

NORTH DAKOTA'S

Nutrient Reduction Strategy

Point Source Workgroup Meeting Summary

October 14, 2014 • Fargo, ND • 8:00 a.m. – 12:00 noon

Background

As follow up to the December 19, 2013 ND Nutrient Reduction Strategy Stakeholder meeting and the March 20, 2014 Point Source Workgroup conference call, the Point Source Workgroup met in person at the Holiday Inn, Fargo, ND on Tuesday, October 14, 2014. The following is a list of those in attendance.

List of Attendees:

| Name | Affiliation |
|-------------------|--|
| Britt Aasmundsted | North Dakota Department of Agriculture |
| Al Basile | USEPA Region 8 |
| Dane Braun | North Dakota Farmers Union |
| Susan Danzl | SHE, Inc. |
| Keith Demke | City of Bismarck |
| Ken Demmons | HDR Inc. |
| Tracy Ekola | SHE, Inc. |
| Mike Ell | North Dakota Department of Health, Division of Water Quality |
| Joel Galloway | US Geological Society |
| Dallas Grossman | North Dakota Department of Health |
| Mike Hargiss | North Dakota Department of Health, Division of Water Quality |
| Marty Haroldson | North Dakota Department of Health, Division of Water Quality |
| Jim Hausauer | City of Fargo |
| Jared Heller | AE2S (Advanced Engineering and Environmental Services, Inc.) |
| Liz Hiatt | Tetra Tech, Inc. |
| Steve Himmelspach | City of Mandan Waste Water Treatment Plant |
| Andrew Job | City of Grand Forks |
| Gary Knutson | North Dakota Agriculture Association |
| Tod Matelski | City of Grand Forks |
| Andy McDonald | North Dakota Rural Water Association |
| Dennis Miranowski | City of Wahpeton |
| Kendall Nichols | North Dakota Soybean Council |
| DelRon Peters | HDR Inc. |

| Name | Affiliation |
|----------------|--|
| Karl Rockeman | North Dakota Department of Health, Division of Water Quality |
| Kyle Rogahn | City of Wahpeton |
| Scott Schaefer | AE2S (Advanced Engineering and Environmental Services, Inc.) |
| Daniel Trosen | City of Carrington |
| Don Tucker | City of Fargo |
| Sarah Waldron | North Dakota Department of Health, Division of Water Quality |

Mike Ell with the North Dakota Department of Health opened the meeting with introductions. He asked that everyone in attendance sign-in. Mike said that he would like to narrow membership on the workgroups a bit and will be using the folks in attendance at this meeting as well as those who have attended the other workgroup meeting and conference call as the basis for the core Point Source Workgroup. He will make one last request to other stakeholders to see if they want to formally be part of the Point Source Workgroup. After that he will limit workgroup emails and correspondence to a core group.

The following sections provide a summary of the agenda items discussed during the workgroup meeting. Copies of all of the presentations used by the presenters during the meeting are available on the North Dakota Department of Health’s North Dakota Nutrient Reduction Strategy website.

(http://www.ndhealth.gov/WQ/SW/Z6_WQ_Standards/Nutrient_Management/Nutrient_Management.htm)

Nutrients in North Dakota

Mike began this agenda topic by introducing Joel Galloway, Associate Director, USGS North Water Science Center. Joel gave a presentation entitled “Nutrient Characteristics for Streams in North Dakota.” Joel said the results he presented were from a report prepared for the ND Department of Health and the ND State Water Commission. The purpose of the report was to examine data collected from 1970-2008 to: 1) provide descriptive statistics and summaries of water-quality data from sites throughout the state; 2) determine trends and loads for selected constituents and sites with sufficient concentration and streamflow data; and 3) determine an efficient state-wide network sampling design for monitoring future water-quality conditions. A copy of the USGS report is available at <http://pubs.usgs.gov/sir/2012/5216/>. Joel then presented several figures depicting spatial trends in ammonia, nitrate-nitrite and dissolved phosphorus concentrations in terms of median concentrations at each site. In summary, there was no discernible spatial pattern to ammonia concentrations in the state, although concentrations tended to be higher in the winter as compared to the spring and summer. Spatial patterns in nitrate-nitrite concentrations showed higher concentrations in the Red River basin when compared to other basins in the state. Nitrate-nitrite concentrations were also higher in the winter in the Missouri River basin and lower in the winter in the Red River basin. Phosphorus concentrations tended to be higher in the Red River basin during all times of the year with generally higher concentrations in the summer at all locations in the state.

