CHARLES M. TEBBUTT, *pro hac vice*
Law Offices of Charles M. Tebbutt, P.C.
941 Lawrence St.
Eugene, OR 97401
Tel. 541.344.3505

BRAD J. MOORE, WSBA #21802
Stritmatter Kessler Whelan
200 Second Avenue West
Seattle, WA 98119
Tel. 206.448.1777

Additional Plaintiffs' counsel on signature page

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF WASHINGTON

COMMUNITY ASSOCIATION FOR RESTORATION OF THE ENVIRONMENT, INC., a Washington Non-Profit Corporation *and* CENTER FOR FOOD SAFETY, INC., a Washington, D.C. Non-Profit Corporation, Plaintiffs, v. COW PALACE, LLC, a Washington Limited Liability Company, THE DOLSEN COMPANIES, a Washington Corporation, and THREE D PROPERTIES, LLC, a Washington Limited Liability Company, Defendants.	NO. CV-13-3016-TOR PLAINTIFFS' STATEMENT OF MATERIAL FACTS IN SUPPORT OF MOTION FOR SUMMARY JUDGMENT THIS DOCUMENT IS BEING FILED UNDER SEAL

NOTE: PORTIONS OF EXHIBITS AND REFERENCES HEREIN HAVE BEEN DESIGNATED AS "CONFIDENTIAL" BY DEFENDANTS PURSUANT TO THE STIPULATED PROTECTIVE ORDER. THIS DOCUMENT IS THEREFORE FILED UNDER SEAL.

Introduction to Defendants, Plaintiffs, and the Cow Palace Dairy

1. Defendant "Cow Palace, LLC" is a Washington limited liability company with one member, Defendant "The Dolsen Companies." ECF No. 181, Answer to Third Amended Complaint ("Answer") at ¶ 13.

2. Defendant Cow Palace, LLC owns and operates two dairies (collectively referred to as the "Cow Palace Dairy") located at 1631 North Liberty Road, near Granger, Washington. Answer at ¶ 14.

3. Defendant The Dolsen Companies is a Washington corporation. The principals of the Dolsen Companies include R. William ("Bill") Dolsen and Adam Dolsen. Declaration of Daniel C. Snyder ("Snyder Decl.") at Exhibit 1.

4. Defendant Three D Properties, LLC, is a Washington limited liability company with one manager, Bill Dolsen. Snyder Decl. at Exhibit 2.

5. Bill Dolsen is the registered agent for Cow Palace, LLC; the President/Chairman of The Dolsen Companies; and the manager of Three D Properties, LLC. Snyder Decl. at Exhibits 1, 2, and 24.

6. Adam Dolsen is the Vice President of The Dolsen Companies. Snyder Decl. at Exhibit 1.

7. Kenneth Willms is the Treasurer and Chief Financial Officer for The Dolsen Companies. Snyder Decl. at Exhibit 1; Snyder Decl. at Exhibit 25 (excerpts of transcript of Kenneth Willms).

8. The Dolsen Companies receive and maintain a number of records concerning the operations at Cow Palace Dairies.

9. The Dolsen Companies maintain at least the following records pertaining to Cow Palace's manure management: records of manure transfers for 2012-2013; records of offsite manure applications for 2014; records of compost transfers for 2012-2014; laboratory analyses of liquid manure samples collected in 2008, 2012, and 2013; and records of annual yields of crops grown on Cow Palace crop fields from 2009-2013. Snyder Decl. at Exhibit 27.

10. Records of safety meetings, inspections, and incident reports involving employee injuries at Cow Palace Dairies are also maintained by The Dolsen Companies. Snyder Decl. at Exhibit 26 (excerpts of transcript of Mr. Vern Carson) at 22:8-22; 23:1-24:7.

11. Current and former employees of The Dolsen Companies, including President Bill Dolsen and Vice-President Adam Dolsen, have performed or currently perform numerous operational functions for Cow Palace Dairies, as follows:

a. The former safety director for The Dolsen Companies, Vern Carson, conducted meetings for employees of Cow Palace which focused on such topics as OSHA compliance, equipment safety, and animal safety. *Id*. at 12:3-13:13.

b. The Dolsen Companies' CFO, Kenneth Willms, oversees the accounting function for The Dolsen Companies' entities. His specific tasks include oversight and review of corporate reports for Cow Palace, LLC--for example, annual reports and tax returns. Snyder Decl., Ex. 25 at 31:19-32:6.

c. Mr. Willms, along with Bill Dolsen, performs annual review and renewal of the insurance policy for Cow Palace, LLC, *Id*. at 37:1-4; *see also* Snyder Decl., Ex. 28 (excerpts of transcript of R. William "Bill" Dolsen) at 70:13-18, and discusses with Mr. Dolsen the financial implications of purchases and sales of major assets. Snyder Decl., Ex. 25 at 34:20-35:4. He also performs work for Three D Properties, LLC. *Id*. at 8:10-19.

d. The Dolsen Companies' Vice President, Adam Dolsen, reviews Cow Palace's monthly financial statements and has done so for the past four or five years. Snyder Decl., Ex. 29 (excerpts of transcript of Adam Dolsen) at 45:13-21. Adam Dolsen also makes decisions relevant to employees at Cow Palace, including hiring decisions. *Id.* at 21:17-22.

e. Adam Dolsen visits Cow Palace dairies one to two times per month to meet with managers, *id*. at 23:5-11, and oversaw the development of a website for the Cow Palace. *Id*. at 33:12-21.

f. Adam Dolsen, individually, purchased residential properties that could not be sold to a corporation, including a home located at 51 N. Arms Road, for employees who work at the Cow Palace dairies. *Id*. at 90:2-14; 94:8-9; 15-17. The homes at 51 N. Arms Road, and two other properties, were transferred to Three D Properties, LLC in November of 2013. *Id*. at 96:25-97:8; Snyder Decl., Ex. 28 at 37:3-11.

12. Three D Properties, LLC, owns approximately 50 percent of the land on which Cow Palace Dairy operates, including three parcels which were formerly owned by Adam Dolsen, individually, and transferred on Nov. 7, 2013. Snyder Decl., Ex. 25 at 28:25-29:6; Ex. 28 at 31:16-18; *see also* COWPAL009283, delineating real property interests of Cow Palace, LLC, The Dolsen Companies, and Three D Properties, attached as Exhibit 30 to Snyder Decl. On the same date, The Dolsen Companies transferred sixteen parcels to Cow Palace, LLC. Snyder Decl., Ex. 30.

13. Bill Dolsen has primary authority for decisions pertaining to acquisitions of real property by Cow Palace, LLC and Three D Properties, LLC, and authority for decisions about whether to increase the size of the dairy facilities. Snyder Decl., Ex. 28 at 59:2-9; 63:3-9.

14. In approximately 2011 or 2012, Adam and Bill Dolsen, along with the former safety director for The Dolsen Companies, Vern Carson, decided to install reverse osmosis units in all dairy employee housing. Snyder Decl., Ex. 26 at 31:6-18.

15. Mr. Carson was involved in the inspection and installation of filtration systems at Cow Palace dairy employee residences. *Id*. at 28:13-17; 31:11-13.

16. Fernando Romero has been employed by Cow Palace since 1998, and presently works as the farm foreman. Snyder Decl. at Exhibit 31 (excerpts of deposition transcript of Fernando Romero) at 5:20-21; 6:1-4.

17. Mr. Romero resides at 621 N. Arms Road, in a home owned by Three D Properties, LLC. *Id*. at 8:11-17; Snyder Decl., Ex. 32 (screen image of Yakima County GIS Land Information Portal for 621 N. Arms Road).

18. When Mr. Romero moved into the home at 621 N. Arms Road about October of 2012 (Snyder Decl., Ex. 31 8:18-19), Mr. Carson informed him about the location of the reverse osmosis system under the kitchen sink, and that explained that only filtered water from that location should be used for drinking.

Mr. Carson also informed Mr. Romero that nitrate was dangerous. *Id*. at 18:20-20:13.

19. In 2012, Vern Carson ordered nitrate testing in well water samples from dairy employee housing. Snyder Decl., Ex. 26 at 35:10-36:3. The laboratory results of those samples are maintained by The Dolsen Companies. *Id*. at 46:7-12, 22-23; Snyder Decl., Ex. 33 (laboratory results at DOLSEN002078-86).

20. Cow Palace Dairy meets the definition of a "Large CAFO" under state and federal law. 40 C.F.R. § 412.2; WAC 173-224-030. "CAFO" is an acronym for "confined animal feeding operation."

21. Plaintiff Community Association for Restoration of the Environment, Inc. ("CARE") is a public interest, Washington not-for-profit corporation. CARE's organizational interests are adversely affected by Cow Palace Dairy's operations. Reddout Declaration, ECF No. 52 at ¶¶ 6, 9-12, 22.

22. Plaintiff Center for Food Safety, Inc. ("CFS") is a public interest, not-for-profit corporation organized under the laws of Washington, D.C. CFS's organizational interests are adversely affected by Cow Palace Dairy's operations. *See, e.g.,* Kimbrell Declaration, ECF No. 49 at ¶¶ 2-17.

23. Plaintiffs' members' interests are threatened with injury, and have been injured, as a result of Cow Palace Dairy's operations. *See, e.g.,* Reddout Declaration, ECF No. 52 at ¶¶ 2, 13-25 & Declaration of Robert Lawrence, filed herewith, at ¶ 16 (Ms. Reddout's well has tested over the 10 mg/L Maximum Contaminant Level for nitrate); Whitefoot Declaration, ECF No. 50 at ¶¶ 5-19; Fendell Declaration, ECF No. 53 at ¶¶ 5-20; Declaration of Debbie Stark, filed herewith, at ¶¶ 3-20; Declaration of Jean Mendoza, filed herewith, at ¶¶ 3-19; Declaration of Eric Anderson, filed herewith, at ¶¶ 3-19; Declaration of Douglas Moore, filed herewith, at ¶¶ 4-14; Declaration of Steven Butler, filed herewith, at ¶¶ 4-23; and Lawrence Decl. at ¶ 16 (Mr. Butler's well has tested over the 10 mg/L Maximum Contaminant Level for nitrate).

24. As of 2012, Cow Palace Dairy housed 7,372 milking cows, 897 dry cows, 243 springers, 89 breeding bulls, and 3095 calves. Snyder Decl., Ex. 3 at COWPAL002097.[1]

25. Cow Palace Dairy causes manure to be moved from its lagoons at certain times such that the manure is land-applied to agricultural fields. Snyder Decl. at Ex. 18 (Excerpt of Defendants' Response to Plaintiffs' First Set of Requests for Admission No. 6).

The Environmental Setting, Manure, and the Nitrogen Cycle

26. The Cow Palace Dairy is located at the northern end of the Lower Yakima Valley, and is bounded to the north by basalt hills known as the "Rattlesnake Hills." Snyder Decl. at Exhibit 4, "Relation Between Nitrate in Water Wells and

[1] Plaintiffs make specific references to the Bates Numbered pages where available and appropriate.

Potential Sources in the Lower Yakima Valley, Washington," EPA-910-R-13-004 (hereinafter the "EPA Study") at 127, Figure 7; Expert Declaration of Byron Shaw at ¶ 5, filed herewith ("Shaw Decl.")

27. There are only a small number of agricultural fields located north of Cow Palace Dairy. Shaw Decl. ¶ 5.

28. There are two main aquifer types in the area. The first is a surficial unconfined to semi-confined alluvial aquifer. The second is an extensive basalt aquifer of great thickness underlying the sedimentary deposits. The deep portion of the basalt aquifer is believed by the United States Geological Service to be semi-isolated from the surficial aquifer and local stream systems and eventually discharges to the Columbia River. Natural groundwater flow within the shallower, surficial aquifer generally follows topography, but may be influenced by irrigation practices, drains, ditches, and canals. It is uncontested that this shallower aquifer feeds the Yakima River. *Id*. at ¶ 6; *see also* Snyder Decl. Ex. 14 (excerpts of deposition testimony of Defendants' expert, Mr. David Trainor) at 67:14-17; 133:6-14.

29. Precipitation is the main source of natural groundwater recharge in this area, and as a result, most natural groundwater recharge occurs in the winter and early spring months when evapotranspiration is low. Groundwater recharge is also influenced, however, by irrigation water, both from the irrigation canals and from irrigation practices, and liquid manure that is applied to agricultural fields or leaked from manure lagoons. Irrigation and manure applications thus impact the natural groundwater recharge occurring whenever precipitation plus irrigation/application exceeds the water holding capacity of the soil. Shaw Decl. at ¶ 7.

