

report



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Environmental Management Plan Alliance Matura

Submitted to:
Alliance Matura

Quality Assurance

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Table of Contents

1.0	Introduction	3
1.1	Relevant Resource Conditions	3
2.0	Responsibilities	4
3.0	Treated Wastewater Discharge Water Quality	5
3.1	Discharge Volume	5
3.2	Discharge Quality	5
4.0	Mataura River Water Quality	8
4.1	Mataura River Water Quality Limits	8
4.2	Mataura River Water Quality Monitoring Programme	9
5.0	Water Quality Data Management and Reporting	13
6.0	Ecological Monitoring	13
6.1	Sampling Sites	13
6.2	Timing of Sampling	13
6.3	Aquatic and Riparian Habitat	14
6.4	Periphyton and Heterotrophic Growths	14
6.5	Benthic Macroinvertebrates	14
7.0	Fish Health Monitoring	15
7.1	Introduction	15
7.2	Methodology	15
8.0	Reporting	16
9.0	References	16

Index to Tables

Table 1:	Pre-upgrade Treated Wastewater Limits.	6
Table 2:	Upgraded Treated Wastewater Limits	7
Table 3:	Discharge water quality monitoring schedule.	8
Table 4:	Water quality monitoring sampling sites.	9
Table 5:	Mataura River water quality monitoring schedule at Hydro-race and Bridge Sites.	11
Table 6:	Mataura River water quality monitoring schedule at Sites BD1 and BD2.	11
Table 7:	Ecological monitoring sampling sites.	13
Table 8:	Ecological monitoring frequency.	13

Index to Figures

Figure 1:	Sampling site locations.	10
Figure 2:	Dissolved oxygen sonde location.	12

Appendix A - Resource Consent Conditions.

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1.0 Introduction

This report presents an Environmental Management Plan (EMP) for Alliance Group Limited's (Alliance) Matura Plant (the Plant). The EMP sets out the aims and methods for monitoring treated wastewater discharge (the discharge) water quality and monitoring physical habitat, water quality and biological community health in the Matura River receiving environment.

1.1 Relevant Resource Conditions

The aim of this EMP is to meet the requirements of Conditions 17 and 18 outlined below obtained from *The Resource Consent Application and Assessment of Effects* document dated 31 May 2019 (see Appendix A for full list of conditions).

17. No later than six months from this consent commencing the Consent Holder shall prepare and submit to the Consent Authority an Environmental Monitoring Plan (EMP) for certification.

The purpose of the EMP shall be to describe the methods for monitoring the physical characteristics and water quality parameters of the discharge, and the physical, water quality and biological characteristics and parameters of the Matura River receiving waters as prescribed by Consent XXXX.

The objectives of the EMP are to:

Confirm compliance with consent limits on discharge quality;

Understand the effects of the discharge on Matura River water quality and instream ecology and confirm no unexpected effects are arising as a result of the exercise of Consent XXXX.

The EMP shall include but not be limited to:

- a. The inclusion of a description and maps identifying the monitoring sites;
 - b. A description of the methods and appropriate timing for undertaking the following monitoring requirements:
 - i. Discharge monitoring.
 - ii. Receiving water quality monitoring.
 - iii. Ecological instream monitoring.
 - iv. Fish health monitoring.
 - c. The reporting requirements associated with any monitoring undertaken in accordance with these conditions.
18. The EMP, as a minimum, shall provide for the following monitoring requirements:
- a. maintenance of records of the times and volumes of treated wastewater discharged on each day the permit is exercised;
 - b. representative weekly samples of the treated wastewater at the point of discharge for the following parameters:
 - *E. coli*.
 - Temperature.