Joel then provided a comparison of median ammonia, nitrate-nitrite and phosphorus concentrations for the Red River and Missouri River basins in North Dakota to those reported by Mueller and Spahr (2006). Mueller and Spahr compiled results from the USGS's National Water Quality Assessment Program by land use category. Land use categories reported by Mueller and Spahr included undeveloped, partially developed, agriculture, urban, mixed, and "large" watersheds. When compared to the land use categories reported by Mueller and Spahr, ammonia concentrations for both the Red and Missouri River basins in North Dakota were similar to those reported for the partially developed land use category. Nitrate-nitrite concentrations for both the Red and Missouri River basins in North Dakota were similar to the undeveloped land use category. Phosphorus concentrations in the Red River basin were similar to the agricultural land use category, while phosphorus concentrations in the Missouri River basin were similar to the undeveloped and partially developed land use categories.

Based on nutrient concentration data and flow, Joel then presented nutrient yield results for 34 sites located across the state. For purposes of Joel's analysis, yield is expressed as pounds per year per square mile. For all of the nutrients (ammonia, nitrate-nitrite, total phosphorus and dissolved phosphorus), yields were greatest in the Red River basin.

Finally, Joel presented results of some trends analysis. It was determined that of the sites used for the USGS's analysis in the report, only 10 sites had sufficient nutrient data to compute trends. Also, of the nutrients analyzed, trends were only determined for nitrate-nitrite and total phosphorus. Based on the USGS's analysis, the only site with a significant trend in nitrate plus nitrite was the Red River at Grand Forks site. This site had a significant increasing trend. For the remaining 7 sites (Wild Rice River at Abercrombie, Sheyenne River near Cooperstown, Souris River near Sherwood, Little Missouri River near Watford City, Knife River near Hazen, Heart River near Mandan and Cannonball River near Breien) there was no discernible increasing or decreasing trend in nitrate plus nitrite. For total phosphorus, 4 sites (Spring Creek at Zap, Knife River near Hazen, Heart River near Mandan and Cannonball River near Breien) had significant decreasing trends and one site, the Red River at Grand Forks, had a significant increasing trend.

There was a question from the audience regarding variability due to flow. Joel responded that the analysis of the trends takes out variability caused by such anomalies as flow, seasonal effects, etc. By removing the natural variability, changes due to other things such as land use change can be detected.

Joel Galloway then presented information on the SPARROW model and results. SPARROW is an acronym for SPatially Referenced Regression on Watershed Atttributes. For a full description of the model the reader is referred to the following web site <http://water.usgs.gov/nawqa/sparrow>. Currently, there are eight (8) SPARROW models which cover the US. North Dakota is covered by two models, the Missouri River Basin model and the Great Lakes-Red-Souris-Rainey River model. Each of these models provides estimates of average annual total nitrogen and total phosphorus loads and yields. These loads and yields are provided as a total for the entire contributing watershed above a point on a river or stream or as the incremental load or yield for the catchment represented by the point on the river or stream. The model also partitions the total/incremental load or yield into various source categories (e.g., point sources, fertilizer, manure, atmosphere, urban areas, and natural [e.g., forest, wetlands]). Joel then provided several examples of N and P SPARROW model results for both the Missouri River basin and for the

Great Lakes/Red/Souris/Rainey at different spatial scales and for both incremental and total load and yield. As an example of some of the results provided through SPARROW, Joel showed a ranking of state contributions of N and P loading to the Gulf of Mexico. Based on the SPARROW model, of all the states in the Mississippi River/Gulf of Mexico drainage, North Dakota ranks 23rd in terms of N loading and 25th in terms of P loading.

Joel also mentioned that there are other methods to demonstrate results and help guide decisions using other parts of the SPARROW model. These tools allow you to obtain more specific and in-depth information.

- SPARROW Mapper – easy and simple way to get SPARROW results, especially by hydrologic and political boundaries (<http://wim.usgs.gov/SparrowMRB3/SparrowMRB3Mapper.html#>, <http://wim.usgs.gov/SparrowGL/Sparrow/GLMapper.html#>, <http://wim.usgs.gov/SparrowMARB/SparrowMARBMapper.html#>)
- Decision Support System – capable of using to visualize SPARROW output and run various scenarios (<http://cida.usgs.gov/sparrow/>)

Following his presentation, Joel asked if anyone had any questions.

Q: When was data collected for the model? Agricultural practices have changed substantially through time.

