

## Joint Data, Livestock/CAFO, Irrigated Ag, RCIM and Data Collection and Monitoring Working Group Meeting with Nitrogen Loading Assessment Presentation

### **Charge from Groundwater Management Area Advisory Committee**

None at this time.

### **Working Group Members**

Troy Peters (Chair, Irrigated Ag), Melanie Redding (Chair, Data), David Bowen (Chair, Livestock/CAFO), Dan DeGroot (Chair, Residential, Commercial, Industrial, Municipal)

### **Meetings/Calls Dates**

Location: Yakima County Roads Maintenance Conference Room

Date/Time: Thursday, April 13, 2017 / 10:00 AM – 4:00 PM

Phone Line: (509) 574-2353 – PIN 2353#

### **Participants**

Rand Elliott, Vern Redifer, Jim Davenport, Melanie Redding, Dave Cole, Steve George, Ron Cowin, Sheryl Howe, Stuart Crane, Jean Mendoza, Corina Hayes, Sandy Braden, Bud Rogers, Kathleen Rogers, Dan McCarty, Mark Peterschmidt, Ginny Prest, Laurie Crowe, Rodney Heit, Lisa Freund, Marivet Lombera, Joshua Tsavastewa, Frank Lyall, Larry Fendell, Doug Simpson, Kevin Lindsey, Mike Martian, Gary Bahr, Hector Castro, Margaret Drennan, Perry Beale, Kelly McLean, Laura Butler, Jaclyn Hancock, Andy Bary, Marlene Carpenter and Bobbie Brady (Yakima County Staff Support). Andres Cervantes (participated by telephone).

### **Key Discussion Points**

Melanie Redding opened the meeting at 10:06 AM and welcomed everyone. She explained the logistics for the meeting and had everyone introduce themselves. Melanie reiterated the goal of the GWMA was to reduce nitrates in the groundwater and that the task of the nitrogen loading assessment was to determine how much loading was coming from different sources so that the GWAC could determine how to direct future limited resources and assist with developing strategies.

Nitrogen Cycle/Nitrogen Fate and Transport (Andy Bary): Melanie introduced Andy Bary, a Senior Scientific Assistant who works in the Department of Crop and Soil Sciences for Washington State University in Puyallup. Andy was invited to the meeting to make a presentation on the nitrogen cycle, composting and manure management. In his presentation Andy explained the different forms of nitrogen, the nitrogen cycle, factors effecting nitrogen mineralization, how organic matter and nitrogen interacts, and the cumulative available nitrogen from an organic

source. Andy went on to explain the biology of composting including a summary of the requirements for aerobic and thermophilic composting, oxygen consumption, the phases of aerobic composting, temperature changes in an average compost pile and the variety of ways one can compost. Andy asked for questions. A member asked if organic nitrogen was soluble in water. Andy said generally not. Another member asked about the time frame for availability of nitrogen in successive years. Andy said that after four or five years it becomes more difficult to discern (too small to measure) and there is not much impact. A member asked about the carbon to nitrate ratio; Andy indicated at 20 to 30 neither is available or it is minimal as they offset each other. Another member asked if it would help if a five year moratorium on fertilizer application was put in place. Andy indicated that he didn't think this would solve the problem. Last of all a member asked how the amount of moisture from irrigation or rainfall effects nitrates. Andy answered that in the winter temperatures are a driving factor because it becomes too cold for water to drive anything. When the soil warms up water drives but in a gross matter when it is too dry the microbes are not active. He added that if it's too wet it goes from an aerobic system to an anaerobic and you get N2O and N2 gas.