30. The Lower Yakima Valley is filled with sediments shed by the basalt ridges at the borders of the Valley, such as the Rattlesnake Hills, and those deposited in the valley bottom by the Yakima River. The sediments' internal structure strongly controls groundwater movement, meaning that water movement through the sediments tends to follow preferential flow paths composed of coarse sediments. There can be sizeable ranges in groundwater velocities among aquifer materials of varying grain size, such as the sediments found in the Valley. As a result, a well that is located along a preferential flow path may draw a substantial portion of its water from a particular source, whereas a neighboring well located along a different preferential flow path may have different water chemistry. *Id*. at ¶¶ 8, 102 (discussing evidence).

31. Shallower wells located in the Lower Yakima Valley are more likely to be contaminated with higher levels of nitrates than deeper wells, because the sources of the nitrogen loading to the groundwater are anthropogenic, or man-made, and occur on the land's surface. These activities include land-application of fertilizer and pesticides, including liquid and solid manure, and from storage of manure in unpaved confinement pens and unlined, earthen lagoons. The EPA Report, along with other earlier studies, documented more contaminated wells screened within the shallower aquifer than the deeper, basalt aquifer; in fact, the highest levels of nitrate generally occur in the shallow alluvial aquifer. *Id*. at ¶ 9.

32. Anthropogenic nitrogen sources above the aquifer can cause excess nitrogen to move through soils and into groundwater. Nitrogen, once converted to nitrate, is a highly mobile element, and the "nitrogen cycle" is well documented and understood. *Id*. at ¶ 10 (see figure).

33. Nitrogen contained in manure starts primarily in the organic nitrogen and ammonium form. Ammonium is then converted to nitrate if soil temperatures are above four degrees centigrade and aerobic conditions are present. Both nitrate and ammonium are available to plants and are important plant nutrients when properly applied. Nitrate, which is more mobile in soils than is ammonium, leaches through the unsaturated (vadose) zone of soil; in both the unsaturated and saturated zone, it can move at nearly the speed of migrating water. As a result of this high mobility, it is important that nitrates be applied only when plants have the ability to use it and only in amounts that a crop can completely utilize. Any residual nitrate left at the end of the growing season is susceptible to leaching from irrigation, precipitation, snowmelt, and further manure applications. Fall rain, winter snowmelt, and early spring rain convey excess nitrate further into the soil before any plant growth can utilize it. Excess nitrogen present during the growing season is also susceptible to leaching from over irrigation, rainfall, and additional manure application. *Id*. at ¶ 11.

34. Once nitrate leaches below the root zone of crops it is destined to reach groundwater, unless conditions suitable to denitrification exist in the soils. Denitrification is the conversion of nitrate to nitrogen gas by bacteria or nitrogen oxides, a green house gas issue. It can only occur in poorly drained or organic soils where oxygen is depleted in the root zone. In the absence of denitrification, nitrate moves with the groundwater until the groundwater is discharged to surface water, or extracted from a well. *Id*. at ¶ 12; *see also CARE v. Nelson Faria Dairy*, 2011 WL 6934707 at *8 (E.D. Wash. 2011) (Suko, J.) ("Once nitrates leach below the root zones of crops, it is destined to reach groundwater…[f]or this reason, it is imperative that liquid manure is applied to fields only in amounts that the current crop can completely utilize."); *see also* Snyder Decl. Ex. 14 at 133:6-14 (Defendants' expert Mr. Trainor agrees that nitrate in soil column will either go to groundwater and potentially travel to some other surface point or be attenuated through denitrification).

35. Denitrification is unlikely to occur in the soils underlying Cow Palace's agricultural fields. Within the approximate property boundary of the Cow Palace, six soil units have been mapped by the NRCS. All six soil units have a silt loam texture with a "well-drained" classification. Three of the soil units (Esquatzel, Shano, and Warden) represent approximately 81 percent of the surface area. These units have a saturated hydraulic conductivity in the range of 1.1 to 4.0 feet per day, which is characterized as "moderately high to high" in their capacity to transmit water. Two of the soil units (Burke and Scoon) represent approximately 19 percent of the surface area and have a saturated hydraulic conductivity in the range of 0.0 to 0.12 feet per day which is characterized as "very low to moderately low." One of the soil units (Finlay) represents less than 1 percent of the surface area and has a saturated hydraulic conductivity of 4 to 11.9 feet per day, which is characterized as "high." The predominant soils present little potential for any loss of nitrate through denitrification. The lack of any denitrification was verified by the EPA through nitrogen and argon gas analysis, which showed no evidence of denitrification. In addition, the AOC monitoring data shows oxygen to be present in all monitoring wells which means nitrate is stable and little chance of denitrification in the aquifer. Shaw Decl. at ¶ 13; *see also* Snyder Decl., Ex. 8 (transcript excerpts of deposition of Defendants' expert Dr. Stewart Melvin) at 158:14-159:15 (Dr. Melvin agrees that "probably very little" denitrification occurs in soils at Cow Palace Dairy, and admitting that he has no information demonstrating that "denitrification will occur in the soils at Cow Palace Dairy[.]").

36. The soils present in Cow Palace's application fields are all developed in alluvial deposits from erosion of the nearby Rattlesnake Hills and all have a loess silt cap of varying thickness. The Warden soil dominates the soils, with Scoon in lower topographic positions and Finley along waterways. All the soils are well drained with Warden soil having a potential rooting depth in excess of 5 feet while the Scoon has a rooting depth of less than 2 feet due to the development of a caliche layer. All soils have moderate to high permeability. According to the DNMP, Warden soil is identified as having a high hazard for soil erosion, and run-off is rapid. The soil maps and area topography maps show a strong drainage pattern running from northeast to southwest through the application fields with several intermittent or ephemeral streams present. The moderate slopes draining to the intermittent streams means there is a significant potential for runoff and pollution of downstream surface waters. Shaw Decl. at ¶ 14.

37. Because denitrification is unlikely in the soils underlying Cow Palace Dairy, any excess nitrogen or nitrate that moves past a crop's root zone – and therefore not used by the crop as fertilizer – will continue to migrate downward with water movement, eventually reaching groundwater. *Id*. at ¶ 15; *see also* Snyder Decl., Ex. 8 at 159:16-160:24 (Defendants' expert Dr. Melvin agrees that nitrates below root zones will "eventually" reach groundwater); 31:20-32:23 (nitrate applied via manure applications in the fall "will probably leach through the system before you ever get the plant to grow into that root zone" if sufficient rainfall is present); 201:9-202:2 (Dr. Melvin's dispute with Dr. Shaw's testimony, before changing his mind later in his deposition when faced with data he had not seen before, concerns timing of nitrate leaching, not whether leaching will occur); 163:2-24 (discussing deep soil sampling at Cow Palace Dairy by Arcadis; opining that he would "expect to see more than" 25 ppm nitrate at twenty feet below ground surface "if it had been leaching a lot"); 73:3-4 (degree of leaching is "not zero"); Snyder Decl. Ex. 21 at 48:16-49:8 (deposition testimony of Washington State Department of Ecology Yakima Regional Director Thomas Tebb) (agreeing that nutrients found below root zones have nowhere to go but groundwater, and testifying that "[a]pplication of irrigation water or precipitation from the sky would drive material down through the soil column that wasn't taken up by the plant and eventually into the vadose zone, and eventually into groundwater potentially"); 50:15-19 (agreeing that if a field is regularly cultivated and irrigated, he would be concerned that "nitrate would be driven down to the groundwater from those regular activities[.]").

38. Manure contains two primary forms of nitrogen: ammonium and organic nitrogen. The organic form of nitrogen is nearly immobile. It becomes mobile, and available to crops as fertilizer, through mineralization. Mineralization is composed of two subparts: Ammonification and Nitrification. Ammonification is the process by which soil microbes decompose organic nitrogen and release ammonium, which is then available as fertilizer for crops. The rate of mineralization varies with soil temperature, soil moisture, and the amount of oxygen in the soil. It is for this reason why obtaining soil samples showing the level of plant-available nutrients *prior* to a manure application is required by the DNMP. The total organic nitrogen is important because it will mineralize over time and become ammonium and then nitrate. Shaw Decl. at ¶ 16.

39. After ammonification, microorganisms within the soil convert ammonium into nitrate. This process, called nitrification, occurs most rapidly when the soil is warm, moist, and well-aerated. Nitrates are a plant-available form of nitrogen for fertilization purposes, but as described above, are highly mobile and susceptible to leaching loss to groundwater. During winter months when soil temperatures drop below 50 degrees Fahrenheit, mineralization and nitrification slows until soil temperatures warm in the spring. *Id*. at ¶ 17.

40. Some nitrogen contained in manure may be lost through volatilization, which is the loss of nitrogen through the conversion of ammonium to ammonia gas. After conversion, ammonia gas can be released into the atmosphere, and the ammonia can be redeposited onto the ground locally. Shaw Decl. at ¶ 18; *see also* Snyder Decl. Ex. 8 at 66:7-11 (Dr. Melvin testifying that “probably some of” the ammonia that is volatilized will be redeposited onto nearby fields). Volatilization losses increase at higher soil pH and when weather conditions are hot and windy. Organic nitrogen is not lost through this process. Shaw Decl. at ¶ 18.

Cow Palace Dairy's "Dairy Nutrient Management Plan"

41. Like all dairy CAFOs operating within the State of Washington, Cow Palace Dairy is required to obtain and operate by a Dairy Nutrient Management Plan or "DNMP."

42. The primary purpose of the DNMP is to "provide the dairy manager with Best Management Practices (BMP's) for the production, collection, storage, transfer, treatment, and agronomic utilization of the solid and liquid components of dairy nutrients in such a manner that will prevent the pollution or degradation of state ground waters and surface waters." Snyder Decl. at Exhibit 5, a true and correct copy of Cow Palace's DNMP (COWPAL000467). Along these lines, adherence to the DNMP is meant to "agronomically recycle the nutrients produced through soil and crops," which in turn "prevent[s] the chance of contaminant migration from the dairy facility to the underlying aquifer." *Id*. Cow Palace Dairy's DNMP has was certified by the Dairy on August 14, 1997, and approved by the local NRCS on February 10, 1998. *Id*. at COWPAL000459. It was updated in November, 2008 and December, 2012. *Id*.

43. Cow Palace Dairy, like all dairy CAFOs, produces substantial amounts of manure from its herd. The DNMP calculates that Cow Palace Dairy creates on an annual basis at least 61,026,000 gallons of manure-contaminated water from its wash water (water used to wash cows); 40,383,850 gallons of liquid manure directly from the herd; and 4,485,900 gallons of stormwater runoff. *Id*. at COWPAL000511 (Dairy Waste Calculations Table).

44. Cow Palace Dairy stores the liquid manure generated and collected by its herd in a series of earthen impoundments, which include four storage ponds, two settling basins, a "safety debris basin," and several catch basins. The total amount of storage is approximately 40,884,691 million gallons. *Id*. at COWPAL000468. Cow Palace Dairy uses a chemical additive in its lagoons as a form of treatment of the manure. Snyder Decl. Ex. 6 at 147:6-15 (Mr. Boivin testifying that he adds a chemical additive to lagoons "that is supposed to break down solids in your lagoons" and is a form of "lagoon treatment.").

45. None of the earthen storage impoundments at Cow Palace Dairy possess a synthetic liner. Answer at ¶ 52.

46. Cow Palace Dairy maintains approximately 533 acres of land that it uses for land application of its liquid manure. Snyder Decl. Ex. 5 at COWPAL000467.

47. Cow Palace grows alfalfa, sudan grass, corn, and triticale on its fields. *Id*. at COWPAL000477.

48. Cow Palace Dairy's manure contains many chemical constituents that have the potential to be used as fertilizer by growing crops. These include nitrogen, phosphorus, and potassium. *Id*. at COWPAL000476.

49. The DNMP requires Cow Palace Dairy to maintain adequate manure storage for the winter months of November-February, when land application may not be possible due to environmental conditions such as frozen ground and when crops are unlikely to uptake the manure constituents. *See id*. at COWPAL000479. During those months, the DNMP estimates that Cow Palace Dairy will need 30,854,835 gallons of available storage for the manure generated by the herd. *Id*. at COWPAL000475.

