6-7m) legal width and may require boundary adjustment, land purchase or easement to attain enough width. Alternative access from SH6 would require 1.4km of road. • Residual risk of flooding from Tatare River. Protection works likely required. River appears relatively stable. • Long term accumulation of large sludge volume	• High	Possible site
Site 4	• Owner has indicated he would be agreeable to selling part of the land for siting the ponds.	• Road could be constructed from no-name road. Owner has indicated he does not want a road past his house and down his farm access race.	• Moderate	Possible site

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
	• Most land is potentially utilizable. • Powerlines adjacent to SH6 at Farm entrance. Approximated 550m to nearest powerlines • Distance measured to site marker on map is 400m. • There is no evidence of recent flooding and the east of the site drops off a 10m high terrace down to the Tatare River. • 1.9km to an appropriate connection to the trunk sewer. This will need to be pumped. • Access road could be formed off un-named road.	• According to owner a QEII covenant is in place on land to the north-west of the site. • A portion of the land is swampy and would require further earthworks for development. • Insufficient land for full sized ponds inside boundary constraints and outside 300m odour buffer so a supplementary aeration system will be required. • Likely future exposure to break outs of the Waiho across the alluvial fan toward the Tatare River. • Will require a pumped discharge back to the Waiho River. • Long term accumulation of large sludge volume		
Site 5 – North of Tatare Rv.		• The owner of this property was not interested in having ponds located on their farm. In order to be 300m from a dwelling the ponds would need to be in the middle of the farm and would make it impractical to continue farming the site. • The site is also the furthest from Franz Township.	• N/A	Not recommended
Site 6 – Tatare South of SH6	• Advantages of this site are the ability to service the new sub-division, • Powerlines on site and access to SH6. • It may have merit as it is flat, well drained farmland with alluvial gravel base. • There is existing road access to the site that would need to be extended.	• However it is located on the north side of the Tatare River and therefore would require long distance piping of wastewater across the river. • River protection is needed. • Situated on the edge of new subdivision so there is potential for reverse sensitivity issues to arise and closer sections are	• High	Possible site

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
		developed. To establish a 300m buffer, several of the vacant sections would also need to be purchased by Council. • Even with purchasing sections, insufficient land outside 300m odour buffer and inside boundary constraints so supplementary aeration system required. • Very high cost of purchasing subdivided lots for buffer zoning. • Long term accumulation of large sludge volume		
Site 7 - Makaawhio	• Distance to nearest trunk wastewater connection point approx. 1.5 km to achieve 300m buffer zone. • 17ha of land outside the buffer zone that could be developed. However some of this is too close to the Tatare River • Power crosses through the property. • Access is available off the SH.	• Residual risk of flooding from Tatare River. Protection works likely required. River appears relatively stable. • Disadvantages as per other pond sites	• High	Possible site
Site 8 – Douglas Drive Compact Plant	• Distance to nearest trunk waste water line 150m • Outside flood zone & protected by SH stop banking. • Small footprint, compact plant • Odour is easily managed with on-site odour control • Good access to power. • Access is available off Douglas Drive. • 200m to Waiho River	• Land will need to be purchased • Close to Alpine fault. Although well outside of the recognized 130m wide Fault Avoidance Zone[15] (FAZ), but is still only approximately 620 m off the fault line itself. • Energy intensive. • Noise generated (but readily mitigated) • Low hydraulic buffering capacity	• Low	Recommended

[15] Langridge et al, GNS 2016.

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
	• Shorter and less expensive sewer system • Almost fully modular. A 25% capacity reduction can be made at a saving of $350,000. This can be replaced at any time in future. • Easily expandable • Can be 'tuned' for different loads • Ability to easily continue discharging into the Waiho River • Capable of being configured for very high levels of treatment which improves overall environmental performance. • And hence more readily 'consentable'. • This is also important in the context of the relationship between environmental performance of the District and its direct link to the Franz Josef and Westland economies. • Preferred concept by WCRC	• Less resilience to toxic shock from industrial trade waste • Produce excess biomass that must be dewatered and disposed of on an on-going basis.		
Site 9 (Site 3) – Top of Cron St – Compact Plant	• Distance to nearest trunk wastewater connection point 1.1km. Will require pumping • Owner has indicated he would be agreeable to siting of ponds on this land. • The site is close to the township • 10ha of land is potentially utilizable. • Powerlines pass through the site. • Flat to gentle, ~ 1-2 degree slope. • Small footprint, compact plant	• Waiho discharge not practical from this location. • Close to Alpine fault • Road could be constructed along the alignment of the powerline corridor however this would require burial of the powerline or moving the poles. The corridor is narrow (6-7m) legal width and may require boundary adjustment, land purchase or easement to attain enough	• Moderate - High	Possible site

