30 Jan 2026

Soil report on proposed compost recovery at Kokatahi

I have been invited to comment on the impacts related to soil characteristics at the compost recovery proposal.

I support the concept of converting waste organic material into usable compost provided the process does not result in significant negative environmental impacts.

Qualifications

I have a M.Agr.Sci degree in soil science from Lincoln University.

I have 43 years' experience in soil survey and land resource assessment as a pedologist employed by DSIR and thence Manaaki Whenua, Landcare Research.

I have authored scientific papers and reports including evaluation of land for rural use (Webb and Wilson 1994). Evaluating soils in relation to leaching of nutrients and microbes (Webb et al 2010).

Experience in mapping soils on the West Coast

In the 1970's I was part of team that mapped the soils in this region published in 'Soils of Greymouth-Hokitika Region' (Mew 1980). As part of that survey, I mapped the soils under the proposal.

The soil map and soil descriptions have subsequently been transferred to a soil database that is available online (S-map online). Descriptions in this report are derived from the S-map database.

Basis of evaluation

Comments in this report are solely based on information contained within the von Ah Contracting Composting Proposal and AEE, Final 29/08/2025. I am unaware of any other evaluations.

Soil map units

There are two soil map units at the site.

Paddocks 1, 2, 8 and 70% paddock 7 and 25% paddock 3 are mapped as:

- 70% Hinds moderately deep sandy loam, imperfectly drained
- 30% Karapoti moderately deep sand, imperfectly drained

(These soils were previously named Harihari soils.)

Paddocks 4, 5, 6, and 30% paddock 7 and 75% paddock 3, are mapped as:

- 60% Huangarua shallow silt loam, well drained
- 40% Rangitata very shallow sand, well drained

(These soils were previously named Hokitika soils.)

Soil descriptions

These descriptions record the layers of the soil from the soil surface to 100 cm depth.

Hinds

15 cm sandy loam topsoil, rapid permeability
30 cm sandy loam, moderate permeability
35 cm sand, rapid permeability
20 cm very stony sand, rapid permeability

Karapoti (Moderately deep, imperfectly drained)

10 cm sandy loam loamy silt topsoil, rapid permeability
50 cm loamy sand, rapid permeability
20 cm stony loamy sand, moderate permeability
20 cm very stony sand, rapid permeability

Huangarua

12 cm silt loam topsoil, rapid permeability
25 cm silt loam, moderate permeability
25 cm very stony loamy sand, rapid permeability
38 cm extremely stony sand, rapid permeability

Rangitata

15 cm very stony silt loam topsoil, rapid permeability
55 cm very stony sand, rapid permeability
30 cm extremely stony sand, rapid permeability

Soil characteristics

Table 1 records soil characteristics as recorded in the S-map database.

Soil type	Drainage	N leaching vulnerability	Water logging vulnerability	Profile available water[1]
Hinds	Imperfect	Low	Moderate	High
Karapoti	Imperfect	Low	Moderate	High
Huangarua	Well	High	V Low	Moderate
Rangitata	Well	V High	V Low	Moderate to Low

[1]Water stored within the soil between dry and wet soil conditions

Table 1. Soil characteristics.

Classification of soils for leaching vulnerability.

In the process of forming compost, the runoff is to be stored in a leachate pond. This water will contain significant amounts of nutrients and organic molecules plus unknown quantities of bacteria (such as E-Coli).

The applicant's report states

> 'Soils in the Kokatahi area are identified as Hinds and Karapoti, with both being moderately deep and imperfectly drained, with low leaching susceptibility (source S-maps Landcare Research).

This statement is not accurate. About half the site contains well drained shallow Huangarua and very stony Rangitata soils. Table 1 records that S-map rates these soils as having high or very high N-leaching vulnerability. The other half of the site contains imperfectly drained Hinds and Karapoti soils. Table 1 records that these soils as having low N-leaching vulnerability.

While S-map records that leaching potential is low in the imperfectly drained soils - this is for normal agricultural practices and does not take account of high rainfall, With around 3,000 mm of annual rainfall, the imperfectly drained soils would also have high leaching vulnerability. Under conditions within this proposal there will be high to extremely high leaching vulnerability.