50. The DNMP states that "[p]roperly utilized agricultural nutrients can be considered a natural resource that produces economic returns." *Id*. at COWPAL000476.

51. To promote proper utilization, the DNMP provides detailed guidance to Cow Palace Dairy about how to "agronomically recycle" manure nutrients. *Id*. at COWPAL000467. In particular, the DNMP provides information and instructions for Cow Palace Dairy to utilize to determine manure application rates, which according to the DNMP "are established by balancing nitrogen with crop nutrient needs." *Id*. at COWPAL000476. Stated differently, "[t]otal nutrient quantities must not exceed the amount that can be used by the crop being grown." *Id*. at

COWPAL000480. The DNMP warns that the "**[a]pplication rates discussed in the following sections are based on the average values listed previously, and may need to be adjusted according to actual test results.**" *Id*. at COWPAL000476 (emphasis in original).

52. As stated by the DNMP, the "balancing" of nitrogen vs. crop needs is important because nitrogen "is a more mobile element" and in "the nitrate form it leaches easily through the soil because it is an anion that has low sorptive capabilities, and does not form insoluble precipitations…[t]hus, nitrogen has the greatest pollution potential of the three elements, and generally limits the amount of manure that can be safely applied." *Id*. at COWPAL000476.

53. First, the DNMP contains information about the nutrient content of the manure generated by the Dairy's herd. A table in the DNMP indicates that, for initial planning purposes, the Dairy could plan on its manure having a nitrogen content of 1.51 lbs. per 1000 gallons of liquid manure. *Id*. at COWPAL000511. That number is just a starting point, however, as the DNMP states that "[i]t is **required** that the dairy manager test the nutrient residuals in the soil along with nutrient content of the liquid in the storage ponds and the solid (dry) manure **before** land application." *Id*. at COWPAL000478 (emphases in original). As such, the DNMP requires Cow Palace Dairy to obtain "**Nutrient analysis** for all sources of organic and inorganic nutrients including, but not limited to, manure and commercial fertilizer supplied for crop uptake. Manure and other organic sources of nutrients must be analyzed annually for organic nitrogen, ammonia nitrogen, and phosphorus." *Id.* (emphasis in original).

54. Second, the DNMP requires Cow Palace Dairy to sample the nutrient residuals found in its soils following the harvest of a crop. "Regular testing for soil nutrient availability is essential for proper nutrient management decisions [sic] making. Soil tests should be completed as close as possible to the time of seeding for best results. Tests will be completed on each field or management group for a starting point for nutrient and manure application recommendations." *Id*. at COWPAL000478. The soil analysis must include "[a]nnual post-harvest soil nitrate nitrogen analysis," and a "spring" and "fall" soil sample are required if double cropping "prior to any manure application." *Id*.

55. Third, the DNMP provides estimates for how much manure nutrients each of the Dairy's four crops are generally expected to utilize (the "crop removal" rates). For instance, the DNMP estimates that the Defendants' corn crop will remove approximately 250 lbs./acre nitrogen, 105 lbs./acre phosphorus, and 250 lbs./acre potassium annually. *Id*. at COWPAL000477. These numbers are only meant as a starting point, however, and the DNMP requires that the Dairy use "[a]verage yields for the past three to five years for each field" when "determining agronomic rates[.]" *Id*. The DNMP goes on to warn Cow Palace Dairy that the estimated crop removal rates listed in the DNMP "**are guidelines only**" and that "**farmers should vary timing and amounts of application depending on particular soil, crop type, and crop needs and weather conditions.**" *Id*. (emphases in original).

56. Fourth, the DNMP instructs Cow Palace Dairy that "land application of the liquids from the storage ponds be scheduled agronomically throughout the growth period," and that "[t]he proper timing of nutrient application is an essential part of management...[l]iquid nutrients must be applied at a rate that is compatible with the infiltration characteristics of the soil." *Id*. at COWPAL000479-480. The DNMP then identifies the soil classifications in Cow Palace Dairy's fields, which are predominated by the Warden silt series soil, "a very deep, well-drained soil." It goes on to describe the various infiltration rates of the soils, warning that irrigation should not take place unless 50% of the "available soil moisture has been depleted." *Id*. at COWPAL000481.

57. Fifth, the DNMP summarizes its Best Management Practices in a list of "Do's" and "Don'ts." The "Do's" list includes: taking manure nutrient concentrations into account before applying manure to crops; taking soil nutrient levels into account before applying additional manure nutrients; apply manure based on realistic crop yield goals, defined as the five-year average from farmer records; avoiding applications to bare ground; taking soil tests to "determine the proper application of manure;" and finally to "maintain a record for each field showing the crop sequence, crop, soil test data, any tissue testing data, kind and amount of nutrients applied, special application practices, crop yields, and water applied." *Id*. at COWPAL000482.

58. The DNMP contains a mandatory recordkeeping section, which includes requirements that Cow Palace Dairy maintain records of "[c]rop nutrient needs based on expected crop yields;" "[n]utrient sources available from residual soil nitrogen including contributions from soil organic matter, previous legume crop, and previous organic nutrients applied;" "[d]ate of applications, method of application, nutrient sources, nutrient analysis, amount of nitrogen and phosphorus applied and available for each source;" "[t]otal amount of nitrogen and phosphorus applied to each field each year;" and finally, "[w]eather conditions twenty-four hours prior to and at the time of application." *Id*. at COWPAL000486. The DNMP further requires Cow Palace Dairy to maintain irrigation water management records identifying the total amount of irrigation water applied to each field each year. *Id*. at COWPAL000487. It also requires an annual report summarizing all key data. *Id*. at COWPAL000487.

59. To help implement these Best Management Practices, Cow Palace Dairy's DNMP also contains a series of appendices containing guidance documents. These include:

a. A fact-sheet about the Washington Natural Resources Conservation Service "590" Standard, which pertains to the land application of manure. *Id*. at COWPAL000508 (requiring a "nutrient budget" for nitrogen, phosphorus, and potassium based on realistic yield goals, soil tests, and manure tests).

b. A guidance document about how to calibrate manure application equipment to place the right amount of liquid manure onto a field. *Id*. at COWPAL000533.

c. A document from the Oregon State Extension Service about "Dairy Manure Nutrient Application Rates," which describes how to calculate the amount of nitrogen that a manure application will place onto a field. *Id*. at COWPAL000537.

d. A document entitled "Test for Success," which generally describes, *inter alia*, how to obtain a liquid manure sample. *Id*. at COWPAL000571.

e. A series of spreadsheets that are designed to be used by Cow Palace Dairy to calculate agronomic manure application rates. *Id*. at COWPAL000572-576. These Tables include:

    i. Table 1, "Crop Information." A table for Cow Palace Dairy to insert the types of crops grown on its fields, the Dairy's yield goals, the actual yields, and other related information, such as tillage practices.

ii. Table 2, "Soil Test Summary." A table for Cow Palace Dairy to insert the results of its soil sampling from its fields, including the soil test levels, organic matter percentage, and other data.

iii. Table 3, "Nutrient Planning." This table provides additional, specific instructions besides those identified in the DNMP (discussed *supra*) for how Cow Palace Dairy should calculate an agronomic manure application rate. The Table identities field number, crop, and yield goals; fertilizer recommendations in pounds per acre (lbs./acre) for the planned crop in terms of nitrogen, phosphorus, and potassium; the "manure nutrient credits," which are the available nitrogen, phosphorus, and potassium levels found in the soil; and an "additional fertilizer Nutrients Needed by the Crop" section, which is meant to show the Dairy manager how much additional nutrients to apply via manure applications. The Table also describes how Cow Palace Dairy should calculate its actual applications. It instructs the Dairy to subtract the soil test nitrogen, phosphorus, and potassium numbers in the "Manure Nutrient Credits" from the

"Fertilizer Recommendations" section and to "record the result" in the "additional fertilizer nutrients needed" section. The Table states that "[a] negative value indicates no extra fertilizer is needed." *Id*. at COWPAL000574.

iv. Table 4, "Nutrient Applications," has columns for the date and type of material applied to a field, the analysis of that manure for available nitrogen, phosphorus, and potassium, and the rate of application, including the amount of additional nitrogen, phosphorus, and potassium added to the field. *Id*. at COWPAL000575.

f. A guidance document entitled, "To insure proper utilization, follow these guidelines." The document instructs Cow Palace Dairy to:

i. "Perform a nutrient test of animal waste in order to determine the quantity of nutrients presently in the material."

ii. "Test soils for nutrient levels."

iii. "Account for all sources of nutrients."

iv. "Set realistic crop yield goals and apply animal waste to fit crop needs."

v. "Time the application of animal waste so that neither surface or ground water contamination will occur."

60. These same requirements have appeared in earlier versions of Cow Palace Dairy's DNMPs. For instance, the Dairy's "Waste Management Plan" from 1997 required:

a. The Dairy to complete soil testing on its fields "for potentially high levels of nutrients…to give a starting point for nutrient and manure application recommendations." Snyder Decl., Ex. 12 at DOLSEN000124.

b. Soil testing to "be completed each spring before application of manure." *Id*.

c. "Total nutrient quantities must not exceed the amount that can be used by the crop being grown." *Id*. at DOLSEN000125-126.

d. "Total manure nutrient concentrations" to be taken "into account before applying to crops." *Id*. at DOLSEN000126 (under "DO'S").

e. "Soil will be tested to determine the proper application of manure and any supplemental fertilizers." *Id*.

f. The use of "realistic goals" for crops, and to "apply manure to fit the crop needs."

61. The 2001 version of the Cow Palace Dairy DNMP contained the same requirement as well. *See* Snyder Decl., Ex. 13 at DOLSEN001032-39.

62. Both of these prior versions of the DNMP contain the same series of spreadsheets that appear in the present DNMP, which are designed to be used by Cow Palace Dairy to calculate agronomic manure application rates based on the factors described in the DNMP. Snyder Decl., Ex. 12 at DOLSEN000162-166; Ex. 13 at DOLSEN001096-1100.

63. One of Defendants' experts, Mr. Scott Stephen, agreed during his deposition that it is "fair to say" that Cow Palace Dairy's DNMP "provides guidance on how to calculate an agronomic rate[.]" Snyder Decl., Ex. 15 at 72:23-25.

64. Laurie Crowe works for the South Yakima Conservation District in the livestock and dairy program. Snyder Decl. Ex. 19 at 28:17-29:1. Ms. Crowe's job responsibilities include providing advice and assistance to Cow Palace Dairy about implementation of the Dairy's DNMP and calculations of agronomic rates. *Id*. at 29:11-20; 79:21-80:3 (part of Ms. Crowe's job to provide assistance about how to determine agronomic rates). In providing such advice, Ms. Crowe instructs dairies to "get your soil test, look at your manure test, figure out your crop yield, and base your application accordingly." *Id*. at 80:10-13. For the soil test, Ms. Crowe instructs dairies to look at "the amount of nitrogen in the soil[,]" then to determine what amount of nitrogen the crop will need, and finally "to subtract and apply what's needed." *Id*. at 80:24-81:2. Ms. Crowe tells dairies that they are supposed to "have an average" from the past "three-to-five year history" of crop yields to "figure out what your crop is going to uptake[.]" *See id*. at 81:8-19. The manure test "is part of the equation" in that, according to Ms. Crowe, "you need to know what – what nutrient content there is in the manure so you can figure out how much to put out there." *Id*. at 82:25-83:2. Ms. Crowe agreed that this type of advice is "also what the DNMP prescribes[.]" *Id*. at 82:10-15. Finally, Ms. Crowe agreed that this is the "type of application guidance" that she was "sure" she had given "to the Cow Palace facility." *Id*. at 82:16-21.

Cow Palace Dairy Discarded Its Manure by Ignoring the Best Management Practices Contained Within Its DNMP, Applying Manure at Above-Agronomic Rates Without Regard to Crop Needs, Manure Analyses, or Soil Tests.