- pH.
 - Total Kjeldahl Nitrogen.
 - Ammoniacal Nitrogen.
 - Dissolved Inorganic Nitrogen (nitrate- and nitrite-N plus ammoniacal N)
 - Total Nitrogen.
 - Total Suspended Solids.
 - Total Phosphorus.
 - Dissolved Reactive Phosphorus.
 - Carbonaceous BOD₅.
- c. representative weekly samples of receiving water quality both upstream and downstream of the point of discharge while a discharge is occurring for the following parameters:
- Enumerate *E. coli*.
 - Temperature.
 - pH.
 - Dissolved oxygen concentration and saturation.
 - Nitrate-Nitrite-Nitrogen.
 - Total Kjeldahl Nitrogen.
 - Ammoniacal Nitrogen.
 - Dissolved Inorganic Nitrogen.
 - Total Nitrogen.
 - Total Suspended Solids.
 - Total Phosphorus.
 - Dissolved Reactive Phosphorus.
 - Carbonaceous BOD₅
- d. Ecological monitoring to understand the effects of the discharge including by monitoring the periphyton and benthic invertebrate communities of the Mataura River at points above and below the point of the discharge.
- e. A fish health monitoring survey.

2.0 Responsibilities

Environmental Manager

The Environmental Manager is responsible for ensuring that compliance with resource consents and the maintenance, operation and adherence to this procedure is proactively managed. The Environmental Manager is responsible for the maintenance and operation of

this plan, compliance and annual review. In addition, they are responsible for reviewing this EMP at five yearly intervals in accordance with Condition 19. Results of the review should be reported to the Consent Authority within 30 working days of the review being undertaken.

Southland Regional Council

Southland Regional Council (SRC) is responsible for certifying this plan and any future amendments to it.

3.0 Treated Wastewater Discharge Water Quality

3.1 Discharge Volume

Condition 1 of the wastewater discharge consent permits the discharge of up to 8,000 m³/day of treated wastewater from a meat processing plant into the Mataura River. Treated wastewater is discharged through two 200 mm diameter pipes that exit the Plant ~100 m below the hydro race discharge and drop ~10 m to the river bed. The discharge is currently monitored electronically by two flow meters (Jessica McKee pers. comm.).

3.2 Discharge Quality

Pre-Upgrade Discharge Limits

Condition 2 of the discharge consent sets out the limits applied to the treated wastewater prior to its discharge to the Mataura River (Table 1). These limits apply to the discharge before the intended Wastewater Treatment Plant upgrade which should be fully commissioned and operational no later than 15 years from the commencement of consent.

Condition 4 of the discharge consent states:

The Consent Holder shall ensure that the annual load of total nitrogen measured in the discharge between 1 October and 30 September does not exceed 60 tonnes. In circumstances where this total annual load is exceeded, the Consent Holder shall report to the Consent Authority in accordance with Condition 22.

Condition 5 of the discharge consent states:

No more than 780 tonnes of total nitrogen may be discharged in the wastewater prior to the wastewater treatment plant upgrade required by condition 12 being commissioned. Advice note: This is equivalent to 52 tonnes per year being discharged over the 15-year period before the wastewater treatment plant upgrade is required.

Table 1: Pre-upgrade Treated Wastewater Limits.

Parameter	Limit
Ammoniacal Nitrogen ¹	Shall not exceed a maximum of 50 g/m ³ and consistently maintained at <30 g/m ³
cBOD ₅ Load	Shall not exceed a maximum of 3,500 kg/day
cBOD ₅	Shall not exceed a maximum of 300 g/m ³
Total Suspended Solids ¹	Shall not exceed a maximum of 200g/m ³ and consistently maintained at <100 g/m ³
Total Kjeldahl Nitrogen	Shall not exceed a 12-month rolling median of 60 g/m ³ and 95 th %ile of 80 g/m ³
Dissolved Inorganic Nitrogen	Shall not exceed a 12-month rolling median of 40 g/m ³ and 95 th %ile of 60 g/m ³
Total Phosphorus	Shall not exceed a 12-month rolling median of 5.5 g/m ³ and 95 th %ile of 10 g/m ³
Dissolved Reactive Phosphorus	Shall not exceed a 12-month rolling median of 0.5 g/m ³ and 95 th %ile of 1.5 g/m ³

Note: ¹ to be “consistently maintained” if not less than four results out of each set of five meet the lesser specified value, when a set of five results is obtained in accordance with the EMP.

Disinfection Treatment

Within 5 years of the commencement of the consent, equipment to disinfect the process water will be installed. Post disinfection upgrade wastewater *E. coli* limits are:

- (i) Annual median <1,000 cfu/100ml.
- (ii) 95th percentile of 10,000 cfu/100 ml.