Location	Advantages	Disadvantages	Failure / construction Risk	Recommendation
	• Odour is easily managed with on-site odour control • Good access to power. • Access is available off Cron St • 220m to Tatare River • Almost fully modular. A 25% capacity reduction can be made at a saving of $350,000. This can be replaced at any time in future. • Easily expandable • Can be 'tuned' for different loads • Ability to easily continue discharging into the Waiho River • Capable of being configured for very high levels of treatment which improves overall environmental performance. • And hence more readily 'consentable'. • This is also important in the context of the relationship between environmental performance of the District and its direct link to the Franz Josef and Westland economies. • Preferred concept by WCRC	width. Alternative access from SH6 would require 1.4km of road. • Residual risk of flooding from Tatare River. Protection works likely required. River appears relatively stable. Alternatively the site can be elevated providing a higher foundation on which to construct the WWTP. • Energy intensive • Noise generated (but readily mitigated) • Low hydraulic buffering capacity • Less resilience to toxic shock from industrial trade waste • Produce excess biomass that must be dewatered and disposed of on an on-going basis.		

5.2 Cost Summary

Rough order cost estimates have been prepared for each of the seven treatment plant siting and configuration options considered. Costs have been assessed based on the constraints identified in section 4 and upon the basis of design requirements described in section 3, particularly sections 3.7 and 3.8.

Flood Protection: Sites 1, 3 and 6 include significant costs for the formation of additional flood protection works that will be required. Figure 3 above shows the extent of additional stop banking provided for. At site 4, most of the flood protection work allowance is built into the earthworks Cost.

Liners: Regarding the liners described in section 3.8, the former, plastic liner system has been included in the price make up. Suitable quality clay is not known to be available in South Westland (Ross may be the closest source at 95km distant) and the cost to acquire, haul to site, place, compact and apply a concrete wave band is highly likely to be more than that of the plastic liner system. There has been a community query regarding the possibility of lining the ponds using a mix of lime with the in-situ material. That has been considered. For lime stabilization to be effective, the fill material needs to have a high proportion of fines (clay) as the lime reacts chemically with the clay particles. We are essentially dealing with alluvial gravels in Franz Josef. These gravels have low fines content as they have been washed by the river. Lime stabilisation won't work because the fines/clay content is far too low.

Consents: The three oxidation pond options considered at Sites 3, 6 and 7 each include $0.5M allowances for obtaining new discharge consents for discharge of treated wastewater into the smaller Tatare River. This assumes that there will be considerable resistance to such applications and appeals to the Environment court. From experience with numerous previous consents, the $0.5M sum is not, by any means, a worst case scenario. On advice from WCRC (refer appended email), allowances have been made for obtaining new consents for all options because a) The proposed future volumes are significantly higher than present, b) the plants are essentially entirely new and c) are configured differently to the existing. The lowest cost has been assigned to the Site 8 option because it represents a highly treated tertiary effluent discharging to the larger Waiho River and is therefore likely to receive the least opposition of any application.

Tertiary Treatment: Each of the oxidation pond option costs includes a provision of $0.83m (+ Contract P&Gs + contingency) to provide some form of tertiary clarification followed by UV disinfection. Again, this is not a worst case. An 'Actiflo' ballasted clarification unit itself can readily cost more than $1m (the Gore unit complete with all civil works cost $2m in 2008 – but for 9,000 m^3/day capacity c.f 2,500m^3/day). Direct filtration can be used for 'polishing' an activated sludge effluent prior to UV disinfection. However, the algae rich effluent from an oxidation pond is notoriously difficult to filter and clarification using a flocculant (and sometimes a ballasting sand) is normally required to prepare the effluent for disinfection. In some cases, where only a very minor amount of additional disinfection is required, the additional intervention is not required.

High Voltage Electrical Supply: Electrical costs are approximated only, based on information received for the 2014 report. The grid operator, Westpower has not yet been provided the likely costs for each of the options considered here.