65. Jeff Boivin is the general manager at Cow Palace Dairy. ECF No. 132 at ¶ 1 (Declaration of Jeff Boivin). Mr. Boivin has declared to the Court that Cow Palace Dairy's DNMP is the "blueprint of how we run our dairy and how we treat, store, manage, and apply our manure…[o]ur DNMPs contain reference tools and best management practices that we use to operate our dairy." *Id*. at ¶ 11. Mr. Boivin further declared that Cow Palace Dairy uses the information "generated from soil sampling records to decide how best to apply our nutrient to our crops." *Id*. at ¶ 12. Mr. Boivin also declared that Cow Palace Dairy uses the information "generated from manure sampling and application records" to "decide how much fertilizer to apply to our crops and how best to maximize our application of fertilizer to those crops." *Id*. at ¶ 17.

66. During his deposition, Mr. Boivin testified that he was in charge of compliance with the DNMP, deciding when and where to apply manure, and that, ultimately, the "buck" stopped with him. Snyder Decl. at Ex. 6 (Transcript of Deposition of Jeff Boivin) at 45:15-46:8.

67. Mr. Boivin confirmed his understanding of the requirements of the DNMP during his deposition. In particular, Mr. Boivin testified that an agronomic application under the DNMP requires one to know certain facts: "You have to know what crop is in the field. You have to know how much nutrients that crop can uptake. You have to know how much nutrients are in your liquid that you're going to apply or your manure that you're going to apply. And then you have to know how much nutrients are in the soil." *Id*. at 227:8-16. Mr. Boivin further testified that one has to know "how much that crop will yield, too, to help you determine how much nutrient uptake you may need." *Id*. at 227:18-20.

68. Nonetheless, Mr. Boivin admitted during depositions that Cow Palace Dairy failed to follow or implement the DNMP's Best Management Practices when applying manure to the Dairy's fields – practices that, according to the DNMP, are designed specifically to ensure that Cow Palace Dairy "agronomically recycle[s] the nutrients produced through soil and crops" and to "prevent the chance of contaminant migration from the dairy facility to the underlying aquifer." Snyder

Decl. Ex. 5 at COWPAL000467; *See also* Shaw Decl. at ¶ 22 (discussing failures). In particular, Mr. Boivin admitted that:

a. Cow Palace Dairy failed to use its manure nutrient sampling to calculate agronomic rates. Instead, the Dairy only used a generic, 1.5 lbs./1000 gallon figure to determine application rates. *See, e.g.,* Snyder Decl. at Ex. 6, Boivin Trans. 258:6-12 (Cow Palace Dairy failed to use 2012 manure nutrient sampling from lagoon, instead using a 1.5 lbs./1000 gallon figure); 279:5-10 (used only 1.5 lbs./1000 gallon figure); 280:12-14 (same); 284:24-285:1 (same); 295:7-9 (same); 304:12-15 (same) 351:13-18; 379:4-8 (no manure analysis for manure applied from settling basin to Field 4A). This meant that the Dairy did not use critical information about how much nitrogen, phosphorus, and potassium were actually present in the manure it applied to its fields. Records provided by Cow Palace Dairy show that the nutrient concentrations of the Dairy's manure vary widely, but all exceed 1.5 lbs./1000 gallons. *See* Snyder Decl., Exhibit 7 (lagoon analyses) (total lbs. of nitrogen per 1000 gallons of lagoon material range from a low of 1.67 lbs./1000 gallons, COWPAL009266, to a high of 33.7 lbs./1000 gallons (more than 20 times the rate used), COWPAL009272). The Dairy also failed to test the nutrient concentration of other sources of manure applied to its fields, instead only taking one sample from one lagoon. Snyder Decl., Ex. 6, 239:23-240:3; 279:19-24 (Cow Palace Dairy sampled the main lagoon only, regardless of where the applications actually came from); 301:16-19; 358:11-14. Recent sampling under the AOC shows that manure nutrient concentrations not only vary over time, but also vary from lagoon to lagoon. *Compare, e.g.,* Snyder Decl. Ex. 7 at COWPAL009262 (September 11, 2013 sampling from Lagoon 1, showing 3.76 lbs. of total nitrogen per 1000 gallons of manure) *with* COWPAL009263 (September 11, 2013 sampling from Lagoon 4, showing 5.38 lbs. of total nitrogen per 1000 gallons of manure). *See also* Shaw Decl. at ¶ 22(f).

b. Cow Palace Dairy failed to take into account the residual soil nutrient levels in its fields when deciding how much manure to apply. *See, e.g., id*. at 258:13-259:1; 260:9-23; 264:2-265:8 (admitting failure to take into account residual nitrogen levels when making 1.2 million gallon manure application); 297:8-10. Instead, the Dairy applied manure to its fields without subtracting the nitrogen, phosphorus, and potassium that was already present in the fields and available for fertilization to crops. This meant that the Dairy failed to use information about how much additional manure its crops needed – or did not need – when deciding how much manure to apply to a field. In this same vein, the Dairy did not take spring soil samples when double-cropping its fields, which in turn meant that the Dairy applied manure to its fields without knowing how much residual nitrogen, phosphorus, and potassium were already in the soil and available for fertilization to crops. *See id*. at 240:16-23 (Mr. Boivin admitting that it is important to take two samples from double-cropped fields "to see what that crop utilized."); *id*. at 307:2-7 (failure to take spring soil sample in double-cropped field); *id*. at 350:21-23. *See also* Shaw Decl. at ¶ 22(b), (c).

c. Cow Palace Dairy failed to calculate agronomic rates based on realistic yield goals per the DNMP, as established by averaging the past three to five year's crop yields per field. Instead, the Dairy only relied upon the basic guidelines for crop removal rates identified in the DNMP. *See, e.g., id*. at 270:7-271:13; 284:19-23; 289:15-17; 295:1-3. The DNMP explicitly warns that the Dairy should plan to vary application rates based on *actual* yield goals. Snyder Decl., Ex. 5 at COWPAL000477. *See also* Shaw Decl. at ¶ 22(d), (e).

d. Mr. Boivin further admitted that using current manure nutrient analyses from the lagoons, varying application rates based on the last three-to-five year's average crop yield for the field, and using post-harvest soil sample results were "the type of information" that he "should have used" before making a 7.68 million gallon manure application to a field. Snyder Decl., Exhibit 6 at 302:9-306:15. And even though Mr. Boivin testified that Cow Palace Dairy would not apply manure to third-party fields if their soil tests were higher than 200 lbs./acre nitrogen (a number identified as "high" by Mr. Boivin), he agreed that Cow Palace Dairy itself would – and has – applied manure in the face of soil tests having higher than 200 lbs./acre residual nitrogen. *Id*. at 311:17-312:8.

e. In addition, Mr. Boivin admitted that Cow Palace Dairy had failed to keep track of the irrigation water applied to its fields and had never produced an annual report, both of which are required by the DNMP. *Id*. at 324:3-325:21 (no irrigation water records indicating amount of water applied to each field); 327:16-328:12 (no annual report). *See also* Shaw Decl. at ¶ 22(g), (h).

69. Mr. Boivin further testified that these same failures to follow the DNMP identified, *supra*, were repeated in 2009, 2008, 2007, 2006, 2005, and 2004. *Id*. at

407:13-408:11. Prior to 2003, Mr. Boivin testified that Cow Palace Dairy maintained no records about its manure applications. *Id*. at 408:25-409:4. Records dating prior to 2003 were, however, in existence at the time this lawsuit was commenced; Cow Palace employee Dirk Porter threw away these old records, which encompassed "[s]ome old soil analysis, some old fieldbooks, things I didn't think I needed." Snyder Decl., Ex. 17 at 25:7-26:6 (excerpt of deposition of Dirk Porter).

70. Cow Palace Dairy uses hand-written field application logbooks to document when manure is applied to a field. The logbooks do not contain any evidence that Cow Palace Dairy took into account residual nitrate levels, crop yields, or the nutrient content of manure when making manure applications. Snyder Decl. Ex. 6 at 287:1-9.

71. The hand-written field application logbooks further demonstrate that the Dairy's applications of manure were made without regard to crop fertilization needs. For instance, the Dairy applied manure to Field 2 between July 28 and August 7, 2008, only ending the manure application when "lagoon south west" was "empty." Snyder Decl., Ex. 7 at COWPAL000319. The Dairy similarly applied manure to Field 1 between November 3-7, 2010, until "lagoon empty." *Id*. at COWPAL000333. The DNMP provides guidance that the Dairy should have its lagoons drawn down by November of each year, after which the Dairy should store its manure for the winter months, or apply it under certain limited conditions. Snyder Decl., Ex. 5 at COWPAL000479.

72. Another example of poor management includes manure applications that were made to fields before any crop was planted that could potentially make use of the nutrients supplied by the manure as fertilizer. For instance, Cow Palace Dairy applied manure to Field 6 between March 4 and April 8, 2011, when there was no crop planted. The applications, as Mr. Boivin admits, were to "bare ground." Snyder Decl., Ex. 6 at 381:6-22. Similar manure applications were made to bare ground in September, 2009, and between March-April, 2010, when the Dairy applied manure to Field 6 when no winter crop was planted. *Id*. at 402:8-403-21. The Dairy's corn crop on Field 6 was only seeded in May, 2010. *Id*. at 403:19-21. Yet more applications to bare ground took place between March 29 and April 12, 2011, when manure was applied to Field 4A when no crop was present. *Id*. at 379:9-380:4.

73. Plaintiffs' soil scientist and expert, Dr. Byron Shaw, also concluded that Cow Palace Dairy made multiple manure applications to bare ground. According to Dr. Shaw, who bases his testimony on Cow Palace Dairy's own records, the Dairy applied manure to bare ground on at least the following dates:

a. Field 2, September 7-16, 2009. Cow Palace applied liquid manure to a "bare" field from the "main lagoon" at 1000 GPM in 8-hour sets.

The triticale crop was seeded two months later, on November 24, 2009. Shaw Decl. at ¶ 29(a).

b. Field 3, October 28, 2006. Cow Palace applied liquid manure to "bare" ground. The triticale crop was seeded a month later, on November 20. Shaw Decl. at ¶ 29(b).

c. Field 4, September 22-25, October 6-8, and October 16-22, 2008. Cow Palace applied liquid manure to "bare" ground; the applications beginning on October 6 state in the comment section "clean lagoon for winter storage." The last entry for October 22, 2008 may state "water off, emptied lagoon," however it is difficult to read whether the handwritten text actually says "emptied." No date for the seeding of triticale is mentioned in the document. Shaw Decl. at ¶ 29(c).

d. Field 4A, September 17-30, 2009. Cow Palace applied liquid manure to ground identified in a rotation of "corn/bare" per its records.[2] As of the date of these applications, Cow Palace's corn crop would have been harvested; a new corn crop would not have been planted until the following year. Shaw Decl. at ¶ 29(d).

---

[2] COWPAL000376.

e. Field 4A, October 4-October 13, 2010. Cow Palace applied liquid manure to "bare" ground when no crop would be planted until the following year. Shaw Decl. at ¶ 29(e).

f. Field 4A, March 29-April 12 and May 2-9, 2011. Cow Palace applied liquid manure to "bare" ground when no crop was planted. Corn was seeded on May 30. Shaw Decl. at ¶ 29(f).

g. Field 5, October 5-9, 2008; March 4-9, 2009. Cow Palace applied liquid manure to bare ground with no crop actively growing. The corn crop was seeded May 5, 2009, Shaw Decl. at ¶ 29(g).

h. Field 6, September 21-26, 2009, March 15-April 2, April 1-April 8, 2010. Cow Palace applied liquid manure to bare ground with no crop actively growing. The corn crop was seeded on May 1, 2010. Shaw Decl. at ¶ 29(h).

i. Field 6, October 25-November 11, 2010, February 22-April 11, 2011. Cow Palace applied liquid manure to bare ground; corn was not seeded June 4, 2011, many months later. Shaw Decl. at ¶ 29(i).

j. Field 6, October 27, 2011, April 12-20, 2012. Cow Palace applied liquid manure to bare ground; corn was not seeded until April 30, 2012. Shaw Decl. at ¶ 29(j).

74. Mr. Boivin further testified that he understood that one of the possible consequences from having an over-application of manure was that excess nutrients could leach through the soil, including excess nitrogen. Snyder Decl. Ex. 6 at 242:6-11.

75. Mr. Boivin testified that Kevin Freeman, the project coordinator of the AOC, told Mr. Boivin that the nitrates found in the groundwater in and around Cow Palace Dairy "could have come from field application," and that Cow Palace Dairy "could have contributed some" to those nitrate levels. *Id*. at 68:19-69:1. Mr. Freeman also told Mr. Boivin to make sure that Cow Palace Dairy's residual nutrient levels in the field were not "at the level that they're at right now." *Id*. at 68:10-14.