Depth to water table

The applicant does not record the depth to the underlying water table.

Topographic maps indicate that:

- A creek runs through the property just within the Huangarua and Rangitata soil map unit.
- Every paddock has at least one channel leading into this creek and thence into Duck Creek.

These channels drain water from the water table. This indicates that there is a shallow water table.

I estimate that in the imperfectly drained soils the water table will at times rise within 50 to 100 cm from the ground surface and that in the well-drained soils the water table is likely to often be within 100 to 150 cm from the soil surface. Water from the water table will drain into Duck Creek and the Kokatahi river.

Under periods of extended rainfall, the water table under the imperfectly drained soils will rise. When this happens there will be limited drainage from the imperfectly drained soils and surface ponding is likely to occur in channels and depressions.

Extended times of ponding can stunt or kill plants.

Data should be provided on depth to the water table.

Climate data

There seems to be no evaluation of the practicality of irrigation of waste onto land under climatic conditions at the site. This needs to be done. So I have accessed climate data and have made assessment of climatic effects on leaching and ponding.

Figure 1 records monthly rainfall for 2024 and 2025. Rainfall exceeded 200 mm in 75% of months and exceeded 460 mm in August 2024 and October 2025.

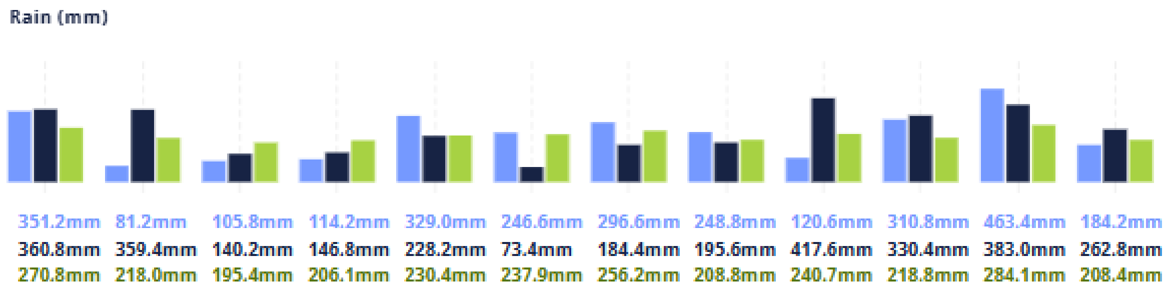


Figure 1 Monthly rainfall at Hokitika, December 2025 to November 2025. *Monthly rainfall for Hokitika from Metservice website, (http://metservice.com/towns-cities/regions/westland/locations/hokitika/past-weather). Green is long term average, Black is 2024, Blue is 2025.*

Figure 2 records daily rainfall at Hokitika. In October 2024 there was a daily rainfall event of around 140 mm of rain and 120 mm in September.

Daily rainfall data is from https://envirodata.wcrc.govt.nz/dashboards/rainfall/rainfall.php#1

