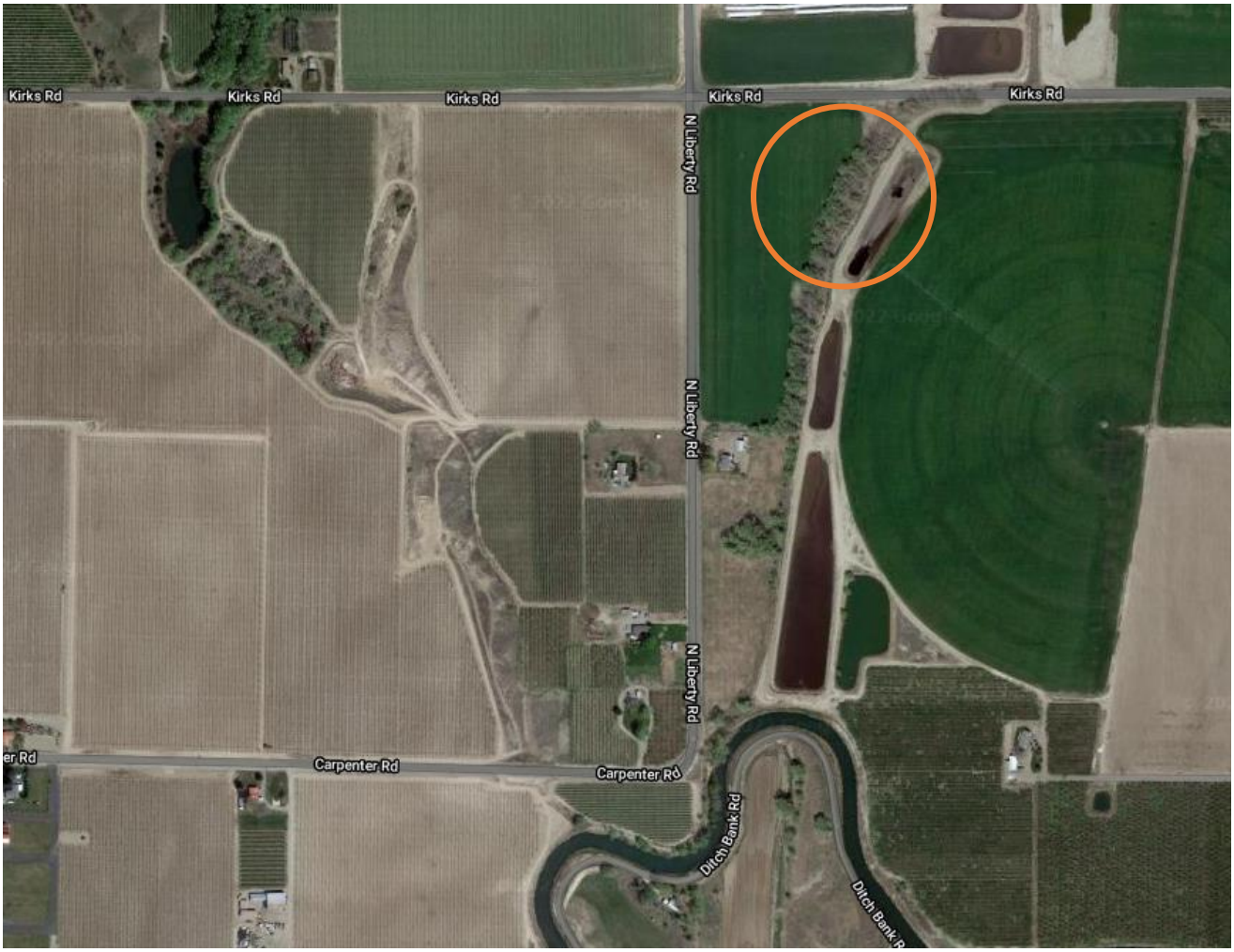
Leakage from Manure Lagoons – Lower Yakima Valley

Concentrated Animal Feeding Operations (CAFOs) produce huge amounts of manure that is stored in multi-million gallon lagoons. These lagoons leak – a lot. But CAFO defenders have convinced the courts to require proof of discharge before requiring National Pollutant Discharge Elimination System (NPDES) permits for CAFOs. Proving discharge is costly and generally beyond the ability of everyday citizens to accomplish.

Here is a case in point from an area in the Yakima Valley with a density of 330 to 370 milk cows per square mile. The unpermitted H & S Bosma Dairy is one of five dairies in a cluster of dairies under a consent decree with the Environmental Protection Agency (EPA) that address groundwater pollution. Bosma Dairy is decommissioning one of several manure lagoons as part of the decree.



This 2.3 million gallon lagoon was built decades ago, apparently without a permit, in Yakima County where local regulation is minimal. It was constructed in a draw, next to an intermittent stream, and next to the Roza Irrigation Wasteway. Nitrate N levels in a nearby EPA monitoring well have exceeded 200 mg/L – twenty times higher than the safe drinking water standard of 10 mg/L. People and animals that drink water with 200 mg/L Nitrate N will get sick and often die.

Manure and commercial fertilizer contain large amounts of ammonia. In the presence of oxygen, ammonia converts to nitrate which is used by plants as food. Nitrate is highly soluble in water and leaches to the aquifer when it is not used by plants. There are no plants beneath manure lagoons to use the nitrate. There is no question that ammonia and nitrate leach from this lagoon into the soil and eventually into the aquifer.