Upgraded Discharge Limits

A full biological treatment system that will reduce BOD, ammoniacal nitrogen and total nitrogen loads in the Plant’s wastewater will be operational by Year 15. Condition 13 of the discharge consent sets out limits following the treatment system upgrade (Table 2).

Table 2: Upgraded Treated Wastewater Limits

Parameter	Limit
Ammoniacal Nitrogen	Shall not exceed a rolling 12-month median of 5 g/m ³ and 95 th %ile of 10g/m ³
cBOD ₅ Load	Shall not exceed a maximum of 3,500 kg/day
cBOD ₅	Shall not exceed a rolling 12-month median of 50 g/m ³ and 95 th %ile of 100 g/m ³
Total Suspended Solids	Shall not exceed a rolling 12-month median of 40 g/m ³ and 95 th %ile of 80 g/m ³
Total Nitrogen	Shall not exceed a rolling 12-month median of 20 g/m ³ and 95 th %ile of 40 g/m ³
Total Phosphorus	Shall not exceed a rolling 12-month median of 5 g/m ³ and 95 th %ile of 10 g/m ³
Dissolved Reactive Phosphorus	Shall not exceed a 12-month rolling median of 0.5 g/m ³ and 95 th %ile of 1.5 g/m ³
Dissolved Inorganic Nitrogen	Shall not exceed a 12-month rolling median of 20 g/m ³ and 95 th %ile of 35 g/m ³
<i>E. coli</i>	95 th %ile of 1,000 cfu/100 ml

Condition 14 states:

Once the upgraded Wastewater Treatment Plant has been commissioned and fully operational for 12 months, the annual load of total nitrogen measured in the discharge between 1 October and 30 September must not exceed 25 tonnes. In circumstances where this total annual load is exceeded, the Consent Holder shall report to the Consent Authority in accordance with Condition 22.

The annual load of total nitrogen is calculated as the product of the total nitrogen concentration (recorded once per week) and the weekly total discharge volume to give a weekly total nitrogen load, which can be aggregated over a 12-month period.

Sampling Sites

The wastewater treatment discharge should be sampled at the discharge lines prior to the discharge lines entering the Mataura River. The samples are collected from each line (green and non-green) and then combined.

Sampling Methodology

Composite samples over 8 hours should be collected at the discharge line sampling sites (with the exception of *E. coli* that is collected via a grab sample) and chilled before transport to an IANZ registered laboratory for analysis. Samples should be collected directly into laboratory supplied bottles and must arrive at the laboratory within 24 hours of collection.

Monitoring Frequency and Analytical Parameters

The frequency of the discharge water quality monitoring and required analytes are presented in Table 3. Samples are collected once per week, rotating through Monday to Thursday when the Plant is in operation and a discharge is occurring.

Table 3: Discharge water quality monitoring schedule.

Parameter	Unit	Daily ²	Weekly	Who
Volume ¹	m ³ /day	●	●	Alliance
Temperature	°C		●	Alliance
pH	-		●	Lab
Total Ammoniacal Nitrogen	g/m ³		●	Lab
Dissolved Inorganic Nitrogen	g/m ³		●	Lab
Total Kjeldahl Nitrogen	g/m ³		●	Lab
Nitrate-Nitrite-Nitrogen	g/m ³		●	Lab
Total Nitrogen	g/m ³		●	Lab
Total Phosphorus	g/m ³		●	Lab
Dissolved Reactive Phosphorus	g/m ³		●	Lab
Total Suspended Solids	g/m ³		●	Lab
Carbonaceous BOD ₅	g/m ³		●	Lab
<i>E. coli</i>	CFU/100mL		●	Lab

Note: ¹Discharge volume is currently monitored electronically by two flow meters. ²Data is collected daily but reported on a weekly basis along with other sampling.

4.0 Mataura River Water Quality

4.1 Mataura River Water Quality Limits

Condition 16 states instream water quality limits for the Mataura River below the zone of reasonable mixing as follows:

The discharge shall not directly result in any of the following below the zone of reasonable mixing:

- a. *A change in the natural water temperature by more than 3 degrees Celsius.*
- b. *The acidity or alkalinity of the waters as measured by the pH to not be within the range of 6.0 or 9.0.*
- c. *The waters being tainted so as to make them unpalatable following treatment, nor must they contain toxic substances to the extent that they are unsafe for consumption by humans or farm animals, nor must they emit objectionable odours.*
- d. *The destruction of natural aquatic life by reason of a concentration of toxic substances.*

- e. A conspicuous change in the natural colour and clarity of the waters.
- f. The oxygen content in solution in the waters being reduced below 5 milligrams per litre.