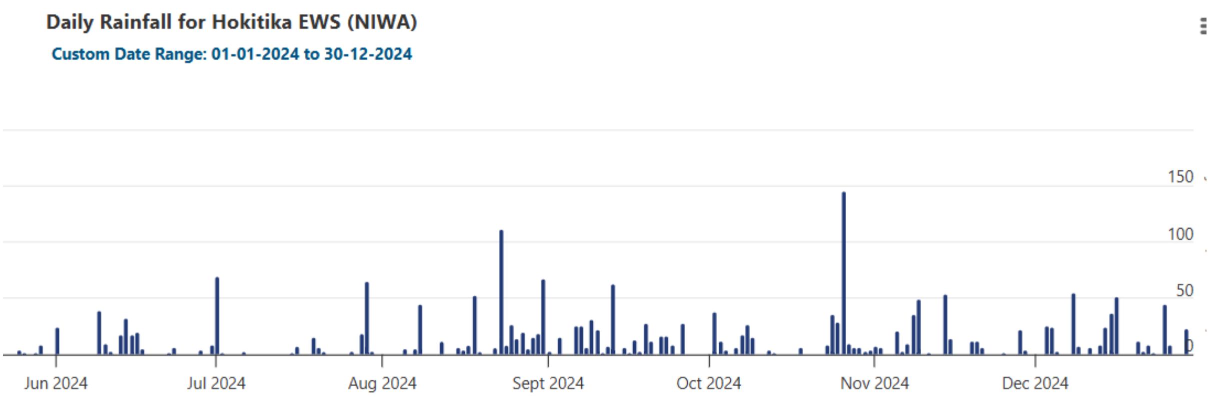


Figure 2 Daily rainfall in Hokitika in 2024

Table 2 tabulates recorded average monthly rainfall, evapo-transpiration and rain days over a 30 year period. It also records calculated runoff and soil moisture deficit based on a soil with 150 mm soil water storage capacity. NB a soil with 150 mm soil water storage relates to a soil with around 100 mm depth of fine texture.

> NB runoff is somewhat of a misnomer – most of this water will drain below the soil and a significantly lesser amount may runoff at the soil surface.

It is notable that (excepting February) every month, on average, estimates runoff of 130 to 230 mm and 7 to 14 days with 'runoff'.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
							Millimetres water						
Rainfall	211	204	184	203	246	267	183	243	221	273	197	301	2732
Evapo-treanspiration	120	93	72	38	21	14	18	28	46	73	97	112	732
Runoff	135	84	133	190	218	230	199	200	211	204	154	157	2116
Soil moisture deficit	2	2	1	0	0	0	0	0	0	0	0	0	4
							Days						
Rain days	12	10	13	13	15	14	13	15	17	17	15	16	170
Days with Runoff	7	5	8	11	14	13	13	13	14	13	9	9	127

Table 2 Monthly and annual rainfall and monthly distribution of annual climate data for Hokitika (average for 30 years from 1981–2010). (From NIWA 2016). *Estimation of runoff, soil moisture deficit and days with runoff are based on a soil with 150 mm soil water storage capacity.*

Figure 2 records monthly variation data of rainfall for all available data for Hokitika. This shows that five months have recorded monthly rainfall of 500 to 600 mm.

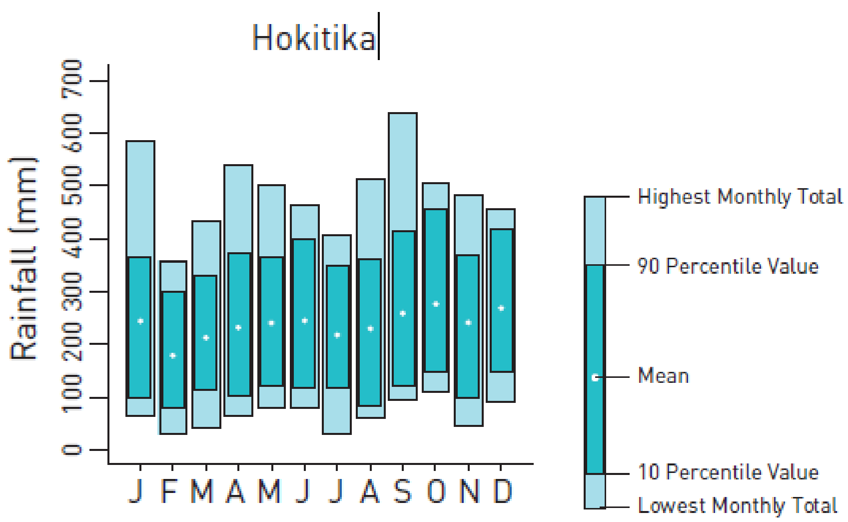


Figure 2. Monthly variation data of rainfall for all available data for Hokitika (From NIWA 2016).

Table 3 records the greatest rainfall to accumulate over 3 to 5 days at Kokatahi in 2025. On five occasion 3-day rainfall varied from 90 to 169 mm and on two occasions 4-5 day rainfall varied from 186 to 208 mm.