P&G: Each estimate includes a sum to cover Contractors 'Preliminary and General' costs. These include: Various insurances (Works, Public Liability, Vehicle, Professional Indemnity), Performance Bond, costs of financing the purchase of long lead items, cost of financing the contract retentions, FOREX cover, establishment on site (site office, communications, toilets and water, survey), workers consumables, workers transport and accommodation, clean-up and disestablishment, Contract Manager. P&G also covers the Contractor's off site overheads, being a proportion

of the cost of running the Contractor's business generally (Office, office staff, promotions, bidding costs, business costs etc) which, by definition, must be spread across each contract that the contractor wins.

Contingency: For the compact plant options, a contingency of 10% has been applied to the tendered mechanical plant and 30% contingency has been applied to the, as yet, undersigned civil works. For the oxidation pond options, without the benefit of any formal geotechnical investigations, survey, specific flood mapping or design, a 30% contingency has been applied to the cost estimates developed. Arguably a 50% contingency would be more appropriate at this stage considering the situation of the sites and the very basic conceptual assessments carried out to date.

Table 13: Capital cost estimate summary

	Site 1	Site 3A	Site 3B	Site 4	Site 6	Site 7	Site 8
	Oxidation Ponds Combines Sites Existing & Scenic C	Oxidation Ponds Top of Cron St	Compact Plant Top of Cron St	Oxidation Ponds Waiho Delta	Oxidation Ponds. North of Tatare, South of SH5	Oxidation Ponds. Mataawhio	Compact Plant Douglas Drive
Civil & Electrical Works	$5,600,000	$3,400,000	$2,100,000	$3,400,000	$3,100,000	$3,400,000	$1,700,000
Process Cost	$1,100,000	$1,100,000	$4,500,000	$1,100,000	$1,200,000	$1,100,000	$4,500,000
Land, Fees, Consents and Investigations	$500,000	$1,100,000	$700,000	$800,000	$1,400,000	$1,100,000	$600,000
Total Direct	**$7,200,000**	**$5,600,000**	**$7,300,000**	**$5,300,000**	**$5,700,000**	**$5,600,000**	**$6,800,000**
Preliminary & General	$700,000	$400,000	$300,000	$500,000	$400,000	$400,000	$300,000
Contingency allowance	$2,200,000	$1,700,000	$1,800,000	$1,600,000	$1,700,000	$1,700,000	$1,600,000
Project Total	**$10,100,000**	**$7,700,000**	**$9,400,000**	**$7,400,000**	**$7,800,000**	**$7,700,000**	**$8,700,000**

5.3 Options Scoring Matrix

To assist in drawing together the information that has been gathered and developed in making this comparison of various sites and plant options, a multi-criteria scoring matrix has been developed with all sites scored against the selection criteria that are considered to be most important in choosing the option to proceed with. A relative weighting (10 maximum) has been applied to each criteria. Because of the likely consequences of a complete failure of a plant, physical resilience to the severe natural hazards that exist in the immediate vicinity have been given the highest weighting. i.e a plant that still exists and works or can be repaired after an event is more important than the ability for a new plant to be built by a certain date. This is a very common form of assessment process used to assist in selection of preferred wastewater treatment and disposal options.

Table 14: Multi-Criteria scoring matrix

			Site 1	Site 3A	Site 3B	Site 4	Site 6	Site 7	Site 8
CAPEX estimate excluding P&G and contingency			$7.2m	$5.6m	$7.3m	$5.3m	$5.7m	$5.6m	$6.8m
Criteria	**Description / Key Aspects of Criteria**	**Weighting (1 to 10)**	Oxidation Ponds Combines Sites Existing & Scenic C	Oxidation Ponds Top of Cron St	Compact Plant Top of Cron St	Oxidation Ponds Waiho Delta	Oxidation Ponds. North of Tatare, South of SH5	Oxidation Ponds. Mataawhio	Compact Plant Douglas Drive
Operational complexity and risk									
Operational complexity and risk	Complexity of plant operation, particularly using remote resources. Ready availability of spares and maintenance expertise locally to address operational issues.	**4**	9	9	5	9	9	9	5
Effluent Quality	Ability to consistently meet consent conditions	**7**	5	5	9	5	5	5	9
Future Proofing	Ability to expand the option in the future to address any potential expansion / growth and or increased effluent standards	**6**	3	3	8	3	2	3	8
OPEX	Ongoing operational costs	**6**	7	7	5	7	7	7	5
Project Delivery:									