For the purposes of this condition, the downstream sampling site is at the Matura Bridge 330 m downstream of the discharge and has been selected to be as close as possible to the extent of the mixing zone.

4.2 Matura River Water Quality Monitoring Programme

Sampling Sites

Two Matura River sites should be sampled while a discharge is occurring. One site is upstream (Hydro-race) and one site is downstream (Bridge) of the discharge point. Refer to Table 4 and Figure 1 for site locations.

Sampling Methodology

Grab samples should be collected at the Matura River sampling sites and chilled before transport to an IANZ registered laboratory for analysis. Samples should be collected directly into laboratory supplied bottles and must arrive at the laboratory within 24 hours of collection.

Table 4: Water quality monitoring sampling sites.

Site	Location	NZTM coordinates	
		Northing	Easting
Discharge	Discharge	4876329.6	1281321.3
Hydro-race	Matura River upstream of discharge	4876660.1	1281480.1
Bridge	Matura River downstream of discharge	4876028.6	1281177.8

Monitoring Frequency and Analytical Parameters

The frequency of Matura River water quality monitoring and required analytes are presented in Table 5. Samples are collected Monday to Thursday rotating through the week when the Plant is in operation and a discharge is occurring.

During the key contact recreation period, defined as November to April for the purpose of this EMP, black disc measurements should be recorded at Sites BD1 and BD2 to assess water clarity and water samples collected to test for turbidity and total suspended solids. Sampling should be carried out on a fortnightly basis when river flow, recorded at the Tuturau monitoring station, is below 30 m³/s and the sites can be safely accessed ensuring health and safety protocols can be met.

In addition, a water sample should be collected from the Waikana Stream that flows under the Matura Industrial Estate on the true left bank immediately before it discharges to the Matura River and analysed for total suspended solids and turbidity. Health and safety issues prevent the measurement of black disc at this location.



Figure 1: Sampling site locations.

Table 5: Mataura River water quality monitoring schedule at Hydro-race and Bridge Sites.

Parameter		Weekly	Responsibility
Temperature	°C	●	Alliance
Dissolved Oxygen	g/m ³ and %	●	Alliance
Conductivity	µS/cm	●	Lab
pH	-	●	Lab
Total Ammoniacal Nitrogen	g/m ³	●	Lab
Total Kjeldahl Nitrogen	g/m ³	●	Lab
Total Nitrogen	g/m ³	●	Lab
Nitrate-N	g/m ³	●	Lab
Nitrite-N	g/m ³	●	Lab
Total Phosphorus	g/m ³	●	Lab
Dissolved Reactive Phosphorus	g/m ³	●	Lab
Total Suspended Solids	g/m ³	●	Lab
Carbonaceous BOD ₅	g/m ³	●	Lab
<i>E. coli</i>	CFU/100mL	●	Lab
Foams, scums, odour ¹	Visual inspection	●	Alliance

Note: ¹ To be collected during summer low flow conditions.

Table 6: Mataura River water quality monitoring schedule at Sites BD1 and BD2.

Parameter	Unit	Fortnightly between Nov-Apr ¹	Responsibility
Black disc	m	●	Alliance
Total suspended solids ²	g/m ³	●	Lab
Turbidity ²	NTU	●	Lab
Colour ²	Hazen units	●	Lab

Note: ¹River flow below 30 m³/s; ²Water sample should also be collected from Waikana Stream and tested for turbidity, total suspended solids and colour.

Continuous Dissolved Oxygen and Temperature Monitoring

A data sonde that can continuously measure dissolved oxygen and temperature will be deployed on the Mataura River near Chalmer Road (13 km downstream from the discharge), which has previously been identified as the dissolved oxygen sag point. Refer to Figure 2 for the sonde location. The sonde will be deployed during summer low flow conditions for a minimum of one month or more (depending on river flow conditions).