A: Joel: The model uses concentrations from a long period of time, but normalizes the data to one year so it can be aligned with the GIS data. The current model was normalized to 2002, but the model is being updated to 2012 data.

Q: Audience member: You mentioned that work is currently being done to bring the two models together to develop one much better model. Do you know what the timeframe is for the release of the new model?

A: Joel: Within the next year. By include the models together and including the watersheds in Canada, the model will be improved to provide better estimates of load

Q: The model shows high contributions of nutrients from agricultural application of fertilizer, but fertilizers are applied at much higher rates in the urban areas. Is that accounted for in the model?

A: Joel: Unfortunately, the model just links loads to the urban land use, not specifically fertilizer application in the urban setting. The main reason that it is not include is that fertilizer application for urban uses is not tracked like fertilizer use for agriculture. Agricultural application rates are well documented and was available for use in the model. If information was available for urban use of fertilizer, it would have been included in the model.

Summary of North Dakota's Nutrient Reduction Strategy

The next topic on the agenda was a presentation by Mike Ell, North Dakota Department of Health.

Mike began with an update on the strategy development effort. He presented an overview of where it all started and led up to the stakeholder meeting that occurred December 19, 2013.

- Nutrient Criteria Development Plan (May 2007)

- Initial discussions on a state strategy (late 2011) based, in part, on the Stoner Memo (March 2011)
- Formed a planning team
- Selected a facilitator
- EPA sought contractor assistance
- Developed the ND Nutrient Strategy Fact Sheet
- Held 1st Planning Team Meeting (November 2012)
- Held 1st Stakeholder Meeting (December 2013)

Mike discussed the recommended elements of the nutrient framework. EPA issued the Stoner memo, which encouraged states to develop statewide nutrient reduction strategies to make both near-term and long-term progress on reducing nutrient pollution while continuing to develop numeric nutrient criteria. The nutrient framework recommended states prioritize watersheds and set load reduction goals, ensure effectiveness of source reduction strategies for point source permits, storm water and septic systems, and agricultural areas; ensure accountability and report progress to the public; and continue with numeric nutrient criteria development.

Mike then moved onto the next topic – forming a planning team. The team is made up several sector groups including agriculture, municipalities, industry, regulatory, environmental and exofficio members. The first planning team took place in November 2012. The purpose of this meeting was to meet one another, come to a common understanding of the nutrient management issues in our state, identify gaps, and begin to outline the key elements of a state strategy. The second planning team meeting took place April 2013. The group discussed the states’ progress towards nutrient management strategies, approved the draft outline of North Dakota’s Statewide Nutrient Reduction Strategy, reviewed processes and procedures for prioritizing watersheds for nutrient reduction, and developed five workgroups (Agriculture/Nonpoint Source, Nutrient Criteria, Outreach/Education, Prioritization, Point Source) to continue the development of the statewide strategy.

The draft outline included defining the scope of the problem, identifying the necessity of having a nutrient reduction strategy for North Dakota, determining how this strategy relate to other watershed management programs in the state, and listing the elements of a state nutrient reduction strategy.

Mike then briefly described the Stakeholder Meeting held in December of 2013, and the Workgroup carousel activity that, for each workgroup, resulted in a list of ranked answers to a series of why, how, elements and considerations; and potential roadblocks questions. For example, the nutrient criteria workgroup was provided the following: 1) Why develop nutrient criteria? 2) How to develop nutrient criteria? 3) What are the primary elements and considerations we must be aware of when developing nutrient criteria? and 4) What are the potential roadblocks to nutrient criteria development? The top two results in each category were:

- Why?
 - Keep control at local level (keep EPA out)
 - Prevention is easier than correction
- How?

- Source control (reduced phosphorus content on products, appropriate application, public education)
- Funding programs
- Elements and considerations
 - Funding and costs (cost/benefit, bang for the buck, most beneficial)
 - Implementation and prioritization (municipal, industrial, watershed, etc.)
- Roadblocks
 - Costs
 - Value-measurable benefits

Mike followed this discussion with the outcomes from the other workgroups that have met.

Nutrient Criteria, Prioritization and Nonpoint Source Workgroups

Prioritization Workgroup

Mike reported that the Prioritization Workgroup came away from their meeting recommending that the Department pursue the recovery potential screening tool as the main prioritization method for nutrient reduction and water quality management.

