Courtenay Environmental
Consultants Ltd

[redacted]

17 November 2025

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Bathurst Resources Ltd
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CHRISTCHURCH

Email:- [redacted]

Dear [redacted]

ON-SITE WASTEWATER MANAGEMENT AT STOCKTON MINE

1. Introduction

Bathurst operates a range of on-site wastewater treatment systems (OWTSs) to treat and discharge sewage at various locations at the Stockton mine and at the coal loading facility at Ngakawau. It has been reported that the facilities were previously consented by West Coast Regional Council and that the consents have now expired. There are plans to continue mining at the site and as such it is necessary to reconsent the OWTS discharges.

The mining operation at Stockton has changed significantly since the original systems were installed by Solid Energy around 2009 to 2012. In at least one instance the OWTS has been moved from one location to a second location to account for changes in mining operations and worker locations. Most significantly there has been a large reduction in the number of workers on the mine site from the period when Solid Energy operated the mine. Advice has been sought from Courtenay Environmental Consultants Ltd (CEC) on whether the existing OWTSs are necessary, fit for purpose and with the reduced effluent volumes, currently performing to expected effluent quality parameters.

This letter report details:

1. CEC understanding of the systems,
2. the original design flows (based on staff numbers at Stockton in 2012 – 2014),
3. the future design flows for the systems,
4. makes an estimation of how well the systems could perform based on predicted future reduced design flows, and
5. provides recommendation on changes to the system operation.

Note, as current staff numbers are slightly lower than future predicted numbers the suitability of the systems for future operation should form the basis of this assessment. The current and predicted future staff numbers are sufficiently close to not change the overall recommendations.

A site visit was undertaken to the Stockton mine and Ngakawau sites in March 2025 and a second visit to the Ngakawau site took place on 24 July 2025 to view the current locations of the existing systems and understand the environment into which each is discharging.

Tables 1 and 2 list the locations where sewage is generated and provide a description of the treatment systems.

Table 1: Stockton Sewage Discharge Locations

Discharge Location	Current Wastewater Treatment System Description	Known or Estimated Design Capacity (L/day)	Estimated Current and Future FTE[1]/Day	Estimated Future Flow (L/day)
Bathhouse Office Complex	Hynds high-capacity system to surface laid pressure compensated drip irrigation (PCDI) field	21,000	85 + wastewater from holding tanks	1,300
Top Offices Complex/Hoods	Dual septic tanks (1 x 2,000 L, 1 x unknown size) with Zabel filters and flout chamber for effluent dosing, field drain disposal	8,000 Est.	50	750
Campbells Crib-hut (ex-Kings Cross system)	RX Plastics (Airtech (?)), UV filters, to buried PCDI field.	1,600 (est.)	58	870
Downers Old Workshop	Multi-chamber septic system with field drain disposal	Unknown	2	30
Stockton Alliance Workshop	Hynds 'Elite' system to buried PCDI field	3,000	55	830
CHPP	Hynds 'Advanced' system to buried PCDI field	1,800	17	850
Sub-Contractors Complex	2 x 8,500 L septic tanks with UV filtration and field drain disposal	8,000 est.	11	165
Orica Compound	Hynds 'Advanced' system field drain disposal	1,800	10	150
Station #2	Septic tank of unknown dimensions probable discharge boulder hole.	Unknown	1	15
Electrical Workshop BWTP		Unknown	2	30
Gatehouse	Holding tank	Unknown	2	30
Red Rocks Crib Hut	Hynds 'Elite' system to buried PCDI field	3,000	64	960
Station 5	Septic tank	Unknown	4	60
TOTAL			**357**	**6,010**

Note: 1. FTE = Full Time Equivalent workers

Table 2: Ngakawau Sewage Discharge Locations				
Sewage Discharge Location	**Wastewater Treatment System Description**	**Known or Estimated Design Capacity (L/day)**	**Estimated Current and Future FTE[1]/Day**	**Estimated Future Flow (L/day)**
Bathhouse System	Septic Tank to probably boulder hole or possible gravity trench	3,500	26	1,300
Offices (Behind)	Oasis Clearwater S2000 (circa. 2006) to surface laid pressure compensated drip irrigation (PCDI) field	1,600	12	180
Tubshop	Oasis Clearwater S2000 to buried PCDI	1,600	8	120
SGS Lab	Septic Tank to boulder hole	Unknown	12	180
TOTAL			**62**	**1,780**
Note 1: FTE = Full Time Equivalent workers				

2. Expected Effluent Quality from Existing On-site Wastewater Treatment Systems

4.1 Stockton Systems

The key observation from the data in the previous tables is that the existing OWTS are all well over capacity apart from the Campbells Crib Hut, CHPP and potentially the Red Rocks Crib Hut systems. For the last three systems it is likely that the effluent will have concentrations expected of secondary treatment systems[1].