Figure 2: Dissolved oxygen sonde location.

5.0 Water Quality Data Management and Reporting

Data Management

The Environmental Manager and Wastewater Supervisor enter data into the “Effluent” and “River new” spreadsheets maintained on P drive / Effluent in the relevant season folder. External laboratory results are received by the Environmental Manager and Wastewater Supervisor. The Environmental Manager enters the external lab results to confirm compliance, however this is also done by the Wastewater Supervisor when the Environmental Manager is on leave.

Water Quality Reporting

In accordance with Condition 20 of the discharge consent, results of the water quality sample analysis for each five-week period shall be provided to the Consent Authority within two weeks of the receiving all of the laboratory results for that period, unless otherwise agreed with the Consent Authority.

6.0 Ecological Monitoring

6.1 Sampling Sites

There are two upstream sites (U1 and U2) and two downstream sites (D1 and D2). Sites U1 and U2 were referred to as U3 and U4 prior to 2013. Sampling site details are presented in Table 7 and Figure 1. A 30 m reach within riffle habitat at each site should be selected to collect all water physicochemistry, habitat, periphyton and invertebrate data.

Table 7: Ecological monitoring sampling sites.

Site	Location	Description	NZTM coordinates	
			Northing	Easting
U1	Upstream	2.5 km u/s from discharge	4878019.4	1282824.7
U2	Upstream	2 km u/s from discharge	4877618.5	1282525.2
D1	Downstream	580 m d/s from discharge	4875813.4	1280827.2
D2	Downstream	1.85 km d/s from discharge	4874711.2	1280228.9

6.2 Timing of Sampling

The timing of the ecological instream monitoring is presented in Table 8.

Table 8: Ecological monitoring frequency.

Survey	Frequency	Responsibility
Aquatic and riparian habitat	Annually ¹	Ecologist
Periphyton	Monthly	Alliance
Heterotrophic growths	Weekly (summer low flow)	Alliance
Benthic macroinvertebrates	Annually ¹	Ecologist
Fish health	Annually ¹	Ecologist

Note: ¹survey should be carried out during summer–autumn low flow conditions, and if possible, following 20 days of river flow below 40 m³/s.

6.3 Aquatic and Riparian Habitat

Aquatic and riparian habitat should be assessed at each of the four sites and a photograph taken to assist in the interpretation of invertebrate and periphyton results. Habitat parameters to be assessed should include:

- Channel width (m), water depth (m) and velocity.
- Streambed substrate (percent boulder, cobble, gravel, sand/silt).
- Streambed compaction and embeddedness.
- Channel characteristics (percent pool, riffle, run, chute).
- Organic matter content (percent logs, branches, leaves and detritus).
- Riparian vegetation and channel shade (%).
- Stream bank erosion (%).

6.4 Periphyton and Heterotrophic Growths

Visual Assessment

Periphyton cover should be assessed at each site using the Rapid Assessment Method (RAM 1) outlined in Biggs and Kilroy (2000). Periphyton cover should be recorded at five points along four transects within riffle habitat where periphyton and invertebrate samples are collected. Periphyton cover results should be compared with the SWLP for lowland hard bed stream guidelines for filamentous algae and thick mat (0.3 cm) cover of <30% and <60%, respectively.

Ash-free Dry Weight and Chlorophyll-a

Five replicate samples should be collected from riffle habitat at each of the four sites. Each replicate should be collected by randomly selecting three rocks and scraping periphyton within a total area of 0.0085 m² using a scalpel blade and brush into containers. Samples should be stored on ice after collection and transferred to a freezer as soon as practicable and sent to an IANZ registered laboratory for analysis.

Ash-free Dry Weight (AFDW) analysis should be carried out using APHA 10300 C 21st ed. 2005 and chlorophyll-a concentration analysis should be carried out using the method outlined in APHA 10200 H 21st ed. 2005 (modified). Mean AFDW should be compared with the SWLP lowland hard bed stream guidelines of <35 g/m² for either filamentous algae or diatoms and cyanobacteria. Mean Chlorophyll-a should be compared with the NPS-FM and SWLP guidelines of <120 mg/m² for filamentous algae and <200 mg/m² for diatoms and cyanobacteria.