			Site 1	Site 3A	Site 3B	Site 4	Site 6	Site 7	Site 8
CAPEX estimate excluding P&G and contingency			$7.2m	$5.6m	$7.3m	$5.3m	$5.7m	$5.6m	$6.8m
Criteria	**Description / Key Aspects of Criteria**	**Weighting (1 to 10)**	Oxidation Ponds Combines Sites Existing & Scenic C	Oxidation Ponds Top of Cron St	Compact Plant Top of Cron St	Oxidation Ponds Waiho Delta	Oxidation Ponds. North of Tatare, South of SH5	Oxidation Ponds. Mataawhio	Compact Plant Douglas Drive
Capital Cost	Capital cost for establishment of the option	**7**	2.8	4.4	2.7	4.7	4.3	4.4	3.2
Land Availability	% treatment area available out of required area x 10	**7**	7.9	5.1	10	5.3	4.1	5.1	10
Constructability	Likely foundation works requirements Ability to construct offline / disruption to Waikeria operations, WWTP operations, community etc.	**0**	Assume all can be constructed and foundation issues are picked up in the CAPEX.						
Timeliness	Ability to implement option by end 2017.	**4**	4	4	8	4	4	4	8
Natural Hazard Risk:									
Flooding	Susceptibility to natural flood hazard from Waiho or Tatare River and ability to protect against	**10**	1	5	5	4	6	5	10
Seismic Event	Susceptibility to severe damage due a rupture of the alpine fault and ability to design against.	**10**	2	2	6	2	2	2	6
Ability to Consent:									
Cultural considerations	Acceptability (or otherwise) of the solution to cultural aspirations for discharge of wastewater to the receiving environment	**8**	8	4	4	8	4	4	8
	Potential acceptability of the option (relative to others) in terms of	**7**	9	2	5	9	2	2	9

			Site 1	Site 3A	Site 3B	Site 4	Site 6	Site 7	Site 8
CAPEX estimate excluding P&G and contingency			$7.2m	$5.6m	$7.3m	$5.3m	$5.7m	$5.6m	$6.8m
Criteria	**Description / Key Aspects of Criteria**	**Weighting (1 to 10)**	Oxidation Ponds Combines Sites Existing & Scenic C	Oxidation Ponds Top of Cron St	Compact Plant Top of Cron St	Oxidation Ponds Waiho Delta	Oxidation Ponds. North of Tatare, South of SH5	Oxidation Ponds. Mataawhio	Compact Plant Douglas Drive
Receiving environment impacts	technical environmental considerations, such as ecology of the receiving environment. Consideration of other environmental impacts, such as recreational value of receiving environment, and acceptance of impact of activity on such aspects								
Odour and nuisance emissions	Ability for the option to control and manage nuisance emissions that need to be addressed through the consenting process	**0**	Assume all equal. Odour buffers for oxidation ponds and scrubbers for compact plants.						
Community Acceptance	Ability to achieve stakeholder approval for construction Community acceptance of the proposed scheme, based on likely community perceptions	**7**	8	8	5	10	8	10	6
	Total score:	**830**	**435**	**386**	**494**	**474**	**382**	**400**	**614**

This multi-criteria (largely associated with project risk) approach to options assessment has drawn together the majority of the information collected about each of the options and utilizes a single methodology to assist in identifying what is likely to be the option that provides the best overall outcome for the community. On this basis, the preferred option would be site 8, a compact, high rate plant located right away from the known flood zones.

6 Recommendations

Our strong recommendation to Westland District Council is that replacement of the current Franz Josef WWTP is most appropriately achieved by the construction of a very compact, high rate, mechanised biological plant sited out of the flood hazard zone and very close to the residential / commercial zoned area of the town. This recommendation is based on considerations of land availability, likely construction constraints, capital cost, natural hazards risk and environmental performance.

Such an option is likely to provide the highest level of protection from the variable flooding and aggradation behaviour of the Waiho River and provide a high level of flexibility for managing future flow, load and discharge quality requirements.

Specific design will be required to minimise damage caused by a design seismic event in the nearby Alpine Fault. This requirement is unavoidable at Franz Josef. However, the compact plant is likely to perform better under design seismic conditions than more expansive pond systems.