	April	May	June	July	Aug	Sept	Oct	Nov

Monthly total	346	231	322	253	180	542	650	270
4 to 5 days						186	208	
3 days	161		108	90	98		169	
Rainfall days	14	14	16	15	9	27	26	18

Table 3 Data derived from daily rainfall records for April to November 2025, recorded by Hazel Hook at 147 upper Kokatahi road.

Implication of climate data

The applicant report is lacking in detail on the description of leachate disposal. The proposal describes irrigation of the leachate pond to be:

> ‘pumped out weekly (or as needed) by a sucker truck and irrigated to land via travelling irrigator’
>
> ‘in the case of high rainfall forecast, the leachate pond will be sucked out and irrigated to the land before the rainfall event’

The report does not specify the type of irrigator or the amount of leachate to be applied at each irrigation.

Table 2 indicates that, even with a deep soil, monthly drainage will generally average around 150-200 mm. On average there will be 5-14 days each month with drainage below the soil. These are 30-year average results – so there will be about 50% of months that exceed this amount of drainage. This is confirmed in Figure 2. Note that Figure 2 records ten months when rainfall exceeded 400 mm.

The report does not specify the area to be irrigated. The area will depend upon set-back from Duck Steam and from other facilities and sensitive areas. I will assume that the irrigated area is 25 ha.

The paved pad area of 4,200 m^2 and an average annual rainfall of 2,732 mm (Table 2), will generate an annual runoff volume of 11,340 m^3. This would result in an annual application of 45 mm of leachate if irrigated is evenly over 25 hectares. In high rainfall years the annual load could amount to 50 mm.

At first glance, this seems to be a minimal depth when spread over the whole year. However, Table 2 indicates that most months do not have a soil moisture deficit and the annual soil moisture deficit is only 4 mm. So applying the 45 to 50 mm over the year may increase the drainage by 45 to 50 mm over the 25 ha of irrigated land. If irrigation application depth is 5 mm, this would entail 4 to 5 applications on the same area over a year.

In parts of the summer period, the soils will have a soil moisture deficit when the irrigated leachate can be absorbed into the soil. But a significant period of Summer, and all the rest of the year, the soil will be at, or close, to field capacity. In this condition, the additional of rainfall or application of irrigation water will cause an equivalent amount to drainage.

When soils are wet, they have limited capacity to absorb chemicals and bacteria etc. There will also be many periods when applications will need to be made when it is raining, or will soon experience heavy rainfall, and this will exacerbate the amount of leaching.

In winter, the imperfectly drained areas are likely to be subject to ponding, particularly in hollows. This presents a significant risk of runoff of contaminants directly into water ways. In this condition these soils should not receive irrigation. This will result in more application of leachate to the well-drained shallow and stony soils, with less ability to absorb contaminants.

Storage Capacity

The storage pond is 840 m^3. The yard is 4,200 m^2. 200 mm of rain will fill the pond. From Figure 2 and Table 2 most months have greater than 200 mm of rain and would require the pond to be emptied at least once. Months with over 400 mm of rain (Figure 2) will require the pond to be emptied more than twice. During wet months, sustained rainfall over several days presents a risk of exceeding the storage capacity of the pond, potentially causing leachate to overflow.

Land use issues

The report does not record what plants that are proposed to be grown, nor the method of harvesting. This is a necessary part of applications for disposing of wastewater.

There are high risks of causing compaction and rutting by wheel traffic when irrigating harvesting crops when soils have high water content. Indeed, this is inevitable because the soils are commonly at high water content.

The applicant does not know the composition of the wastewater (which is understandable) so there is no way to determine the balance of nutrients added against nutrients removed in the crop. This also means that there is no estimate of the kinds of organic chemicals and organisms likely to be present, or their concentration.

The applicant proposes to use a travelling irrigator. There is no information on the nature of this irrigator. Most people have a lack of understanding of what happens under an irrigator. If the irrigator applies 10 mm but only takes 10 minutes to pass over the irrigated area then the average irrigation rate 60 mm/h. This intensity of irrigation will generate surface runoff into hollows and channels. This 60 mm/h is just an average – due to variable application rate under sprinklers there will commonly be double that rate of application in parts of the irrigated land.