76. As to its provision of manure to third-parties, Mr. Boivin testified that about 20% of Cow Palace Dairy's solid manure is given away for free to third-party farmers. *Id*. at 85:7-10. Another one of Cow Palace Dairy's employees, Mr. Dirk Porter, testified during his deposition that the Dairy had given away manure for free to several large growers over the years. Snyder Decl. Ex. 17 at 56:15-24 (Carpenter Farms has been receiving free manure from Cow Palace Dairy for over 10 years); 60:12-61:14 (discussing other farmers who have received free manure).

77. Further evidence of Cow Palace Dairy's application of manure without regard to crop fertilization needs or agronomic rates can be found in the consistently high post-harvest soil sample results obtained from the Dairy's fields. Dr. Shaw's declaration at discusses these results in detail. To summarize Dr. Shaw's testimony:

a. Defendants' soil sampling conducted under its DNMP showed consistently high post-harvest soil sample results for nitrate, phosphorus, and potassium. Such high results after a crop has been harvested indicate that prior manure applications supplied more manure nutrients than the crop could uptake as fertilizer. Shaw Decl. at ¶¶ 31-33 & Exhibit 9.

b. Plaintiffs' own deep soil sampling showed very high nitrate and phosphorus levels in Cow Palace Dairy Fields 1 and 2. The highest levels were observed to be in the 3-5 foot range, which is below the effective rooting zone for Cow Palace Dairy's crops. *Id*. at ¶¶ 34-40; *see also* Snyder Decl. Ex. 8 at 170:11-17 (Dr. Melvin's testimony that bottom of root zones are three-feet at Cow Palace and that management under AOC will "probably not" remedy buildup of nitrate below the root zone). Nutrients found below crop root zones will continue to leach deeper into the soil profile, eventually reaching groundwater. Shaw Decl. at ¶¶ 12-13; *see also* Snyder Decl. Ex. 8 at 159:15-24 (Dr. Melvin's dispute with Dr. Shaw concerns the time it will take nitrate to reach groundwater, not whether it will; "everything's got to go somewhere."); 160:9-24 (nitrate below root zone will "eventually" reach groundwater; Dr. Melvin believes it could take 20 years).

c. Defendants' own deep soil sampling at Field 1 showed there to be high levels of nitrate below crop root zones, as deep as 20 feet below ground surface. Nutrients found below crop root zones will continue to leach deeper into the soil profile, eventually reaching groundwater. Shaw Decl. at ¶ 38. .

78. Cow Palace Dairy's crop yields have been mixed. While some of the Dairy's yields have been at or above the target levels identified in the DNMP, many yields have been below those levels, especially for triticale. Shaw Decl. at ¶¶ 24-25 (citing the Dairy's own crop yield records).

79. High crop yields do not necessarily equate to agronomic applications of manure. The application of manure fertilizer for crop production has an upper limit of efficiency; that is, at a certain point, adding one additional "unit" of fertilizer does not necessarily mean that a higher crop yield will be achieved. In practice, this means that exceeding fertilizer recommendations is wasteful, as applying more manure nutrients to a crop that already has sufficient fertilizer available will not result in a better crop yield after harvest. Consequently, a good crop yield does not necessarily equate to an agronomic application of manure. Shaw Decl. at ¶ 25; *see also* Snyder Decl. Ex. 8 at 33:20-25 (Q: "As you increase nitrogen fertilization rates, does efficiency of plant use increase?" A: Dr. Melvin: "Probably not"); 16:21-17:17 (don't apply manure to a "maximum level" because "[y]ou back it off where you get – where the nitrogen you're putting on pays for itself without adding more to it, so we're trying to minimize the excess of nitrogen that goes on the land"); 27:19-21 (nitrogen use efficiency decreased when applications were made beyond land grant university rates); Snyder Decl. Ex. 15 at 121:15-17 (Defendants' expert Mr. Stephen agreeing that there is an "upper limit on efficiency in plant nutrient use"); 23:15-25 (applying manure if there are sufficient nutrients in soil and one would not see a yield response by applying more is "wasteful of funds, wasteful of your money").

80. Defendants' own expert witnesses have admitted that Cow Palace Dairy's manure applications were not agronomic. Snyder Decl., Exhibit 8, Transcript of Deposition of Defendants' Expert Stewart Melvin at 130:10-131:10 (admitting that Cow Palace's manure applications were "[n]ot really" agronomic and that, prior to the AOC, the applications "weren't" agronomic; if Cow Palace continued to apply manure in the way that it had been, then the applications "would probably be above agronomic rates"); 152:20-24 (Dr. Melvin agrees with Dr. Shaw's opinion that Cow Palace Dairy's manure applications "are not agronomic."); Snyder Decl., Ex.

15, Transcript of Deposition of Defendants' Expert Scott Stephen at 72:9-16 (Mr. Stephen never came to opinion whether Cow Palace Dairy's manure applications were agronomic or not agronomic).

81. Defendants' expert Dr. Melvin further admitted during his deposition that Cow Palace Dairy should have followed the Best Management Practices outlined in its DNMP in order to minimize the amount of manure it applied to its fields, but failed to do so. Snyder Decl. Ex. 8 at 88:23-89:3. For instance:

a. Dr. Melvin believed "it would be" a reasonable step for Cow Palace Dairy to "fully understand your legally required Dairy Nutrient Management Plan and all facets thereto[.]" *Id*. at 98:1-4;

b. Dr. Melvin testified that the Dairy "should have been looking at what we know now resulted from the soil nitrates." *Id*. at 89:7-11;

c. "Putting small amounts on more fields at any one time" was another "reasonable step" that Cow Palace Dairy should have taken "to minimize the application of liquid manure to try to match the delivery to what the plants need[.]" *Id*. at 91:7-14. The reason for this was that Cow Palace Dairy had "a certain fixed amount [of manure] you've got to get rid of. The system doesn't allow you to overflow those basins. You have to get rid of that." *Id*. at 91:17-23.

d. Taking into account the actual nutrient levels of the manure that was applied to field was another reasonable step Cow Palace should have taken, "because that way you know how to balance the nutrient needs to the crop needs," and "you have to know how much nutrients are in your manure to put it to its more effective use[.]" *See id*. at 93:4-20.

e. Along those lines, knowing the nutrient content of the Dairy's manure before applying was a "reasonable step" that Cow Palace Dairy "typically" should have taken "before" applying manure during the summer. *Id*. at 102:14-16.

82. Defendants' expert, Mr. David Trainor, also testified during his deposition that it was "certainly possible" that Cow Palace Dairy's application fields "could be sources of contaminants" observed in YVD-08, which is discussed in detail below. Snyder Decl., Ex. 14 at 138:18-24.

83. In sum, Cow Palace Dairy's own experts and the Dairy's own data demonstrates that the Dairy was not applying manure for crop fertilization purposes, but rather, as Dr. Melvin put it, to "get rid" of excess manure in order to empty its manure storage lagoons before the winter months.

84. Recent communications between Cow Palace Dairy and the EPA confirm that substantial amounts of nitrates are located below crop rooting zones in Defendants' fields. EPA found that, even though the AOC has been in effect for over a year, that there was "approximately 312 to 367 tons of nitrate…at the 3-foot depth" in the application fields of all the "Cluster Dairies'" fields, of which Cow Palace Dairy is included. Snyder Decl., Ex. 20 at DAIRIES019335-336. "[M]uch of this nitrate will eventually end up in groundwater," wrote EPA. *Id*. at DAIRIES019336 (note, however, that EPA stated its belief that further implementation of the AOC "can serve to mitigate this source of nitrate[.]").

Cow Palace Dairy Discards Its Manure by Storing it in Unlined Earthen Impoundments Which Leak Substantial Amounts of Manure

85. According to its Dairy Nutrient Management Plan or "DNMP," Cow Palace Dairy stores its liquid manure in two settling basins, four waste storage ponds, a "safety debris basin," and several "catch basins," which collect run-off from application fields and cow pens. Snyder Ex. 5 at COWPAL000474-475. None of these storage impoundments has any type of artificial or geosynthetic liner preventing the downward migration of manure related contaminants. Answer at ¶ 52. All impoundments are located on an aquifer used for residential drinking water supply. Snyder Decl. Exhibit 10 at p. 9 (Cow Palace Dairy's Response to Request for Admission 11, admitting that facility is located above at least one aquifer).

86. Cow Palace Dairy does not posses any information about whether its manure storage lagoons comply with the Natural Resource Conservation Service ("NRCS") 313 standard for manure storage impoundments, with the exception of

Lagoon 4. Snyder Decl., Exhibit 11 at DAIRIES0000910 (Lagoon 4 is only lagoon that Cow Palace Dairy possess information about demonstrating compliance with the 313 standard).

87. The current NRCS standard requires waste storage impoundments to be located on soils that have a permeability "that meets all applicable regulation, or the pond shall be lined." Expert Declaration of David Erickson at ¶ 9, filed herewith ("Erickson Decl."). The soil permeability requirements are that the wetted surface of a pond shall not exceed 1 x 10-6 cm/s permeability. The 313 standard suggests that a "manure sealing" effect will provide a "liner" that results in a permeability of 1 x 10-7 cm/s, or an order of magnitude greater protection. The standard notes that, "[i]f the permeability rate exceeds 1 x 10-6 cm/s, a compacted clay, amended soil liner or synthetic liner is required." Ponds should not be placed in locations above an aquifer that serves as a domestic water supply. If there is no reasonable alternative location, then the standard requires operators to provide "additional measures of safety from pond seepage," such as a clay liner, a flexible membrane liner over a clay liner, or a "geosynthetic clay liner or a flexible membrane liner." *Id*.

88. Thomas Tebb is the Regional Director for the Washington State Department of Ecology, Yakima office. Snyder Decl. Ex. 21 at 14:2-5. Mr. Tebb is a licensed engineering geologist and hydrogeologist in the State of Washington. *Id*. at 13:2-

10. Mr. Tebb testified during his deposition that, in his professional opinion as a hydrogeologist and engineering geologist, dairy lagoons designed under NRCS standards are less protective of the environment than lagoons designed under Washington State Administrative Code standards. *Id*. at 30:11-14. Mr. Tebb further testified that lagoons built into the earth using native soils could not be impermeable. *See id*. at 41:15-18.

89. The efficacy of the "manure sealing" effect has been questioned by both NRCS and scientific literature. Erickson Decl. at ¶ 10. If a manure seal is present, it can be negatively impacted by fracture flow through the unsaturated zone beneath the lagoon, disruption of the manure seal during emptying with mechanical excavation, drying of the exposed subsoil or embankment soil when lagoon levels are low, erosion of areas where manure is imported into the lagoon, and freezing and thawing are the types of conditions that can cause a manure seal to no longer be effective. *Id*. (citing sources).

90. Mr. Boivin testified during his deposition that the lagoons at Cow Palace Dairy frequently dry and crack and have been subject to repeated freezing and thawing during the winter months. Snyder Decl., Ex. 6 at 155:4-156:11; 164:21-165:4; 174:17-175:7; 183:10-12; 210:2-4; 216:14-217:2.

91. Plaintiffs' Expert David Erickson personally observed areas in Cow Palace's lagoons that were substantially eroded and impacted by plant and weed growth.

Erickson Decl. at ¶ 11. These, along with the conditions admitted by Mr. Boivin, are of the type that impact the effectiveness of a "manure seal." *Id*. at ¶¶ 10-11.

92. The NRCS itself disputes the efficacy of a "manure seal," as documented in the Agricultural Waste Management Field Handbook ("AWMFH"), which provides detailed instructions on how to determine seepage rates from earthen manure storage impoundments. *Id*. at ¶ 15. Instead, NRCS recommends the following:

> "Although the State or local regulations should be used in design for a specific site, the NRCS no longer recommends assuming that manure sealing will result in one order of magnitude reduction. A more conservative assumption described previously allows an initial seepage rate of 5,000 gallons per acre per day, which for the assumed typical site dimensions of 9 feet of liquid and 1 foot thickness of liner, assumes a one half order of magnitude reduction."

Id.