7 References

2012, Campbell, B. A. Microscale modelling experiment to investigate the effects of an avulsion of the Waiho River into the Tatare River, South Westland, New Zealand. Honours dissertation submitted for the requirements of GEOG 420 (UC).

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2016, Gardner, M., Land River Sea, Waiho River MBL Assessment 1983 – 2016 for West Coast Regional Council (WCRC)

2016, Gardner, M., Land Sea River Consulting 'WAIHO' 2D Hydraulic modelling report produced for WCRC.

2016, Davies, T. Behaviour of the Waiho River: A geomorphological perspective.

2016, WCRC, Waiho River Long Term Strategy – Minutes of 27-28 July 2016 WCRC hosted workshop.

2016 Langridge, R.M., Buxton, R., Howarth, J.D., Ries, W.F. Natural Hazard Assessment for the Township of Franz Josef, Westland District. GNS Science Consultancy Report 2016/33.

2016 Murashev, A. Pers comms J Crawford 13/11/2016 appended.

2016 Healey, M. Pers comms J Crawford 13/11/2016 appended.

2016 Gardener, M. Pers comms J Crawford 15/11/2016 appended

2016 McCormack, G, WCRC. Pers Comms Vivek Goel 16/11/2016 appended

8 Appendices

Personal communication emails:

Murashev, Healey, Gardner / Crawford

McCormack (WCRC) / Goel

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John Crawford

From: Matthew Gardner <Matthew@landriversea.com>
Sent: Tuesday, 15 November 2016 8:54 a.m.
To: John Crawford
Subject: RE: franz Josef WWTP Comparative Report
Attachments: Waiho River Flood Overflow Path_v2.jpg

https://www.dropbox.com/s/nre49tau683h7yf/Drone%20Images%20For%20OPUS.zip?dl=0

Hi Lewis – above is a link to the drone images that will hopefully be relevant. Please let me know when you have downloaded them so I can delete them from my dropbox.

I have also produced an image showing approximate overflow paths in the March event (the black and white image is some drone footage of the river bed the day before the event – it was captured at sun rise so the quality is low). This was a fairly small event so the flooding on the delta was not significant.

It should be stressed that that bed levels adjacent to the oxidation ponds are very likely to continue to rise, and based on the recent behaviour the alignment of the river has a strong potential to align itself so that a main channel is directed at the oxidation pond bank putting it under considerable pressure. Also based on current bed and bank levels, the bank is very likely to overtop in a major flood event which will likely cause bank failure. The bed level adjacent to the Mueller hotel increased by approximately 2 metres between the 2015 and 2016 surveys, and it appeared most of this bed level rise occurred within a number of months. I would strongly caution against rebuilding in this location – it would seem to be very short sighted! I know you are on the same page, but just wanted to put that in writing.

Kind regards,

Matthew Gardner
MIPENZ CPEng

Director
Land River Sea Consulting Ltd
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From: John Crawford [mailto:john.crawford@opus.co.nz]
Sent: Monday, 14 November 2016 2:45 PM
To: Matthew Gardner <Matthew@landriversea.com>
Subject: franz Josef WWTP Comparative Report

Hi Matthew

My contact details are below.

John Crawford

From: Mark Healey
Sent: Monday, 14 November 2016 9:33 a.m.
To: John Crawford <john.crawford@opus.co.nz>
Cc: Mark Smith <Mark.D.Smith@opus.co.nz>; Christopher Bergin <christopher.bergin@opus.co.nz>
Subject: RE: Franz Josef WW Comparative Report.

Hi John

Sorry for the delay in reply – have had plenty on.

I'm happy to assist at the council meeting. I think David Inwood was keen for me to talk there as well – he was going to mention that to Tanya Winter (CEO). I do have a prior commitment and potential conflict of interest with my work for NZTA though. I would need to get official sign-off on my attendance at the council meeting, likely on the basis that I talked about general river processes etc and not anything to do with NZTA river works or strategies in the Waiho.

As well as the 0.2m per year average aggradation trend I believe that the river has a short-term correction to make on the north (ponds) side of the fan of about 1m. This is apparent from LiDAR contours of the fan surface profile. I.e. the river bed will likely come up 1m relatively quickly, on top of a 0.2m per year average rate. I also note that stopbanks immediately upstream are about 2m higher than the current ponds stopbank (or access road as they like to call it). You could say that the bank needs to be 1 + 3 + 2 = 6m higher than present in 15yrs.