In his composting presentation Andy defined composting as a controlled degradation of matter (controlled rotting). He noted that WSU offers a week long class to train compost operators and some dairy personnel attend these as well. A member indicated that they had heard that 50 percent of nitrogen was volatilized in composting. Andy stated that it was dependent on the method and quantity. The member then asked if he could provide a range and Andy said no; he would rather get back with a correct number. The member continued and said that in deep soil sampling they had heard a reference made to pore water. Andy said that there is less pore space in composting as the soil is compacted. He added that water is in pores in every level of soil but this is immaterial to nitrates. Another member asked why biosolids are only heated up to 100 degrees if 131 degrees was the appropriate temperature to heat up to for compost. Andy answered that biosolid treatment plants are usually dealing with liquid materials and that 100 degrees will still work but in a different time frame; higher temperatures just take less time. A member asked the preferred temperature for manure composting. Andy indicated that the composting temperatures he referred to is what was required for pathogen reduction for vegetables. Since composted manure could be used to grow cow feed, e.g., triticale, corn silage, etc., composting temperature requirements would be less. Another member asked if Andy had done any work on composting materials that leach nitrates in the groundwater. Andy said only terms of manure and water moving through it and leaking to the soil. A member asked if fungus was more active in lower temperatures below 131 degrees. Andy said that above 160 degrees, between 130 to 160 degrees and below 120 degrees there are different types of microbes. Last of all a member asked if moisture content effects fungus in compost. Andy said yes. As a follow-up question a member asked what kind of fungus is left. Andy said all kinds but he doesn't analyze them and added that every time a compost pile is moved it discourages fungus growth. Ginny Prest reminded everyone of the fate of water in compost piles during the compost process – it is either retained or goes into the atmosphere and is evaporating as the composting process causes water to dry. A member asked that Andy's power point presentation be placed on the GWMA website.

Nitrogen Loading Assessment Overview: Melanie reminded everyone of the process and noted that as the assessment evolved it had become a larger challenge because the group wanted to do it

right and provide the best possible information. The goal of the meeting was to hear from the authors, what they did, their thought processes then ask questions for better understanding. After the working group review and comment period the study would be presented to the GWAC for their review and questions before being finalized. It had been the groups' goal to make the nitrogen loading assessment defensible, transparent, reproducible, and in a format that was consistent, easy to read and understand. Melanie also noted what the document was designed to be and not be. Melanie added that it addressed nitrogen loading to land surface not to ground water and it was not meant to point fingers. She also reminded the group of the ground rules for a productive meeting. Gary Bahr added his thanks to the team and those who peer reviewed the document. He stated that it had been the goal of the Washington State Department of Agriculture (WSDA) to get reliable data that met QAQC, literature review and literature assessment. Each assessment would provide a low, medium and high range and would include a spatial product so it could be related to GIS and reviewed and updated in the future. Gary introduced Margaret Drennan as she had done most of the analysis of the data. Gary noted Margaret had a master's degree in Environmental Engineering and worked for a period of time with dairy nutrient management.

Nitrogen Loading Assessment Presentation CAFO's (Margaret Drennan): Margaret spoke first on CAFO's (Concentrated Animal Feeding Operations) and provided some background information including studies utilized and the areas of focus. The CAFO Management Units were determined to be: irrigated cropland (which would be included in the Irrigated Ag section of the report), animal housing (pens, barns, and pastures), compost areas, and impoundments (lagoons ponds, and settling basins). She explained how pens and compost were identified and defined (for both dairy and non-dairy CAFO's). Margaret also stated that they were unable to calculate the loading rate of compost because they don't have the numbers available to analyze. She emphasized that they aren't claiming they don't have a loading rate and noted that if the information would become available it could be added in and redone.

A member asked if the raw data was on file and could be shared. The data had been sent to the County for layering in GIS. To share it with members would require specific computer programs and that data is too large just to place online otherwise. The member also asked about the average stock rates per pen utilized in the report and the reason for dividing them into dairy and non-dairy pens. Margaret stated that the per pen numbers came from the UC Davis report. The pens were broken down by dairy and beef cows because someone may want to look at this in the future because the nitrogen count in manures differs between cows. She added that the assessment used milking and dry cows; no calves or heifers. The member also asked why there was no calculation of nitrogen emission rates to the atmosphere. Margaret responded that this was outside of the scope of this report. The member asked if runoff would increase since the interface layer in CAFO lots inhibits infiltration. Margaret responded that any runoff is channeled to the lagoon. Another member asked if meteorological conditions are similar to California how does that apply to irrigated areas. Again, the response was that is not in the purview of this report.