93. The AWMFH uses Darcy's Law to describe how to determine the seepage rate from lagoons of specific dimensions and characteristics. *Id*. at ¶ 19. Darcy's Law is the principle that governs fluid movement in lagoons and the subsurface. It is the equation that describes how fluid moves through porous media. At its most basic level, Darcy's Law is based on the fact that the amount of fluid movement between two points is directly related to the distance between the points, the pressure or head difference between them, and the permeability or the hydraulic conductivity of the media that the fluid moves through. *Id*. at ¶ 20.

94. To evaluate the specific seepage from a manure storage lagoon, the AWMFH looks at several parameters: the size of the pond; the thickness of the soil liner at the bottom of the pond; the permeability of the soils composing that liner; and the depth of the liquid stored in the pond at any given time. *Id*. at ¶ 22.

95. According to Cow Palace Dairy, the soils in the Cow Palace area primarily fall into the ML, SM, and GM group names of the Unified Soil Classification System. *Id*. at ¶ 17.

96. According to the well drilling logs obtained by Arcadis while drilling the AOC wells in the vicinity of Cow Palace Dairy, the soils encountered are of classification types ML, SP, SC, and GP, with monitoring well YVD-03 showing some CL type classification. The AWMFH states that ML, SC, and CL type soils are usually in "Group II," which have an estimated permeability of 5 x 10-6 cm/s to 5 x 10-4 cm/s. Sometimes, ML, SC, and CL type soils can fall into Group III, which have an estimated permeability of between 5 x 10-8 cm/s to 1 x 10-6 cm/s. SP and GP fall into Group I, which are highly permeable, having an estimated permeability of 3 x 10-3 to 2. *Id*.

97. The Erickson Decl. contains a detailed accounting of how Mr. Erickson calculated the seepage rates from each of Cow Palace Dairy's manure storage lagoons. Mr. Erickson acknowledges that some assumptions had to be made, as

Cow Palace Dairy does not possess specific information about the thickness of the soil liners underlying its storage impoundments.

a. For the thickness of the liner, Mr. Erickson assumes a compacted soil liner of one-foot. *See, e.g., id*. at ¶ 24. Mr. Erickson bases that assumption on a liner density test conducted on Lagoon 4, which Cow Palace Dairy tested to only 8 inches of depth. *Id*. Defendants' lagoon expert, Mr. David Trainor, also assumes that the Dairy's soil liner is one-foot thick. Snyder Decl., Ex. 14 at 58:18-20 (one foot manure "drape," one foot foundation material).

b. For the amount of liquid in each lagoon, Mr. Erickson uses a 50% figure for his primary calculations, although he presents charts that show how the seepage rate increases with the amount of liquid that is present in a lagoon. *See, e.g.,* Erickson Decl. at ¶ 27.

c. Mr. Erickson obtained information about the specific dimensions of each lagoon from Cow Palace Dairy's DNMP. *See, e.g., id.* at ¶ 24.

d. As to the permeability of the soils comprising the soil liner, Mr. Erickson presents data based on a permeability of 1 x 10-7 cm/s. *See, e.g., id*. at ¶ 28. Defendants' lagoon expert, David Trainor, agreed during his deposition that a seepage flux of 1x10-7 cm/s, an expected seepage rate, would leak 924 gallons of manure per day, per acre of lagoon, assuming a one-foot soil liner. Snyder Decl. Ex. 14 at 61:15-21. This means that 9 acres of lagoons present at Cow Palace leak more than 8,300 gallons per day, or over 3,000,000 gallons per year.

98. For each lagoon, Mr. Erickson uses the seepage methodology prescribed by NRCS in the AWFMH. Based on the most conservative estimates, Mr. Erickson calculates that the manure impoundments at Cow Palace Dairy leak at the following rates:

a. Lagoon 1: 3,830 gallons per day, or 460,000 gallons per year, under very conservative assumption that the pond is half full at least 4 months of the year. Erickson Decl. at ¶ 28.

b. Settling Basins (2 in total): 564 gallons per day, or 200,000 gallons per year, per basin, under very conservative assumption that the basins are half full year-round. *Id*. at ¶ 34.

c. Lagoon 2: 1,018 gallons per day, or approximately 185,000 gallons per year, under the very conservative assumption that the pond is half-full at least 6 months of the year. *Id*. at ¶ 39.

d. Lagoon 3: 763 gallons per day, or 91,000 gallons per year, under the very conservative assumption that the pond is half-full at least 4 months of the year. *Id*. at ¶ 43.

e. Lagoon 4: 416 gallons per day, or 50,600 gallons per year, using a permeability of 5.7 x 10-8 cm/sec (based on the limited testing done by Cow Palace and assuming a full order of magnitude manure seal), under the very conservative assumption that the pond is half-full at least four months of the year. *Id*. at ¶ 48.

f. Catch Basin NW: 831 gallons per day, under the very conservative assumption that the pond is half-full at least 6 months of the year. *Id*. at ¶ 64.

g. Catch Basin NE: 193 gallons per day, under the very conservative assumption that the pond is half-full at least four months of the year. *Id*. at ¶ 69.

h. Stormwater Pumpback Pond / Tailwater Pond / Tailwater Catching Pond: 6,777 gallons per day, or 2.47 million gallons per year, under the very conservative assumptions that these ponds have soil liners of at least one foot in depth that are equivalent to a permeability of 1 x 10-6. *Id*. at ¶ 74.

99. The seepage calculations discussed *supra* are based on very conservative values. As Mr. Erickson testifies, it is his belief, based on his observations of Cow Palace Dairy and experience in this field, that the Dairy's lagoons likely seep substantially more liquid manure. *See id*. at ¶¶ 28, 34, 43, 48, 64, 69, and 74.

Defendants' rebuttal expert, Mr. Backe, did not contest the validity of Mr. Erickson's calculations, agreeing that "the math is the math." Snyder Decl. at Ex. 15, 92:2-23 (transcript excerpts of Backe deposition). Mr. Trainor also did not dispute the validity of the calculations. *See* Snyder Decl. Ex. 14 at 57:10-17; 62:9-63:10.

100. Besides Mr. Erickson's calculations, evidence of seepage and preferential pathways of discharge have been found with regards to the Catch Basin NW, which was seen "bubbling" during the drilling of a nearby monitoring well in August 17, 2013. Erickson Decl. at ¶ 61. Arcadis personnel reported that, while using the air-rotary drill, they observed bubbling in one of the locations of the lagoon. When the drill was off, no bubbling was observed. *Id*. While this lagoon was drained and re-compacted later on, *id*. at ¶ 62, the fact that an air-rotary drill was causing bubbling only 50 feet away in a large lagoon demonstrates that the subsurface is very permeable and that discrete vertical flowpaths are present. *Id*. at ¶¶ 61-62. Mr. Trainor testified during his deposition that "the effects of the air rotary drilling" "potentially" violated the integrity of the lagoon, and that "potentially" a preferential flow path was created by the air rotary drilling. Mr. Trainor further agreed that water "will follow its path" down "when there's a hole in the lagoon." Snyder Decl. Ex. 14 at 126:23-127:19.

101. Plaintiffs obtained further evidence of seepage from Cow Palace Dairy's lagoons from a boring advanced between the Stormwater Catch Basin and the Safety Debris Basin. Erickson Decl. at ¶ 57. The lithology encountered during the boring was a highly-layered depositional environment, commensurate with discrete zones of perched water. *Id*. Nitrate concentrations were observed at all levels sampled, with 20.3 ppm being documented in the 8-10 foot depth; 18.2 ppm in the 10-12 foot depth; 14.4 ppm in the 13-15 foot depth; 27 ppm in the 15-16 foot depth; and 22 ppm in the 17.8-18.2 range. *Id*. (chart with results). Nitrate concentrations dropped below 18.2 feet, although were still present at depths up to 47 feet below ground surface. *Id*. Ammonium and phosphorus were also detected. *Id*.

102. Defendants' expert, Dr. Melvin, admitted during deposition that the nitrate found in the 12-18 feet range of Plaintiffs' boring sample demonstrated "horizontal seepage" between the lagoons. Snyder Decl. Ex. 8 at 185:3-10. Dr. Melvin further admitted that the results show that there could be some impact from the lagoons to groundwater. *Id*. at 183:14-23. While Dr. Melvin testified that he believed some of the nitrate observed in the greater depths could have been from atmospheric deposit from lightning or some other natural source, *id*. at 186:5-7, he admitted that the ammonium found in those same depths "probably" came from some organic source, such as manure. *Id*. at 186:13-24. Overall, Dr. Melvin agreed that the ammonium observed in the sample at depths of 45.5-47 ft. below ground surface "could be" from the lagoons, and could not identify another source besides cow manure. *See id*. at 188:4-11.

103. Plaintiffs also advanced two borings into the abandoned manure storage lagoon at the Haak Dairy. Erickson Decl. at ¶ 75. The Haak lagoon is of similar design and construction as Cow Palace Dairy's lagoons, in that the lagoons are all earthen impoundments constructed with native soils. *Id*. at ¶ 78. The native soils in the area are nearly identical as those at Cow Palace, with the majority being of the Warden silt loam classification. *Id*. This makes the core sampling taking from the Haak lagoon a good approximation of what one would expect to find if a similar test were conducted in Cow Palace Dairy's lagoons. *Id*.

104. Plaintiffs' second boring, after problems were encountered at the first boring site, was advanced to 45 ft. into the soil underlying the Haak lagoon. Two areas of perched groundwater were encountered beneath the lagoon, one is first boring and one in the second. Such perched groundwater is direct evidence that preferential pathways of contaminant migration existed below the lagoon, which transmit seepage through the subsurface and into groundwater. *Id*. at ¶ 81.

105. The sampling results from Plaintiffs' limited borings at the Haak Lagoon provide direct evidence that the lagoon was leaking. Substantial concentrations of nitrate, phosphorus, and ammonium were documented in the first two feet. *Id*. at

¶ 80 (table with sampling results); ¶ 82. Soil ammonium concentrations increased in the 5'-6' zone, showing direct evidence of a migration flowpath, as ammonium concentrations increase when nitrogen-rich liquid is introduced into the oxygen rich soil. *Id*. at ¶ 85.

106. Defendants' lagoon expert, Mr. David Trainor, provided testimony at his deposition confirming that Cow Palace Dairy's lagoons leak and that their contamination is, to some extent, reaching groundwater. For instance, when asked his opinion of whether Cow Palace Dairy's lagoons were "not contributing to the groundwater contamination in the area," Mr. Trainor responded, "[n]ot significantly." Snyder Decl., Ex. 14 at 89:13-16. While Mr. Trainor conditioned his statement, he still maintained that Cow Palace Dairy's lagoons were "not significantly" "contributing to the nitrate loading in the water table." *Id*. at 89:24-3. Mr. Trainor later agreed that the lagoons at Cow Palace Dairy are "potentially" contributing "some amount of nitrate[.]" *Id*. at 90:23-91:3. Mr. Backe, Defendants' rebuttal expert, also testified that "[e]verything that has a hydraulic conductivity [a.k.a. permeability] term to it implies that there is flow through." Snyder Decl. at Ex. 16, 75:15-20. Mr. Backe also stated that he had never seen a study that shows "there is no seepage from a lagoon." *Id*. at 75:1-8.

107. In sum, even based on conservative estimates that exceed the NRCS 313 specifications, the lagoons at Cow Palace Dairy leak substantial amounts of liquid manure into the ground. Defendants' experts do not contest that the lagoons leak or that they have an impact on groundwater. Defendants' experts also do not challenge the validity of Mr. Erickson's calculations.

Cow Palace Dairy Discards Manure by Composting Manure on Permeable Surfaces

108. Cow Palace Dairy composts solid manure on bare soil, without any concrete pads. Erickson Decl. at ¶ 88; Shaw Decl. at ¶ 43. Composting on unlined surfaces such as native soils can cause manure-nutrients to seep out of the solid manure, which still has a high moisture content, and into the soil. Shaw Decl. at ¶ 43.

109. Manure nutrients that leach out of solid manure being composted cannot be used as a beneficial crop fertilizer by Cow Palace Dairy or any recipients of finished compost. Shaw Decl. at ¶ 46. No crops are grown in the compost area at Cow Palace Dairy. *Id*.; Erickson Decl. at ¶ 91. During his site visit, Mr. Erickson observed high liquid content of the solid manure being composted. *Id*. at ¶ 90.

110. Plaintiffs used the Geoprobe to obtain an 18-foot core sample of the soil found underneath the composting area at Cow Palace Dairy. Erickson Decl. at ¶ 89. The results of the sampling show the compost area is a source of nitrate loading to soil and groundwater from Cow Palace Dairy. *Id*. at ¶ 90.