A breakout to the Tatare is almost certain. The river is continuing to aggrade and there is nothing stopping this from happening. This may bring temporary or longer-term relief from aggradation. However, it may also brig wholesale destruction from dramatic down cutting and undermining of the pond protection works and the pond itself. Really depends on where the river decides to cut its channel. I strongly suggest that engineering works to try to control this steeper and more aggressive river situation would be fraught with difficulty and extremely expensive. The likely reality is that we would be at the mercy of the river.

The only real solution available is to release the river to the south again (i.e. take away the stopbanks) to let it traverse the rest of its natural fan and hopefully be more successful in transporting excess sediment loads.

Other risks that the ponds would be exposed to include earthquake induced land sliding and/or dam break dam and/or glacier burst flooding and associated aggradation. Add climate change as well. All bad news…

Regards

OPUS

Mark Healey
Business Group Manager - West Coast
Partner
ME(Nat Res)(Dist), MIPENZ, CPEng [171989]

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John Crawford

From: Alexei Murashev
Sent: Sunday, 13 November 2016 8:21 p.m.
To: John Crawford; Pathmanathan Brabhaharan
Cc: Christopher Bergin; Vivek Goel
Subject: RE: Franz Josef WWTP - Seismic Risk

Hi John

My thoughts are similar to yours. In my view, it is easier to control a small area (Option 1) in terms of satisfying design requirements. Yes, we can have some lateral movement and possibly differential settlement. It also may be that foundation soils are liquefiable and prone to lateral spreading. However, the plant loads distributed over the RC raft should be low (assuming the raft is thick), so we should be able to satisfy bearing capacity requirements even with no ground improvement. If loads are high, ground improvement can be carried out to mitigate soil's potential for liquefaction and lateral spreading.

Design of the plant structures founded on RC raft would need to consider high seismic loads and the need to relevel structures after the design seismic event (unless ground improvement is carried out).

If properly designed, I would expect "Moderate but reasonably repairable damage in Mm=8.1 event" for Option 1.

In terms of flood, everything will depend on levels. I understand that Option 1 site is on high ground level above the Q100 flood level and behind formal flood protection works. So, I guess the risk of flood damage for Option 1 is low. Additional flood protection measures can be put in place if required.

Option 2 will be likely to experience heavy damage and will be costly to repair.

One more risk to consider is the risk to pipelines, what can be done to reduce the risk and minimise time to repair.

We can have a more detailed chat on Monday.

Regards

Alexei

OPUS

Dr Alexei Murashev
Technical Principal
Work Group Manager – Geotechnical Engineering & Risk
Opus Partner

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From: John Crawford
Sent: Sunday, 13 November 2016 3:25 p.m.
To: Alexei Murashev <alexei.murashev@opus.co.nz>; Pathmanathan Brabhaharan <brabha@opus.co.nz>
Cc: Christopher Bergin <christopher.bergin@opus.co.nz>; Vivek Goel <vivek@westlanddc.govt.nz>
Subject: Franz Josef WWTP - Seismic Risk

Hi Alexei
Hi Brahba

I would like your very brief opinions on the following please. I am doing a multi-criteria assessment of the scenarios discussed below and , in scoring the Natural Hazard resilience of the various options, I would like some expert opinion that is independent of the project team.

At Franz Josef in South Westland, we are considering two options for replacement of the Franz Josef WWTP, which is currently an oxidation pond system that has been largely destroyed by a moderate flood of the Waiho River below the SH6 road bridge in March 2016. The river has been aggrading at an average of 0.2m/year over the last 30 odd years and this appears to be accelerating.

You will be familiar with the Alpine F2K fault passing right through the built up area of Franz Josef Township. There is a 130m wide fault avoidance zone (FAZ) straddling the actual fault. According to GNS, the expected quake magnitude for the next event is M_w=8.1. Shaking intensity is estimated at MMI 9. Return period is estimated at 300 years and this is currently at the later end of the cycle. The conditional probability for this event occurring within the next 50 years is 27%. Anticipated vertical displacements are 1 – 2 m. Anticipated horizontal displacements are 7 - 9m. In addition, the Waiho Delta has been identified as being prone to liquefaction and lateral spread. The WW facility is regarded as IL3 priority.

There are two concepts for replacement of the WWTP.