The decommissioning process requires deep soil sampling along the sides and the bottom of the lagoon and, usually, removal of contaminated soil. Testing in 2021 at the Bosma site finds high nitrogen levels at 10 feet as shown in the tables attached below. Removal of contaminated soil in this case might require digging into the Roza Wasteway.

Without fertilizer, background Nitrate N levels in soil are < 10 ppm. Nitrate levels 10 feet from the Bosma lagoon reach 45.7 parts per million (PPM) along the west side wall, 30.4 ppm along the north side wall, and 113.1 ppm along the east side wall. Nitrate levels beneath the lagoon at the lower, southern end are 45.6 ppm at six feet, 21.0 ppm at nine feet and 15.4 ppm at ten feet. Earthen manure lagoons leak.

Sadly, if it were not for the EPA studies, this information would be hidden, and this lagoon would continue to leak into an aquifer that neighbors use for drinking water.

From H&S Bosma Dairy Lagoon No. 3 Abandonment Plan, pages 6 & 7

Table 2
Results of Initial Soil Testing

Station ID	Depth Range (inches)	Nitrate-N (mg N/kg)	Ammonia-N (mg N/kg)	Available N (mg N/kg)	Exceeds 45 mg N/kg?
S-01 (North Sidewall)	**0–12**	147.7	1.7	**149.4**	**Yes**
	12–24	89.5	ND (u)	**89.5**	**Yes**
	24–36	47.7	2.6	**50.3**	**Yes**
	36–48	93.8	3.1	**96.9**	**Yes**
	48–60	18.3	3.6	21.9	No
	60–72	17.3	2.9	20.2	No
	72–84	14.2	3.1	17.3	No
	84–96	28.8	2.6	31.4	No
	96–108	20.3	3.5	23.8	No
	108–120	30.4	3.6	34	No
S-02 (West Sidewall)	**0–12**	26.8	97.5	**124.3**	**Yes**
	12–24	1.0	30.8	31.8	No
	24–36	1.0	23.1	24.1	No
	36–48	1.8	25.0	26.8	No
	48–60	28.5	25.2	**53.7**	**Yes**
	60–72	39.9	1.9	41.8	No
	72–84	51.6	3.3	**54.9**	**Yes**
	84–96	67.0	8.5	**75.5**	**Yes**
	96–108	41.7	ND (u)	41.7	No
	108–120	45.6	7.2	**52.8**	**Yes**
S-03 (East Sidewall)	**0–12**	83.3	ND (u)	**83.3**	**Yes**
	12–24	188.2	ND (u)	**188.2**	**Yes**
	24–36	103.1	ND (u)	**103.1**	**Yes**
	36–48	85.5	ND (u)	**85.5**	**Yes**
	48–60	131.3	4.2	**135.5**	**Yes**
	60–72	56.6	ND (u)	**56.6**	**Yes**
	72–84	44.6	2.3	**46.9**	**Yes**
	84–96	69.5	ND (u)	**69.5**	**Yes**
	96–108	76.7	1.8	**78.5**	**Yes**
	108–120	113.1	2.7	**115.8**	**Yes**

Station ID	Depth Range (inches)	Nitrate-N (mg N/kg)	Ammonia-N (mg N/kg)	Available N (mg N/kg)	Exceeds 45 mg N/kg?
S-04 (South Sidewall)	**0–12**	5.9	67.9	**73.8**	**Yes**
	12–24	ND (u)	81.7	**81.7**	**Yes**
	24–36	ND (u)	61.6	**61.6**	**Yes**
	36–48	2.9	10.7	13.6	No
	48–60	21	21.6	42.6	No
	60–72	1.8	6.0	7.8	No
	72–84	6.6	5.0	11.6	No
	84–96	6.8	6.1	12.9	No
	96–108	3.4	4.5	7.9	No
	108–120	6.9	2.4	9.3	No
B-N (North Bottom Sample)	**0–12**	23.7	251.3	**275**	**Yes**
	12–24	1.9	139.7	**141.6**	**Yes**
	24–36	15.4	128.6	**144**	**Yes**
	36–48	0.8	208	**208.8**	**Yes**
	48–60	ND (u)	20.5	20.5	No
	60–72	4.8	18.5	23.3	No
	72–84	1.1	32.6	33.7	No
	84–96	ND (u)	14.3	14.3	No
	96–108	1.4	10.1	11.5	No
	108–120	0.7	8.2	8.9	No
B-S (South Bottom Sample)	**0–12**	176.8	109.5	**286.3**	**Yes**
	12–24	6.0	92.8	**98.8**	**Yes**
	24–36	24.4	6.6	**31.0**	**Yes**
	36–48	11.2	65.2	**76.4**	**Yes**
	48–60	11.8	118.7	**130.5**	**Yes**
	60–72	45.6	10.3	**55.9**	**Yes**
	72–84	19.8	5.7	25.5	No
	84–96	9.8	5.6	15.4	No
	96–108	21.0	7.8	28.8	No
	108–120	15.4	10.1	25.5	No

Notes:

ND: Not detected

Bolded available nitrogen values exceed the target value of 45 mg N/kg.