111. The compost area boring showed that vertical migration of nitrate, ammonium, and phosphorus were taking place. *Id*. (including table with results).

High nitrates were observed in the 4-5 foot depth (49.6 ppm), and high ammonium levels were observed in the 6-7 foot depth (100 ppm) and the 8-9 foot depth (180 ppm). *Id*. These results, combined with the overall high nitrogen to solid ratio, including 5720 mg/kg at 8-9 feet deep, is highly indicative of manure infiltrating into the ground from the compost area – the only possible surface source for this contamination. *Id*.; *see also* Shaw Decl. at ¶ 45 (agreeing, and also noting that the presence of nitrate down to 18 feet shows little oxygen present in the soil, and therefore no opportunity for denitrification to occur). The presence of very high phosphorus at the 9-10 foot depth (1970 ppm) also demonstrates substantial seepage, as phosphorus is much less mobile than nitrate, yet was found in higher quantities deep below the surface at the composting area. Shaw Decl. at ¶ 45.

112. Plaintiffs' experts' observations and sampling show that Cow Palace Dairy is discarding manure and manure nutrients by composting solid manure on permeable surfaces. Manure nutrients that leach out of the manure and into the ground cannot be used as beneficial crop fertilizer. Shaw Decl. at ¶ 46.

Cow Palace Dairy May, and Does, Contribute to the Nitrate Contamination Observed in Area Groundwater

113. No party can dispute that the groundwater observed in the monitoring area shows high levels of nitrate contamination, many of which exceed the 10 mg/L maximum contaminant level established by the Environmental Protection Agency.

See, e.g., Declaration of Robert Lawrence at Ex. B (table summarizing groundwater data that has been produced to Plaintiffs).

114. Because of nitrate's highly mobile nature, it must be carefully managed to prevent leaching to groundwater. Shaw Decl. at ¶ 47. This is especially true because the soils underlying Cow Palace Dairy's fields are not suitable for denitrification. *Id*. at ¶¶ 12-15. When nitrate is not used by a crop as fertilizer, it moves deeper into the soil with water movement, migrating below crop root zones and eventually to groundwater. *Id*.; *see also* Snyder Decl. Ex. 21 at 48:16-49:8 & 50:15-19 (testimony of Department of Ecology Yakima Regional Director Thomas Tebb).

115. Pursuant to the Administrative Order on Consent, Cow Palace Dairy has generated substantial data about the groundwater underlying its facilities. The Arcadis site model for the project shows that nitrate contamination in the groundwater can originate from Cow Palace Dairy's unlined manure storage lagoons, manure applications that exceed agronomic rates, and infiltration from the compost areas. Shaw Decl. at ¶ 55. The data obtained thus far confirms the conceptual model and shows that the predominant groundwater flow in the area is from the northeast and to the southwest, with water originating from the Rattlesnake Hills and moving generally toward the Yakima River. *See id*. at ¶ 65 (containing Arcadis groundwater contour maps showing flow of groundwater).

116. To determine whether the nitrates that are found in the groundwater are originating from Cow Palace Dairy, one can examine a number of factors. First, the presence of certain manure "tracer" chemicals associated with cow manure are a strong indication that nitrate contamination originates from a dairy-source. For instance, nitrate observed in combination with high chloride, sodium, phosphorus, sulfate, magnesium, calcium, bicarbonate or alkalinity, and ammonia are some of the types of tracers that can be used to "trace" the source of nitrate contamination. *Id*. at ¶ 57.

117. Another indication that nitrate contamination found in the groundwater originates from a cow manure source is the presence of dairy-related pharmaceuticals found in the groundwater. Here, EPA tested downgradient wells from Cow Palace Dairy for the presence of dairy-related pharmaceuticals, including monensin, which is used by Cow Palace Dairy. *Id*. at ¶ 58. Monensin was not found in upgradient monitoring wells, but was present in the Dairy's lagoons, manure piles, and application fields. *Id*. (see EPA chart). It was also found in two downgradient groundwater monitoring wells, *id*., indicating that the nitrates observed in the groundwater are from a manure source.

118. Third, one would examine whether there are any potential upgradient sources of nitrate contamination. To do this, one examines the nitrate and "manure tracer" chemicals found in upgradient wells and compare that to the water quality results obtained from wells located downgradient of Cow Palace Dairy. *Id*. at ¶¶ 56, 59.

119. Here, there are no major upgradient sources of nitrate loading from Cow Palace Dairy, with the exception of a handful of agricultural fields. *Id*. at ¶ 59. These fields are not a likely major contributor to the nitrate contamination of the groundwater found downgradient from Cow Palace Dairy, given the relatively low nitrate concentrations observed in the upgradient wells. *Id*. At least one field upgradient from Cow Palace, however, has had manure and/or fertilizer applications in the past, and one area has been used by the DeRuyter Dairies for manure storage. *Id*.

120. As water moves down and away from the Rattlesnake Hills, there is a steep drop in topographical and hydrologic elevation between the upgradient and downgradient wells. These steep gradients in the water table mean that there is a high groundwater flow rate in the northern part of the area monitored under the AOC, parts of which contain the Cow Palace Dairy facility. *Id.* at ¶ 60. Based on a map of the area, only a relatively small amount of groundwater recharge will occur until the irrigation canal and Cow Palace facilities are encountered. *Id*. at ¶ 60(d).

121. The upgradient wells in this case have shown small amounts of nitrate, ammonia, dairy pharmaceuticals, and other tracer chemicals associated with cow manure. *Id*. at ¶¶ 61-62. The most representative upgradient monitoring well, YVD-02, presents groundwater that has not been impacted by human-influenced sources. *Id*. at ¶¶ 61; 62(b). For instance, nitrate has been observed at 0.41 mg/L, 5.3 mg/L, and <0.200 mg/L; chloride, calcium, sodium, and sulfate values have also been low. *Id*. at ¶ 62(b).

122. Other upgradient wells show low nitrate concentrations, while some are located or designed in such a way that they are not representative of true background levels. *See, e.g., id*. at ¶ 62(a) (EPA well WW-06 had 0.71 mg/L nitrate); 62(c) (YVD-03 has had nitrate levels ranging from 3.9 to 5.96 mg/L as well as low chloride results); 62(d) (YVD-04, with nitrate levels ranging from 3.78 to 4.64 mg/L, is not the best upgradient monitoring well because it was screened 1.5 feet below the top of the water table and therefore misses the top of the saturated zone); 62(e)-(f) (YVD-05 is not the best background well because it is sampling a wide range of groundwater in the northern part of the site, where groundwater flow is fast and likely being influenced from seepage from the nearby Roza irrigation canal); 62(g) (DC-01 is not a good upgradient well because it is not fully hydrologically upgradient from Cow Palace Dairy or other sources of nitrogen loading).

123. Even with some of the problems identified in the upgradient monitoring wells discussed *supra*, the wells show water chemistry that is different – including lower nitrate and chloride results – than that found downgradient from Cow Palace Dairy. *Id*. at ¶ 63.

124. The relevant downgradient monitoring wells from Cow Palace Dairy, on the other hand, show that nitrates originating from a cow manure source have contaminated the groundwater being intercepted.

a. YVD-06. While this well is located within the Cow Palace Dairy facility, it was improperly screened such that the top of the well screen is 39 feet *below* the top of the water table. This means the well is not sampling groundwater originating at Cow Palace Dairy, and is not capable of showing direct nitrate contributions from Cow Palace Dairy to the top of the water table. *Id*. at ¶ 67.

b. YVD-09. This well is located off the Cow Palace Dairy facility, due south of the Dairy and southwest of its application fields. The well is downgradient from the Dairy. This well is screened in such a way that it is monitoring the top of the water table. It has shown nitrate results ranging from 57.1 to 74.7 mg/L, in combination with high amounts of chloride, calcium, sodium, and sulfate. Phosphorus has also been detected. These values indicate that the water intercepted by YVD-09 is impacted, at least in part, by Cow Palace Dairy's handling, storage, and application of cow manure. *Id*. at ¶¶ 70-72.

c. YVD-10. This well is located off of the Cow Palace Dairy facility, due south of the Dairy and its application fields. The well is downgradient from the Dairy, and is screened in such a way that it is monitoring the top of the water table. It has shown nitrate results ranging from 77.6 to 95 mg/L, in combination with high amounts of chloride, calcium, sodium, and sulfate. Phosphorus has also been detected. These values indicate that the water intercepted by YVD-10 is impacted by Cow Palace Dairy's handling, storage, and application of cow manure. *Id*. at ¶¶ 73-75.

d. YVD-14. This well is located off of the Cow Palace Dairy facility and is southwest of the Dairy and its application fields. The well is also south of the Henry Bosma Dairy. The well is downgradient from Cow Palace Dairy and is monitoring the top of the water table. It has shown nitrate results ranging from 101 112 mg/L, in combination with high amounts of chloride, calcium, sodium, and sulfate. These values indicate that the water intercepted by YVD-14 is impacted by Cow Palace Dairy's handling, storage, and application of cow manure. *Id*. at ¶¶ 76-77. The well is likely also influenced to some extent by contamination originating at Henry Bosma Dairy.

e. YVD-15. This well is located off of the Cow Palace Dairy facility and is south of the Dairy and its application fields. It is immediately downgradient from the Dairy's application fields and the entire facility itself, and is therefore a good well to examine in evaluating the groundwater impacts from Cow Palace. The well is screened such that it is monitoring the top of the water table. It has shown nitrate results ranging from 47.4 to 88.1 mg/L, in combination with high amounts of chloride, calcium, sodium, and sulfate. These values indicate that Cow Palace Dairy's manure handling, storage, and application practices impact the water intercepted by YVD-15. *Id*. at ¶¶ 78-80.

f. DC-14. This is one of the EPA wells located south of Cow Palace Dairy and north of Lagoons 3, 4, and 5. Eighteen feet of the well screen is located below the water table, meaning that the water being observed is mixing with a significant amount of upgradient groundwater and leachate from Cow Palace. Nonetheless, the results show that the groundwater being observed is impacted by the practices at Cow Palace Dairy. Nitrate has been observed at levels ranging from 5.8 mg/L to 26 mg/L, with three out of the five sampling events exceeding the 10 mg/L groundwater standard for nitrate.

Chloride, sodium, and calcium were also observed at levels corresponding with a cow manure source. *Id*. at ¶¶ 80-82.

g. DC-03 and DC-03D. These are two "paired" EPA wells, located off of the Cow Palace Dairy facility and south-southwest of the Dairy. DC-03, the shallower of the two wells, has shown nitrate levels ranging from 166 to 234 mg/L, with high amounts of chloride, calcium, sodium, sulfate, and magnesium also being detected. DC-03D, the deeper of the well pair, has shown nitrate levels ranging from 38.9-46.4 mg/L, with high amounts of chloride, calcium, sodium, sulfate, and magnesium also being detected. These values indicate that Cow Palace Dairy's manure handling, storage, and application practices are a likely contributor to the contamination observed in the well; Henry Bosma Dairy is also a contributor to this contamination. *Id*. at ¶¶ 84-91.

h. DC-04. This is another EPA well, located off-site and south-southwest of Cow Palace Dairy and its application fields. This well is sampling near the top of the water table and has shown nitrate levels ranging from 26 to 37.3 mg/L. Chloride, sodium, calcium, and sulfate have also been detected at levels indicating that the source of the nitrate is cow manure. These values indicate that the water being intercepted by DC-04 is impacted by Cow Palace Dairy's handling, storage, and application of manure. *Id*. at ¶¶ 90-92.

i. DC-07. This well is located at the south of Liberty Dairy, close to the southwest corner of Cow Palace Dairy Field 2 and nearby one of Cow Palace Dairy's tailwater recovery ponds. The sampling results from this well are very similar to the sampling results obtained by Plaintiffs from that tailwater recovery pond on October 30, 2013. That pond, which is unlined, showed low, but present, nitrate, chloride, sulfate, phosphorus, calcium, magnesium, and sodium results – very similar to that observed in DC-07. Thus, the results obtained from DC-07, which is an otherwise shallow well (61 feet bgs), indicate that the well is being influenced by seepage from the tailwater recovery pond. *Id*. at ¶¶ 93-94.

j. EPA's sampling of residential wells downgradient from Cow Palace Dairy also showed nitrate contamination ranging from 22.7 to 64 mg/L nitrate. *Id*. at ¶ 95.