Conclusion

This proposal omits vital information needed to evaluate the sustainability and environmental impact of using this site for composting.

I calculate that the proposal requires application of 45 to 50 mm of leachate per annum, which may appear to have low environmental impact. However, when the climatic context is considered there may be significant environmental impacts that need to be assessed.

For most of the year, soils at the site will be wet when irrigated with leachate. Applying irrigation before predicted high rainfall will not change the leaching potential. Climatic calculations indicate that leaching of contaminants below the root zone will occur during all months of the year.

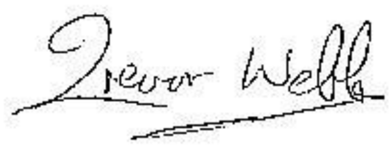
The environmental effects of this proposal need to be assessed having regard to the sensitivity of contaminants entering Duck Creek and Kokatahi and Hokitika Rivers.

References

Webb, T.H.; Wilson, A.D. 1995: A Manual of land characteristics for land evaluation of rural land. Landcare Research Science Series 10. 32 p.

Trevor Webb, Allan Hewitt, Linda Lilburne, Malcolm McLeod, Murray Close. 2010. Mapping of vulnerability of nitrate and phosphorus leaching, microbial bypass flow, and soil runoff potential for two areas of Canterbury. ECAN Report No. R10/125

NIWA 2016 The climate and weather of West Coast, 2nd edition. NIWA science and technology series number 72.



Appendix 1
Comment on Officer Report for Resource Consent RC-2024-0136

I was sent a copy of this report on January 29, 2025

Point No 12

> *The irrigated area is reported as 30 ha. Does this take account of the need to be 20 m away from creeks and water ways?*

Point No 16

> *The applicant notes that other irrigatable blocks may be utilised as a contingency if Duck Creek becomes saturated.*

The leachate from this site will contain significant nutrients to promote plant growth. So farmers will be interested in irrigating this onto their land when the soil can absorb it. Will they still want this to be irrigated when their soils are wet – which is the time that the project will need to irrigate off-site.

Points No 31, 32 and 61

> *The discharge of any contaminants into or onto land in connection with composting operations on production land or for or from domestic composting operations, is a **permitted activity**, provided **all of** the following conditions are met:*
>
> - *There is no contamination of groundwater, water bodies, or coastal water; and*
>
> *The discharge of compost and its leachate is potentially permitted under Rule 74 of the RLWP that provides for the discharge of fertiliser*.

In my view this operation cannot avoid contamination of groundwater and water bodies. The issue is the scale of this contamination.
It is a moot point whether this project (that has the sole purpose using land is for compost leachate disposal) can be compared to a farm's domestic composting operation. The composition of farm compost would mainly take the form of compost from vegetation. This operation is mainly composting manure.
Clearly the leachate will contain many nutrients, as in fertiliser, but I wonder about this being equivalent to fertiliser. It seems to me that it is more akin to waste from a meat works. Another point is that we do not know what this leachate will contain.

Point No 6/ Explanation

> *In making the application of fertilisers a permitted activity, the Council recognises that the adverse effects associated with the activity are generally minor and can be controlled through the conditions imposed. The applicant notes that other irrigatable blocks may be utilised as a contingency*

I disagree that the effects 'can be controlled through the conditions imposed'. Mainly because there is no flexibility to prevent irrigation onto wet land for most applications.

Point No 55

> *As a resultant of the composting operations leachate will be produced through a leachate collection system that is designed to prevent any leachate from entering groundwater.*

The leachate system may be designed with this intent, but in my opinion the project cannot prevent leachate entering the groundwater.

Point No 80

- 8.3A.1*The discharges will largely be undertaken when the soils have the ability to assimilate the leachate, thereby minimizing the potential for surface water contamination.*

- O.13.3.1 *The applicant will only irrigate when the soil is unsaturated and has the ability to assimilate the leachate*

This is not possible - most of the time irrigation will occur when the soils are fully recharged with water.

