

7 September 2018

John Scandrett
Dairy Green Ltd.
10 Kinloch Street
PO Box 5003
Waikiwi
INVERCARGILL

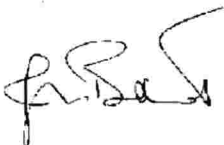
RE: Woldwide Drop Test, August 2018

Dear John

At your request, we have reviewed the data collected for the above test. From this we confirm that:

1. The raw data collected via our Neon data collection system is as you have stated.
2. There were no significant complicating factors during the test.
3. Your conclusion that leakage from the pond complies with the Council's effluent discharge rule appears to be correct.

Yours faithfully



Jeremy Bulleid
NIWA Instrument Systems

Dairy Green Ltd

Practical Engineering Solutions
Consents, Effluent, Stock water, Irrigation
Design through to Installation
Irrigation NZ Accredited Designer

16 August 2018

Abe De Wolde
Woldwide Four Ltd
104 Shaws Trees Road
RD 3
Winton 9783

Dear Abe

Drop Test Results: Woldwide Four Ltd Effluent Pond, 10 - 12 August 2018.

1. Background

The discharge consent for the property is 20181320-01.

As required by Environment Southland, to confirm your effluent pond is not leaking, a drop down test was carried out between the 10 & 12 August 2018.

Site and Set Up

The farm is located at Mayfield Rd, Drummond.

Dung on the yard is scraped upslope into a concrete sump. Liquid effluent flows by gravity from the dairy shed to a pump sump. The liquid is then pumped to a clay lined storage pond. The pond has been emptied in the last 12 months. There was no crust on the pond and the surface was not frozen during testing.

The pond was isolated by not allowing any inflow and by not pumping out during the test period.

The dimensions of the storage pond at the water level during the test period were:

North 62.0m
East 30.8m
South 62.3m
West 33.2m

The dimensions of the storage pond at the top bank level during the test period were:
North 64.0m
East 33.4m
South 63.4m
West 34.0m

The total pond catchment area was 7 % greater than the wetted area during the test.

The maximum design depth for the pond is 2.1m including 0.5m of freeboard. At the time of the test the liquid level was 0.6 below total bank height, i.e.94% full.

Below is an aerial photo that shows the pond and dairy shed. The laser drop test unit was installed at the west end of the pond, as marked.



3. Test Methodology

You were notified when the test was to be run and confirmation was received that there would be no liquid inflow or outflow during the test period.

The monitoring equipment was set up at the pond by Evan Sanderson, as described below. The NIWA Neon website was checked to confirm that data was being recorded and sent to the website.

3.1. Water Level Monitoring Unit

A laser distance measuring unit was set up vertically over the pond surface. A reflective disc was placed on the pond surface to ensure constant, repeatable readings.

The laser was set up within a PVC pipe which acts as a stilling well. Distance readings to the pond surface were taken at 10 second time intervals and sent to NIWA's Neon logging system.

3.2. Meteorological Station

A Vaisala weather station orientated to the North was also set up and the data it collected sent to NIWA's Neon system at 10 second intervals. It measured:

- Air Temperature
- Wind speed
- Wind direction
- Rainfall

3.3 Evaporation Loss Monitoring

A 10 litre bucket (evaporation pan) with a diameter of 250mm was installed in the pond to measure evaporation. The bucket was rinsed and then accurately filled with 9 litres of effluent and the volume monitored to determine evaporation.

To record evaporation in real time a second bucket was installed suspended from a strain gauge with 9.0L of effluent in it, on the pond bank.

4. Results Recording

Recording of results was carried out to comply with the Appendix P of the Environment Southland Land and Water Plan, recording details are summarized below:

- The minimum test period has to be 48 hours.
- Readings are to be taken every 10 seconds.
- For maximum accuracy the wind velocity has to be less than 1.0m/sec. This limit has been set because wind at the test site has been observed to have two affects, the first being to cause waves and the second to push water to one side of the pond from the other, (a seiche effect). The accuracy of the laser distance recorder is such it will detect changes as small as 0.2mm. To accurately determine the true pond level requires calm conditions at the start and end of the test period.
- Rainfall and the evaporation bucket liquid volume was measured at the start and end of the test period, the measurement cylinder was rinsed prior to the volume being measured.
- When a period of 48 hours or more has elapsed the information is down loaded and the results interpreted.
- The GPS location of the pond and equipment set up is recorded. For this test the equipment was located at E1221882, N4883618, at the west end of the pond.

Laser at the west side of the pond.



5. Results Summary

The results for the test are summarised in Table 1 and discussed below.

The plot of wind speed and pond height shows that at times wind caused waves on the pond surface. However, a period was identified at the start and end of the test period when the pond surface was stable and accurate height readings were established.

The start time was assumed to be at 15:27:00 hours on the 10 August 2018.

The distance from the laser to the reflective disc on the pond surface was 264.2mm and the wind speed 0.3m/sec.

The finish time was assumed to be at 16:15:10 hours on the 12 August 2018.

The distance reading was 265.7mm and the wind speed 0.5m/sec.

The total time elapsed was 48 hours and 48 minutes, 10 seconds.

The laser measured a change in distance to the pond surface of a 1.5mm increase. Therefore the pond surface fell 1.5mm over the test period.

There was no rainfall during the test. The evaporation bucket on the pond bank was calculated to lose 1.2mm depth during the test period.

The pond should have mimicked the evaporation bucket result. It can be concluded the pond should have fell 1.2mm due to evaporation. The change in pond height was a decrease of 1.5mm. This is close to the expected result, the difference of 0.3mm is leakage.

TABLE 1 : DROP TEST RESULTS SUMMARY, Woldwide Four Ltd

Start Time	10 August, 15:27:00
Finish Time	12 August, 16:15:10
Total Time	48hrs, 48 minutes, 10 seconds
Start Depth (mm)	264.2
Finish depth (mm)	265.7
Change in depth (mm)	-1.5
Rainfall (mm)	+0
Evaporation (mm)	-1.2
Net Change in Depth After	
Rain and Evaporation (mm)	-0.3
Net Change per 24 Hours (mm)	-0.15
Pond Level, % of Design Depth	94
Net Change if Pond at 75% of	
Design Height. (mm/24hrs)	

6. Conclusion

The pond complies with the requirement of the Environment Southland Land and Water Regional Plan for effluent discharge (Rule 32 D, (2) (b), Appendix P, with a leakage rate of less than 1.8 mm / day.

The pond is suitable for storing effluent as the infiltration rate from the pond is less than 1.8mm per 24 hours.

Yours faithfully

JOHN SCANDRETT
Agricultural & Engineering Consultant

Appended

Depth and wind speed graph for the test period.

Depth and rainfall graph for the test period.

Depth and wind speed for the start of the test period.

Depth and wind speed for the end of the test period.