125. The amount of time it will take for excess nitrate to reach groundwater is highly variable. The geologic conditions in the vicinity of Cow Palace Dairy contain preferential pathways of water migration, due to the differing densities of subsurface soils. Excess nitrate may therefore travel to groundwater via a shorter path in one location than it would in another. In any event, however, because the soils underlying Cow Palace Dairy are not suitable for denitrification, it is a virtually certainty that nitrate observed in and around the subsurface of Cow Palace Dairy will discharge to groundwater. *Id.* at ¶ 48; *see also id.* at ¶¶ 49-50.

126. The rate of nitrate movement is determined by the rate of water movement through the vadose zone, which in turn is determined by the soil texture and amount of water escaping the root zone of a field. The amount of water moving vertically through the vadose zone and recharging groundwater in the Yakima area is largely dependent upon irrigation management. This means that Cow Palace Dairy's irrigation practices have a strong effect on the rate that water and, correspondingly, nitrates, move through the soil matrix. *Id*. at ¶ 51.

127. Data obtained by the Defendants and EPA demonstrate that groundwater recharge in the monitoring area can occur fairly rapidly. First, water table elevation monitoring has shown that the water table in the area fluctuates widely, in some instances by upwards of three feet over a 10 day period. *Id*. at ¶ 102. Monitoring of water table elevations in wells YVD-03, DC-03, DC-05, DC-05D, and YVD-08 have shown considerable changes in elevation over short timeframes. *Id*. These types of fluctuations would not be present if groundwater recharge were taking many decades. *Id*.; *see also* Snyder Decl. Ex. 8 at 209:9-11 (variable water table "probably" "indicative of a groundwater recharge faster than 70 years");

210:18-211:16 (agreeing that water table variability means 70 year groundwater recharge theory "probably isn't totally accurate"); Snyder Decl., Ex. 14 at 119:4-20 (Defendants' expert, Mr. Trainor, testifying that seasonal fluctuations in the water table are evidence that seasonal surface activities are influencing groundwater).

128. Second, wide variability in the temperature of the groundwater being sampled has provided direct evidence that groundwater recharge is occurring fairly rapidly. Comparing the groundwater temperature from the sampling obtained on September 18-20, 2013, to that obtained on December 11, 2013, shows significant temperature changes. For instance, there was a 11.04 degree centigrade change in water temperature from well DC-03; a 9.25 degree change in DC-03D; a 10.8 degree change in YVD-04; and a 8.5 degree change in YVD-03. If groundwater recharge were taking years or decades, one would not find this amount of variability in water temperature between two sampling events that were only three months apart. Shaw Decl. at ¶ 103; *see also* Snyder Decl. Ex. 8 at 211:17-25; 212:9-17 (Dr. Melvin would not expect to see large temperature variation in DC-03 if groundwater recharge took 70 years); 213:25-214:8 (temperature changes indicate seasonal influence in water table, indicating that groundwater recharge is "probably" "occurring much quicker than 70 years"); 216:16-23 (Dr. Melvin states that he "would not expect these temperature changes took 70 years to get there" and that "[i]t's possible" his 70-year recharge theory was wrong); Snyder Decl., Ex. 14 at 120:15-25 (Defendants' expert, Mr. Trainor, agreeing that water temperature fluctuations such as those seen in the monitoring area are evidence that seasonal surface activities are influencing groundwater); 122:4-11 (same).

129. Third, the presence of dairy-related pharmaceuticals such as those used at Cow Palace Dairy in downgradient groundwater are further evidence that groundwater recharge can and is occurring rapidly. One would not expect to find modern pharmaceuticals in the groundwater that Cow Palace Dairy also provides to its herd if recharge were taking many decades. Shaw Decl. at ¶ 104; *see also* Snyder Decl. Ex. 8 at 217:10-18 (presence of pharmaceuticals in groundwater "possible" indication that groundwater is younger than 70 years old); 217:19-21 (agreeing that monensin was not used in the early or late 1800s and 1900s).

130. Fourth, EPA's own age-dating of wells showed that the average age of groundwater observed downgradient from Cow Palace Dairy was 31.6 years. Shaw Decl. at ¶ 105. Note, however, that just because the average *age* of groundwater is 31.6 years does not mean that it was contaminated with nitrate 31.6 years ago; contamination can occur at any point. *Id.*; *see also* Snyder Decl. Ex. 8 at 219:2-7 (Dr. Melvin does not dispute EPA's age dating data).

131. Based on the totality of groundwater sampling data, and considering that data with reference to Cow Palace's history of manure over-applications, storage of manure in unlined lagoons, and composting on permeable soils, Cow Palace's manure handling, storage, and application practices have caused and contributed to the nitrate contamination of the groundwater. Groundwater observed from wells hydrologically upgradient from Cow Palace has very little nitrate and chemical tracers associated with cow manure. On the other hand, the groundwater observed downgradient from Cow Palace shows high levels of nitrate and the elevated concentrations of chloride, calcium, magnesium, sodium, sulfate, phosphorus, and other chemical tracers associated with cow manure. In light of all this data, there is no reasonable question that Cow Palace has caused or contributed to the nitrate contamination of the groundwater. *Id*. at ¶¶ 98-99; *see also* Snyder Decl. Ex. 8 at 228:13-18 (Question posed to defendants' expert, Dr. Melvin: "[I]s it more likely than not that Cow Palace could be a cause of this contamination?" Dr. Melvin's response: "Yes."); 227:24-228:1 (agreeing that there is "a potential that" Cow Palace Dairy "have had some impact" on groundwater); Snyder Decl. Ex. 14 at 138:21-24 (Defendants' expert, Mr. Trainor, testifying that it was "certainly possible" that Cow Palace Dairy could be a source of contaminants in YVD-08); Snyder Decl. Ex. 21 at 57:14-18 (Department of Ecology Regional Director Thomas Tebb) (Mr. Tebb's professional opinion is that "groundwater contamination has/is occurring at these locations.").

132. The contamination to the groundwater extends not only to the area being monitored in the AOC, but also to areas outside of the AOC, following the groundwater flow path. This includes areas hydrologically downgradient where other members of the public and Plaintiffs' own members have installed domestic wells. Shaw Decl. at ¶ 99.

The Nitrate Contamination of the Groundwater May, and Does, Present an Imminent and Substantial Endangerment to Human Health and the Environment.

133. The maximum contaminant level ("MCL") for nitrates is 10 mg/L. Lawrence Decl. at ¶ 6.

134. Exposure to water containing nitrate that exceed the MCL is hazardous to human health. *Id*.

135. Exposure to nitrates at levels below the MCL also present risks to human health and the environment. Nitrate intake below the MCL has been found to contribute to an increased risk of thyroid cancer and thyroid disease, and insulin-dependent diabetes. Some cancers are specifically associated with levels below the MCL, specifically non-Hodgkin lymphoma (at > 4 mg/L), colon cancer (at > 5 mg/L), ovarian cancer and bladder cancer (at > 2.5 mg/L). *Id*. at ¶ 7.

136. Chronic exposure to nitrate, even at levels just above or below the MCL, can be as damaging or more damaging to health than an acute exposure to a higher level during a limited period of time. Long-term exposure to nitrates has been associated with increased mortality from strokes and heart disease and hyperthyroidism (at levels of 11-61 mg/L). *Id*. at ¶ 8. Generally, though, long-term exposure to nitrates at levels > 10 mg/L can increase risks for cancer, specifically, cancers of the stomach, nasopharynx, prostate, uterus, and brain. *Id.*; *see also id.* at Ex. B (document identifying myriad health impacts from exposure to nitrate).

137. The primary pathway for exposure to nitrates is from consuming drinking water, cooking with water, and other food and drink preparation activities. Other pathways of exposure include brushing teeth and ingesting water while bathing, showering, or using pools and sprinklers. Children can be especially vulnerable to ingestion of nitrate-contaminated water. *Id*. at ¶ 9.

138. Once ingested, nitrate is converted to the more potent toxic compound nitrite and can cause adverse health effects. In contrast to the slow release of nitrates in food, nitrates and nitrites in drinking water are absorbed rapidly and reach blood and tissue levels in toxic levels. *Id*.

139. Plaintiffs' members' wells have dangerously high levels of nitrate. For instance, Mr. Steve Butler's well, which was sampled on August 27, 2014, showed 64.6 mg/L nitrate, over six times the MCL. Such water poses a significant risk to human health. *Id*. at ¶ 13. Mrs. Reddout's well has been shown to have exceeded the 10 mg/L for nitrate three times between May 13, 2013 and August 27, 2014. *Id*. at ¶ 16.

140. Other members of the public who rely upon groundwater for their drinking water supply have also had their wells tested, with results exceeding the MCL for nitrate. *See, e.g., id*. at ¶ 12 (discussing results of sampling from EPA study); ¶ 14 (66 residences sampled under AOC program exceeded MCL); ¶ 15 (sampling from Cow Palace employee housing).

141. From a medical standpoint, there is no reasonable doubt that the nitrate levels in drinking water wells on and around Cow Palace Dairy pose an imminent and substantial endangerment to human health. *Id*. at ¶ 18.

Respectfully submitted this 17th day of November, 2014.

s/ Brad J. Moore
BRAD J. MOORE, WSBA #21802
Stritmatter Kessler Whelan
200 Second Ave. W.
Seattle, WA 98119
Tel. 206.448.1777
E-mail: Brad@stritmatter.com

Local counsel for Plaintiffs

s/ Charles M. Tebbutt
CHARLES M. TEBBUTT
OR Bar No. 96579 (*pro hac vice*)
DANIEL C. SNYDER
OR Bar No. 105127 (*pro hac vice)*
Law Offices of Charles M. Tebbutt, P.C.
941 Lawrence St.
Eugene, OR 97401
Tel. 541.344.3505
E-mail: charlie.tebbuttlaw@gmail.com
dan.tebbuttlaw@gmail.com

Counsel for Plaintiffs

s/ Jessica L. Culpepper
JESSICA L. CULPEPPER
NY Bar Member *(pro hac vice)*
Public Justice
1825 K Street NW, Ste. 200
Washington, DC 20006
Tel. 202.797.8600

s/ Elisabeth A. Holmes
ELISABETH A. HOLMES
OR Bar No. 120254 *(pro hac vice)*
GEORGE A. KIMBRELL
WA Bar No. 36050
Center for Food Safety, 2nd Floor
303 Sacramento Street

E-mail: jculpepper@publicjustice.net

Counsel for Plaintiffs

s/ Toby James Marshall
TOBY J. MARSHALL, WSBA # 32726
BETH E. TERRELL, WSBA # 26759
Terrell Marshall Daudt & Willie PLLC
936 North 34th Street, Suite 300
Seattle, WA 98103
206-816-6603
Emails: bterrell@tmdwlaw.com
tmarshall@tmdwlaw.com

Counsel for Plaintiffs

San Francisco, CA 94111
Tel. 415.826.2770
Emails:
eholmes@centerforfoodsafety.org
gkimbrell@centerforfoodsafety.org

Counsel for Plaintiff Center for Food Safety

CERTIFICATE OF MAILING

I hereby certify that on November 17, 2014 I filed a true and correct copy of the foregoing document under seal with the Clerk of Court using the CM/ECF system. Pursuant to the procedures for filing under seal, service will be accomplished by other means to the following:

Debora K. Kristensen
Jeffrey C. Fereday
Preston N. Carter
Givens Pursley LLP
601 W. Bannock St.
Boise, ID 83702
dkk@givenspursley.com
jefffereday@givenspursley.com
prestoncarter@givenspursley.com

Ralph H. Palumbo
Summit Law Group
315 Fifth Avenue S., Suite 1000
Seattle, WA 98104
ralphp@summitlaw.com

Brendan V. Monahan
Sean A. Russel
Stokes Lawrence
120 N. Naches Avenue
Yakima, WA 98901
bvm@stokeslaw.com
sean.russel@stokeslaw.com

Mathew L. Harrington
Olivia Gonzalez
Stokes Lawrence
1420 Fifth Avenue
Seattle, WA 98101
MLH@stokeslaw.com
olivia.gonzalez@stokeslaw.com

/s/ Sarah A. Matsumoto
Sarah A. Matsumoto
Law Offices of Charles M. Tebbutt, P.C.