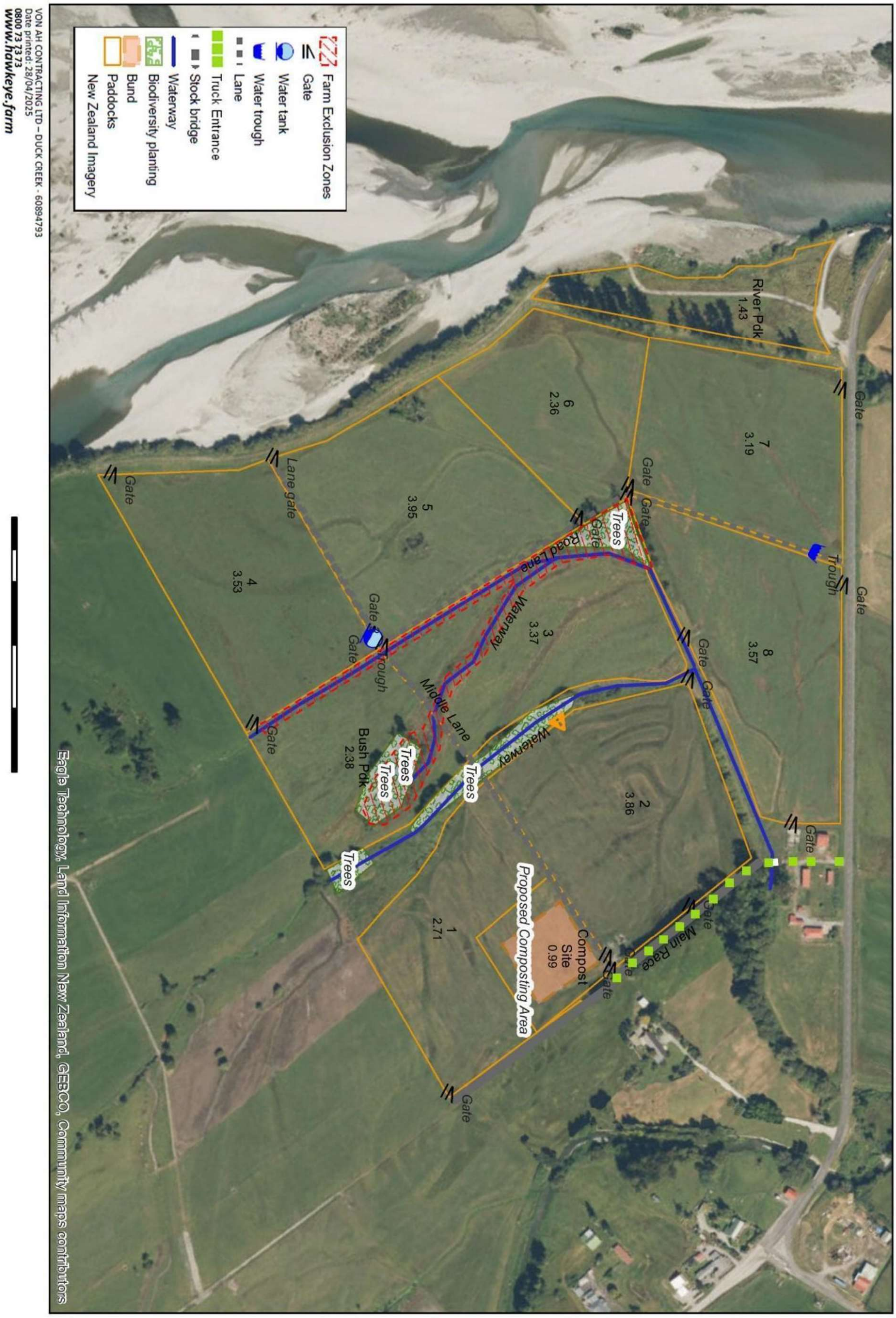


Figure 1: Proposed Site map