1 One concept is a very small, compact high rate treatment plant on a concrete plant slab. Total footprint is less than 50m x 25m. The site is on high ground level above the Q_{100} flood level and behind formal flood protection works. It is however only about 620m from the alpine fault. All flow must be pumped into this plant. This plant is basically a series of stainless steel tanks bolted down to a RC plant slab on ground. The slab can be cast in separate pieces if necessary, with pumps and flexible pipes joining neighbouring sections. The site is in bush and this will have to be cleared, levelled and reworked as necessary to provide appropriate foundations.

2 The second concept is to construct more oxidation ponds, down on the Waiho Delta where there is space and odour buffer provisions can be satisfied. There are 5 potential sites, with total pond area ranging from about 5 to 10ha. Therefore about 1.5 to 2km of pond embankments, 3m high to be built. Some sites will require pumped feed. Some can be fed by gravity. Significant flood protection works will be required in some areas. These 5 sites range from about 700m to 1800m from their closest embankment to the alpine fault

The following are the scoring criteria (out of 10) I have adopted so far for Natural Hazards but am happy to take advice.

Natural Hazard Risk		1
Flooding	Susceptibility to natural flood hazard from Waiho or Tatare River and ability to protect against	Site inundated in event less than Q_{10}
Seismic Event	Susceptibility to severe damage due a rupture of the alpine fault and ability to design against.	Major damage or destroyed in M_m=8.1 event

Are you able to provide opinion (spending no more than 1 hour each) as to relative scoring you would assign, fully accepting that you have had no opportunity to undertake formal analysis (scores can be any number between 1 and 10).

From limited understanding, my expectation is that it will be relatively straight forward to undertake small area foundation improvements in the alluvial gravels as we have done for WWTP facilities at both Shotover Delta and Awatoto Napier and that the likelihood of major level differential levels resulting over any given 50m piece of territory is less than that over the 650 – 700m length that might result along a twin pond oxidation pond system which would result in major readjustment of embankment levels and possibly the need to reinstate breaches occurring as a result of level change induced over topping.

Please call ASAP if you would like me to clarify anything.

Job number 6WWES3.42 Task 66GG.

Thanks very much
Regards

John Crawford

OPUS

John M Crawford

Technical Principal - Wastewater

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John Crawford

To: John Crawford
Subject: FW: Franz Josef WWTP - Request for comments

Importance: High

From: Gerard McCormack [mailto:gerardm@wcrc.govt.nz]
Sent: Wednesday, 16 November 2016 3:15 PM
To: Vivek Goel <vivek@westlanddc.govt.nz>
Cc: Michael Meehan <mm@wcrc.govt.nz>; Tanya Winter <tanya.winter@westlanddc.govt.nz>
Subject: RE: Franz Josef WWTP - Request for comments

Vivek,

Thank you for your email as you will see I have sought to respond to each question in term below.

1. Do you believe under the current consent conditions – any expansion or creation of new oxidation ponds at the current site will require a new consent or the works can be done within the existing consent?
- A community led proposal (which we haven't received to date) is most likely for un-lined ponds and no consideration to a mechanical aeration or any disinfection provisions. So we cannot comment on the proposed effluent quality. This is based on the initial submission from Mr Gavin Molloy.

From the information you have sent it appears the intention is to build two significantly larger treatment ponds rather than upgrading the existing ones, which I assume would be decommissioned. Therefore as you are not modifying the existing ponds but instead proposing a brand new treatment scheme, fresh resource consents would be required. In addition consent would be required for the stop banks that would also be required as part of the scheme.

2. If the works (expansion of oxidation ponds) can be carried without a consent or under the current consent – would you still need an AEE? We have requested similar comments from iwi. Will there be any consultation requirements?

See response to question 1.

3. The recent WWTP discharge consent renewal for Hokitika WWTP was lodged and granted an extension of only 10 years. There are strict instructions to investigate improvements within this timeframe. The 10 year consent was lodged after informal discussions with WCRC on the basis that a longer term of 30 years, in practice will be difficult to be considered. Will it be fair to consider a similar assumption for Franz Josef – should Council consider oxidation ponds as a preferred form of treatment.

The Hokitika application was for the renewal of an existing consent and is therefore not comparable with the new schemes you are proposing for Franz. In determining the length of any new consent would need to demonstrate that it is capable of meeting both current and expected capacity needs, as well as being compliant with discharge limits.