Margaret began her review of lagoons and how they identified them, the limitations, their methodology, nitrogen concentration and liner permeability, thickness, depth and surface area. She also passed out a handout with general site information to aid in the presentation before providing the lagoon results and CAFO conclusions and recommendations. Margaret asked the

group if they had any questions. A member noted that they had seen on page 22 of the report that dairies are required to do sampling. Ginny Prest responded and stated that these samples are not submitted to the State but are available when WSDA is inspecting. A member asked if they had calculated acreage for lagoons with liners. Margaret responded and said that they did some summary information; they had two different databases but they didn't match up. The member noted that in 2005 on-the-ground and aerial surveys were done and spreadsheets were compiled. A couple had caught her eye as very large. Margaret stated that they assumed there were compacted clay or bentonite liners not synthetic liners and that these may be avenues to look into in the future.

A member noted that there were 115 lagoons in the report and wondered if they had made any depth or average surface area calculations. Margaret responded that there were 240 lagoons and/or ponds but they did not calculate all of them as they assumed some were not manure storage ponds but irrigation storage ponds. She acknowledge that there was some gray area. The irrigation ponds were not part of the calculations.

**Nitrogen Loading Assessment Presentation Irrigated Agriculture (Kelly McLain and Perry Beale):** Kelly discussed the limitations of the assessment and turned the presentation over to Perry Beale who explained his methodology in this mass balance study. Perry collected most of the data through a telephone survey. A member asked if producers had provided recommended or applied applications. Perry indicated he received some of both. The member was concerned that the numbers provided were a large stretch since most growers refer back to the WSU handbook. Perry stated that he felt it was important to get local values. Perry provided several handouts and illustrations and noted that the goal had been to provide low, medium and high values. Both the low and high values were the actual reported values. For the medium value they used a weighted value which is the most accurate value.

A member was concerned that one survey represented a large amount of the acreage and therefore weighted the ultimate calculation. He was also concerned that the numbers only reflected a one year snapshot as winter kill, drought, a high commodity crisis, or the ability to mine the nitrogen already in the ground in ensuing years would significantly change the answers. He believed that a study should look over a period of 20 years. Perry thought the member made a good point. Melanie asked if the member had any suggestions as to how this might be done. The member stated that without time and money this would be difficult and expressed a concern that researchers had little comprehension of the real world. Margaret pointed out that the assessment was a starting point and that their biggest recommendation was to calibrate this against the deep soil survey. The member was also concerned that farmers provided accurate information. Perry felt that the bottom line was that data collection could continue as the process had been set up to accomplish this. Another member noted that she thought analyzing the deep soil sampling and comparing it to this data was within the scope of this project and asked how many people were contacted. Perry responded saying that he had contacted approximately 50 people and that some wouldn't give the amount of their acreage. The member also wanted to know how they had reached their estimates for composting. Perry said that typically an analysis was available and for manure they used information from the DNMP work they had done although slurries and solids/liquids were different. When asked for the amount of nitrogen in compost the answer was that some were as

high as 10 percent. The member noted that she found a lot of over application of nitrogen in the Deep Soil Sampling variance in the spreadsheet for alfalfa. Perry said he had the data and the number was 8.2 percent and they do apply manure. There was concern about a faulty conclusion on fields in the deep soil sampling. It was noted that alfalfa can actually fix nitrogen. One last point was that a member didn't see where adjustments for denitrification had been made in the study.

**Nitrogen Loading Assessment Presentation Residential Commercial and Industrial (Vern Redifer):**

Vern stated that he had compiled and written the report with help from Mike Martian and Cynthia Kozma of the Yakima County GIS Department. The goal was to look at loading from all of the sources in the residential, commercial, industrial and municipal areas in the GWMA. Sources included residential on-site sewage systems (ROSS); large on-site sewage systems (LOSS); commercial onsite sewage systems (COSS); fertilizers and small scale commercial and hobby farms. Vern noted that no sources had been found in municipal areas. They had learned that there are 6,044 households that utilize residential systems (ROSS) and were able to calculate the total nitrogen output in low, medium and high ranges using a variety of studies and information available through the County. Vern provided a data input summary and noted that they had also considered the migrant population effect on ROSS as a result of input from various members of the RCIM committee. Vern went on to explain that two large systems (LOSS) exist within the GWMA area as well. These are systems that are designed to handle more than 3,500 gallons per day and they must be registered with the Department of Health. Vern explained their methodology and conclusions. Vern moved on to commercial systems which are septic systems used for employees working at Ag businesses that operate year-round and are not classified as a LOSS by the Washington State Department of Health. He noted that there really are none, but since they knew businesses do operate and are not large enough to register with the Department of Health because they emit less than 3,500 gallons per day they had designed a category. Vern explained how the group had come up with their calculations and methodology and provided an output summary. He did the same for residential lawn fertilizer and small scale commercial and hobby farms noting that the output of nitrogen for these was relatively small. A member asked if the group had done any work on bio-solids. Perry Beale noted that it was part of the organic piece. Vern added that they had learned that bio-solid application was highly regulated by the Department of Ecology – both how it is applied and the agronomic rates of application. Vern added that the Department of Ecology could provide how many acres were approved for the application of bio-solids, but they don't know how many are actually applied.