For the other systems the very low wastewater loads mean that they are unlikely to be achieving the expected design effluent standard. This is because treatment systems require sufficient carbon and nutrients for the bacteria to grow in the treatment tank which break down the waste. Systems loaded at a fraction of the design capacity will not have sufficient carbon.

[1] Secondary treatment effluent quality defined as (AS/NZS1547:2012 On-site domestic wastewater management), when tested shall comply with the following:-

(a) Ninety per cent of the samples shall have a BOD_5 less than or equal to 20 g/m^3 with no sample greater than 30 g/m^3; and
(b) Ninety per cent of the samples shall have TSS less than or equal to 30 g/m^3 with no sample greater than 45 g/m^3

BOD_5 – 5 day Biochemical Oxygen Demand
TSS – Total Suspended Solids

However, for a number of these systems, particularly the bathhouse, top offices, Sub-Contractors Complex and Orica compound, the current and predicted future wastewater load supplied to the treatment tanks is so low that the extended detention time in the treatment systems could be achieving a sufficient level of treatment. The difficulty is that it is very difficult to prove the performance without sampling. Therefore, if performance standards are required to be monitored then sampling and analysis of the effluent should take place.

The typical concentration of nitrogen in raw "domestic" sewage (i.e. not including trade waste and stormwater) ranges from around 26 to75 g/m^3, but generally towards the higher concentration. Taking as an example the Bathhouse system the new future sewage flow is 1,300 L/day. Assuming even a nitrogen concentration of 75 g/m^3 the daily nitrogen load into the treatment system is 97.5 g/day.

Typically, we would assume a nitrogen effluent concentration of 30 g/m^3 from a well designed secondary treatment system. Therefore, with the design load of 21 m^3/day for the Bathhouse system then originally the expected load of nitrogen in the effluent would be 630 g/day. As reported above the actual effluent discharge varied around 5 to 6.2 m^3/day when the Stockton mine was operated by Solid Energy. At 6.2 m^3/day then the mass of nitrogen discharged would have been 186 g/day.

Therefore, in the future, even if there is no removal of nitrogen from the bathhouse treatment system with the current/future staff numbers the actual amount of nitrogen discharged would be approximately half of what would have occurred previously.

As noted above many of the existing systems have very small wastewater flows when compared to the design capacity. Based on this assessment it is likely that the total mass of nitrogen (and phosphorus) has decreased significantly compared to previous years. Hence the environmental impact of the discharges will be lower than previously even though the treatment systems are not performing to their design effluent quality.

During the site visit there was no evidence of seepage or surface ponding around the actual or estimated positions of the effluent discharges indicating that the application rates are not exceeding the soakage capacity of the strata.

4.2 Ngakawau Systems

Two of the systems are Oasis secondary treatment systems (Office and Tubhouse). These were clearly visible and appear to be in good condition (for the age of the systems). In both systems the mechanical components (aerator and pump) are still operating.

For the Office system the surface laid drip irrigation was visible and the area was not wetter than the surrounding environment. This is not surprising given that the treatment system is designed for 1,600 L/day and the current and predicted future wastewater daily volumes are substantially less than the design daily volume at approximately 180 L/day.

The Tubhouse drip irrigation is buried under landscaping as shown in Figure 2. At the time of the site visit in July 2025 the treatment system had been recently emptied and was slowly filling so no discharge had recently occurred. Based on the number of staff using the toilets etc there the wastewater volume is expected to be very low and below the design capacity of the secondary treatment system.

At the design loadings it is probable that both systems have insufficient wastewater load to treat to the design effluent quality. However, Oasis systems have been known to produce the design effluent quality with wastewater volumes of around 500 - 600 L/day. The Oasis treatment system runs a continuous aeration system. Courtenay Environmental Consultants are aware of people who have looked at the aeration capacity and consider that operating the aeration on a timer will achieve similar outcomes as leaving the aeration on. With the installation of a timer and operation of the aerator on a timed sequence then the biological growth in the treatment system will reduce and the wastewater load required for biological growth is also reduced. At an initial estimate running the aerator 30 minute on 30 minutes off may achieve improved treatment outcomes.

The Bathhouse and SGS Lab systems are septic tanks discharging to unknown disposal systems (but given the areas available are likely to be boulder holes). The septic tanks should be inspected and the outlet can be checked for the inclusion of an outlet filter. If no outlet filter is present then the installation of one will significantly improve the effluent quality. For instance, Table 3 is an excerpt from On-Site Wastewater Management in the Auckland Region (Auckland Council Document GD06, 2021).

Table 3: Typical Septic Tank Effluent Quality

Treatment system	Typical concentration (g/m^3)						
	TSS	BOD_5	COD	TN	NH_4-N	PO_4-P	Turbidity (NTU)
Primary treatment without effluent filter	40-140	150-250	250-500	50-90	30-50	8-12	15-30
Primary treatment with effluent filter [Note 1]	20-50	100-140	160-300	50-90	30-50	8-12	10-20

It shows that while there is no practical removal of nutrients there is a very significant reduction in TSS and BOD_5. This reduction will result in less biological load on the receiving environment and extended the life of the land application system due to a reduced risk of blockage.