Heterotrophic Growths

Alliance should monitor heterotrophic growth (sewage fungus) cover weekly both upstream and downstream of the discharge by visual inspection during summer low river flows to ensure there are no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats.

6.5 Benthic Macroinvertebrates

Five benthic macroinvertebrate samples should be collected from each of the four sites

using a Surber sampler (0.1 m² area; 500 µm mesh) and following the quantitative Protocol C3 for hard-bottomed rivers (Stark et al. 2001). Samples should be preserved and identified by an experienced taxonomist using Protocol P3 (full count + sub-sampling) in Stark et al. (2001). Biological indices and metrics calculated from invertebrate data to assess community health and indicative habitat and water quality should include:

- *Community composition* – relative abundance of the main taxonomic groups making up the macroinvertebrate communities recorded from each site.
- *Taxa number* – a measure of the overall health of the benthic macroinvertebrate community and habitat and water quality.
- *Abundance* – a measure of the total number of individuals in a sample. Total abundance tends to increase in the presence of organic/nutrient enrichment but declines in the presence of toxic pollution.
- *Macroinvertebrate Community Index (MCI)* – the MCI is a ‘presence / absence’ based index used for measuring stream health and in particular organic enrichment.
- *Quantitative Macroinvertebrate Community Index (QMCI)* – the QMCI is a quantitative variant of the MCI used for measuring stream health and in particular organic enrichment.
- *Deleatidium Abundance* – *Deleatidium* sp. is a water and habitat sensitive mayfly that occurs very commonly in the Mataura River and is used as an indicator of a change in water quality.
- *EPT taxa number* – a measure of the overall health of the community and of habitat and water quality. A community that has a higher number of water and habitat sensitive taxa from the groups Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (EPT) indicates a healthy community and stream.
- *Percent EPT (%EPT)* – another measure of suitability of the waterway for supporting water and habitat sensitive taxa. A benthic macroinvertebrate community that has a higher percentage of water and habitat sensitive taxa from the EPT groups indicates a healthier waterway.

7.0 Fish Health Monitoring

7.1 Introduction

Fish health monitoring surveys assessing resident species such as shortfin and longfin eel are to be carried out annually in conjunction with the ecological monitoring outlined in Section 5.0. The methodology is based on the observational component of the Fish Health Profile developed by Richardson (1998). The Plant is located within the Mataura River mātaimai and does not discharge persistent pollutants such as metals (e.g., mercury) and persistent organic pollutants (e.g. dioxins and other chlorinated compounds). Therefore, euthanasia of fish for the assessment of organs and tissues is not considered appropriate for this EMP.

7.2 Methodology

Fish surveys should be carried out at two sites on an annual basis. One site is upstream and one site is downstream of the discharge. Ten baited fine mesh fyke nets (five upstream and five downstream) should be set overnight and cleared the following morning.

All fish captured should be transferred immediately into a fish bin of river water and placed in a well shaded location. Multiple fish bins should be used if there are large numbers of fish captured to reduce stress. Species other than eels should be kept in separate fish bins. Aeration pumps should be used to maintain dissolved oxygen levels in fish bins.

The following should be measured for each fish:

- Length (mm).
- Weight (g).
- External examination and assessment of eyes, fins, opercula and gills.
- External examination and assessment for lesions and parasites.

A condition score (CON) should be calculated which is a measure of the weight of the fish relative to its length (Richardson 1998).

- $CON = 100 \times W / (L / 10)^3$

8.0 Reporting

Reporting will be carried out in accordance with Condition 23 of the discharge consent:

On an annual basis the Consent Holder shall prepare and submit an Annual Monitoring Report to the Consent Authority. The report shall cover the 1 October to 30 September period and shall be provided to the Consent Authority by 30 November each year. The annual report shall include, but not be limited to the following information:

- presentation and summary of all wastewater and receiving water monitoring results and biological monitoring as required by this consent, including any recommendations for improved monitoring*
- the identification of any recorded non-compliances with consent standards and the measures taken to ensure compliance is achieved.*
- assessment of the effects of the discharge on river water quality and periphyton, benthic invertebrate communities and fish health.*

9.0 References

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APPENDIX A
Resource Consent Conditions

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