4. Can you comment otherwise – with respect to oxidation ponds in general? In the draft report there is a statement - "*However, looking to the future, it is unlikely that future consent conditions will be as generous as those currently held, or that they will in fact even permit a pond based system on the Waiho delta, and if planning upgrading or rebuild works, it would be prudent to make as much provision as possible for accommodating future needs*."

We are simply looking to achieve a system that deals with effluent which complies with our requirements and does not have an adverse impact on the environment. However we feel that a high rate waste water treatment plant

would be a more appropriate long term solution than a pond system, particularly given the close proximity of the river.

5. Do you have any comments on the proposed locations? I have attached an aerial map with locations under investigations. The elected members have a view about building a stop bank around the ponds and then consider the site be future safe. Any comments? Obviously, any stop banking / flood protection works would have to consider the rate aggradation of the river and the required life of the project.

We would need significantly more information before we could form a view on the suitability of other locations. Obviously consents would be required for the stop banks and there is no guarantees that long term they would be sufficient to keep the river out.

If I can be of any further assistance at this stage then please do not hesitate to contact me.

Kind regards,

Gerard McCormack
Consents and Compliance Manager
Tel. 03 768 0466 ext 236|
Mob. 021 190 7741
E: gerardm@wcrc.govt.nz

PO Box 66, Greymouth 7840
388 Main South Road
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From: Vivek Goel [mailto:vivek@westlanddc.govt.nz]
Sent: Monday, 14 November 2016 11:44 AM
To: Michael Meehan; Gerard McCormack
Cc: Tanya Winter; Pamela Wilson
Subject: Franz Josef WWTP - Request for comments
Importance: High

Hello Mike and Gerard

Thanks for sharing the information on Waiho river studies last week. This is very helpful. As you are aware that we are in the process of finalising another detailed report which will include comparatives on oxidation ponds and a high rate mechanical treatment plant. We need WCRC comments.

Over the past year we have had a number of discussions on this matter. However ambiguous statements have been provided by various members of the community claiming that WCRC has indicated their support or easy consentability for extension of the current oxidation ponds at the current or new site. I appreciate that WCRC, under the RMA provisions, will only act on the information provided or the consent sought. However, in the interest of our working relationship, our ratepayers and in the interest of the environmental sustainability, it is important that WCRC make some clear comments, which we would like to include as part of our report.

We would also request your presence on 24th November 2016, at our Council meeting when the reports for Franz Wastewater Treatment options will be considered. Mike, as CE may I please request your comments to below questions:

1. Do you believe under the current consent conditions – any expansion or creation of new oxidation ponds at the current site will require a new consent or the works can be done within the existing consent?

- A community led proposal (which we haven't received to date) is most likely for un-lined ponds and no consideration to a mechanical aeration or any disinfection provisions. So we cannot comment on the proposed effluent quality. This is based on the initial submission from Mr Gavin Molloy.

2. If the works (expansion of oxidation ponds) can be carried without a consent or under the current consent – would you still need an AEE? We have requested similar comments from iwi. Will there be any consultation requirements?

3. The recent WWTP discharge consent renewal for Hokitika WWTP was lodged and granted an extension of only 10 years. There are strict instructions to investigate improvements within this timeframe. The 10 year consent was lodged after informal discussions with WCRC on the basis that a longer term of 30 years, in practice will be difficult to be considered. Will it be fair to consider a similar assumption for Franz Josef – should Council consider oxidation ponds as a preferred form of treatment.

4. Can you comment otherwise – with respect to oxidation ponds in general? In the draft report there is a statement - "*However, looking to the future, it is unlikely that future consent conditions will be as generous as those currently held, or that they will in fact even permit a pond based system on the Waiho delta, and if planning upgrading or rebuild works, it would be prudent to make as much provision as possible for accommodating future needs*."

5. Do you have any comments on the proposed locations? I have attached an aerial map with locations under investigations. The elected members have a view about building a stop bank around the ponds and then consider the site be future safe. Any comments? Obviously, any stop banking / flood protection works would have to consider the rate aggradation of the river and the required life of the project.

I will appreciate your comments as soon as possible. I realise that your comments can be on a without-prejudice basis, but a firm statement will be very helpful.

Regards

Vivek Goel
Group Manager: District Assets
Westland District Council

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"Westland – The Last Best Place"