3. Changes to Existing On-site Wastewater Treatment Systems

5.1 Stockton

Due to the reduced load to many of the treatment systems, compared with the design loads, modifications to the operation of the systems are recommended. Principally the aerated systems probably do not need much of the existing aeration capacity available. For instance, the bathhouse treatment system has two aerated chambers. One of them could be switched off and if possible the aeration on the second could be reduced by operating an existing (or install a new) timer to switch the aeration on and off. Similarly, for the Hynds Elite systems, at Red Rocks and the Stockton Alliance workshop, reduction in the aeration duration is also recommended. It is understood from Hynds that there is no existing timer on the aerators but timers can be retrofitted.

Where sites have less than 5 people present then it is recommended that any treatment system is removed and a holding tank installed. Any existing septic tank could be repurposed as a holding tank. These would then be emptied, when required, with a sucker truck and the waste discharged into the bathhouse system.

Further work is required to establish changes to the operating parameters for each system, to reduce costs, and possibly improve effluent concentrations. Table 4 summarises the recommended changes to the Stockton treatment systems.

Table 4: Recommended Changes to Stockton Treatment Systems

Discharge Location	**Change system**	**Changes to System**
Bathhouse Office Complex	YES	Once agreement to tanker from small sites is decided, look to change operation, possible remove an aeration chamber and balance tank or alter operation of aerators
Top Offices Complex/Hoods	YES	Retain. May decommission one of the septic tanks as future design flow significantly lower than design capacity.
Campbells Crib-hut (ex-Kings Cross system)	NO	N/A
Downers Old Workshop	YES	Convert septic tank to holding tank. Truck sewage to Bathhouse system or pump to nearby Stockton Alliance Workshop
Stockton Alliance Workshop	NO	Add timer for better control of aeration
CHPP		N/A
Sub-Contractors Complex	YES	Retain system but decommission one of the septic tanks as not required.
Orica Compound	NO	Add timer for better control of aeration
Station #2	YES	Convert septic tank to holding tank. Truck sewage to Bathhouse system.
Electrical Workshop BWTP	TBC	If septic tank then convert to holding tank and convey to Bathhouse system. If already holding tank then no change.
Gatehouse	NO	N/A-
Red Rocks Crib Hut	NO	Add timer for better control of aeration
Station 5	YES	Convert Septic tank to Holding tank and truck to Bathhouse system

5.2 Ngakawau

Table 5 outlines the recommended changes at Ngakawau. The capacity of three of the systems is satisfactory except for the Tubshop which is significantly over capacity. It is understood that the Tubshop system was installed on the basis of showers and other facilities being installed but at present, and in the future, only a few people will use the toilets. If there were a number of other sites which were small then a holding tank would be recommended but it is not worth doing the conversion and therefore it is recommended to leave the system in place but reduce the amount of aeration.

Table 5: Recommended Changes Ngakawau Treatment Systems		
Sewage Discharge Location	**Change system**	**Changes to System**
Bathhouse System	YES	Capacity seems fine. Currently no easy access to chambers. Look to install risers on manhole lids to allow access for emptying. Install outlet filter on septic tank to significantly improve environmental performance.
Office	TBC	Possibly add timer for better control of aeration
Tubshop	YES	Although completely overdesigned for flow best to leave. Place timer on aerator to operate less frequently
SGS Lab	YES	Locate access to septic tank, install outlet filter as per Bathhouse system

Note, all systems have only had an initial inspection at this time. Before any work is finalised it is recommended that an inspection is carried out using a drainlayer experienced in the operation and maintenance of on-site wastewater systems to thoroughly check the current state of the systems and ensure that these are sufficiently durable to last for the proposed duration of the mining activity.

4. Summary

The data from the Bathhouse treatment system during the period from 2012 to 2014 indicates that the typical daily volume of wastewater generated per person (other than at the CHPP) is in the order of 12 to 14 L/day. For sites where showers are also used (e.g. at the CHPP) then a design flow of 50 L/day has been adopted.

Using a wastewater volume of 15 L/person/day plus 50 L/day where showers are used, some of the existing systems are not, or will not be, supplied with sufficient wastewater to operate to the design effluent quality. In some instances, converting a system to a holding tank and using a sucker truck to convey the wastewater to the bathhouse treatment system has been recommended. In others, changes to the operation of the treatment systems are recommended which should result in improved environmental performance for small investment in equipment.

Typical effluent quality information is presented for the different systems based on assessment of the likely performance with the predicted wastewater flows and recommended changes to the systems.

Yours sincerely

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Courtenay Environmental Consultants Ltd
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