**Nitrogen Loading Assessment Presentation Atmospheric Deposition (Kelly McLean):** Kelly explained the methods used to determine atmospheric deposition in the GWMA and provided the results. She noted the calculation was for lands in the GWMA only; excluding lagoons and pens and irrigated agriculture as those calculations were contained in their respective reports. They had even taken into account the poor air quality in December in Yakima County. Jim Davenport wanted to know how to get the total atmospheric deposition number for the GWMA. It was suggested that he take the total acreage (out of the Irrigated Ag piece) and multiply it by the number of total deposition (tons N/year). There was no good solution for pulling out the information for lagoons and pens and no good resolution. Melanie said that if anyone had an idea as to how to handle this dilemma, please make suggestions during the comment period as it was their desire to

make this the best useable document for the GWAC. Another member noted that the rates found in Tulare Lake (California) which was similar to the GWMA were nine pounds per acre. Vern stated that he had derived information from the National Atmospheric Deposition Program (NAPD) for just the GWMA area and also for Tulare County and both wet and dry deposition were around four pounds per acre. Mike also did a weighted average for the GWMA and Tulare. The member stated that Tulare County (not Tulare Lake Basin) had a concentration of dairy animals closest to the GWMA and better monitoring and came in at 17 lbs. per acre. She provided maps to Kelly.

**Wrap-up and Next Steps:** Gary provided an analysis of all sources and stated that over the entire GWMA acreage, irrigated agriculture (which makes sense because this represents the largest amount of acreage), CAFO lagoons, and CAFO pens were the largest contributors of nitrogen available for transport. However, on a per-acre basis the largest contributors of nitrogen available for transport are different – they are CAFO pens, lagoons, and onsite sewage systems (ROSS, LOSS and COSS) because they are more concentrated. Gary Bahr provided a summary of conclusions the WSDA had reached upon completion of the Estimated Nitrogen Available for Transport in the Lower Yakima Valley Groundwater Management Area study. He also provided a geospatial data set to illustrate how GIS tools could be used in the future and added that at present the tool did not include small farms, ROSS, COSS or LOSS. (Vern will provide this data and the two pieces will be married) The example was of a six mile diameter area which contained approximately 23,000 acres with a variety of farms. Gary also provided a list of future research that they would suggest be accomplished to further calibrate the system. A member noted that in the Irrigated Ag section of the report there was no mention of cover crops and their uptake. He thought this might affect approximately 1,000 acres. Gary said that all acres were crop mapped in 2015 but they did not discern if an apple orchard, for example, had a cover crop. The member thought this should have been assumed, but noted that the type of cover crop could vary. Vern said that most cover crops were put back into the soil which may contribute to nitrates; the member said some may or may not and that orchard grass takes up a significant amount of nitrates. Gary noted that they had talked about the limitations early on in the process. The member added that it might have been more accurate to take data from the WSU handbook. Gary pointed out that the Irrigated Ag Working Group decided the survey was the better route to take.

At Melanie's direction the group discussed when and how everyone should submit comments. It was agreed that everyone should forward their comments to Bobbie. They will be summarized and forwarded on to the presenters. All comments should be in by Friday, April 28. If members are unable to meet the deadline they should tell Bobbie when their comments will be ready. A member asked if they could see the other comments. Vern indicated they would be made available when compiled.

#### **Resources Requested**

None at this time

#### **Recommendations for GWAC**

None at this time

**Deliverables/Products Status**

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None at this time

**Proposed Next Steps**

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- Andy Bary's power point presentation will be placed on the GWMA website.
- Members should forward their comments on the draft Nitrogen Loading Assessment to Bobbie at Yakima County by Friday, April 28. They will be compiled and sent on to WSDA.
- Vern indicated other members' comments would be made available when compiled.