Mike briefly explained what the Recovery Potential Screening Tool is. The tool was developed by EPA. It is a method to help states and restoration planners compare restorability across watersheds. It is a science-based, indicator-driven tool. The tool uses three different indices (ecological, stressor, and social) of a watershed, plugs the information into an equation and prioritizes based on the recovery potential of the waterbody. For more information about the tool, visit www.epa.gov/recoverypotential.com.

It was also the consensus recommendation of the Prioritization Workgroup to implement the basin management framework and to start with the Red River basin.

Nutrient Criteria Workgroup

Mike reported that the Nutrient Criteria Workgroup came away from the meeting establishing that the current Nutrient Criteria Development Plan (developed in 2007) makes sense. They recommended including the plan in the strategy with minor revisions.

Nutrient Criteria Development Plan for North Dakota

While referring to the slides in his presentation, Mike provided a summary of the current North Dakota Nutrient Criteria Development Plan. The current plan was developed and approved by EPA in May 2007. The goal of the Plan is “to develop technically defensible nutrient criteria for surface waters, which are protective of the resource, and consistent with federal guidance.” Mike said the Plan, which provides the framework for criteria development, includes rivers and streams as one category and lakes and reservoirs as a second category, and excludes wetlands. The Plan also recognizes that criteria need to take into consideration spatial (e.g., ecoregion or hydrologic basin differences) and temporal scales (e.g., when and how long until excessive nutrients cause an effect). Finally, the Plan recognizes that stressor-response relationships, which are the basis for criteria development, must be quantifiable (i.e., you must be able to measure both stressor and response variables).

The workgroup also identified where we need to begin. The plan is to identify priority waterbodies to begin nutrient criteria development. The Nutrient Criteria Workgroup identified Lake Sakakawea and Red River as potential waterbodies to begin criteria development.

Agriculture/Nonpoint Sources Workgroup

Mike reported that the Ag/NPS Workgroup came away from this meeting recommending the need to develop a conservation systems handbook for North Dakota. A subgroup was developed comprised of persons from the NDSU Extension, NDSU faculty, NRCS, commodity groups, Health Department, and ND Department of Agriculture. The group will tailor the handbook to the unique regions in the state (east to west) and focus on agricultural BMPs applied in a systems approach that addresses nutrient reduction and recognizes that there are multiple benefits that can be derived from the implementation conservation systems (i.e., wildlife, soil health, flood mitigation) that go beyond nutrient reduction.

Education and Outreach Workgroup

Mike mentioned that the Education and Outreach Workgroup has not met at this time. Mike stated that in discussions he has had with those currently involved in the workgroup, it would probably be more beneficial to have one to two people from each workgroup be involved in the outreach and education workgroup since this information would span all workgroups. Mike stated that he would reach out to each workgroup to identify volunteers to be a part of the Outreach and Education Workgroup.

Mike mentioned that the North Dakota Department of Health will be responsible for writing the strategy that will be based on the information they receive from the workgroups. He expects there will be one stakeholder planning meeting where all the workgroups will come together prior to developing the strategy.

Basin Framework

Lastly, Mike briefly discussed the Basin Framework for Water Quality Management. Mike described the basin framework as something the Health Department has been discussing internally for a few months and is a new way to organize and implement their water quality management programs. This would include monitoring and assessment, TMDLs, Section 319 NPS and nutrients. Mike explained that currently, the Health Department for the most part implements their water quality management programs on a statewide basis. Through the basin framework, the state would be divided into 5 major basins (e.g., Red River, Souris River, James River, Upper/Lower Missouri River). The Health Department would then implement basin water quality planning, monitoring, assessment, TMDLs and Section 319 NPS implementation within each basin over a 2-3 year time frame, then move on to the next basin where the process would be repeated. Mike then stated that this basin framework may be a good way to organize the nutrient reduction strategy. Through the basin framework, nutrient priorities would be set for each basin, rather than on a statewide basis.

Following the discussion on the Basin Framework, Mike presented a slide (Figure 1) showing a flow diagram for nutrient reduction or management which would be implemented within the basin framework. The process would start with monitoring, make assessment decisions based on the data, TMDL development if it's an impaired waterbody, then implementation. If TMDLs were identified, you need to identify allocations for point sources and nonpoint sources, and then move to monitoring. During the

process, if it's determined that implementation isn't getting us to the threshold needed to restore water quality, then we may need to refine our criteria. Mike then concluded this presentation by pointing out that in the diagram, prioritization is in the middle and is required for each element in the conceptual framework.

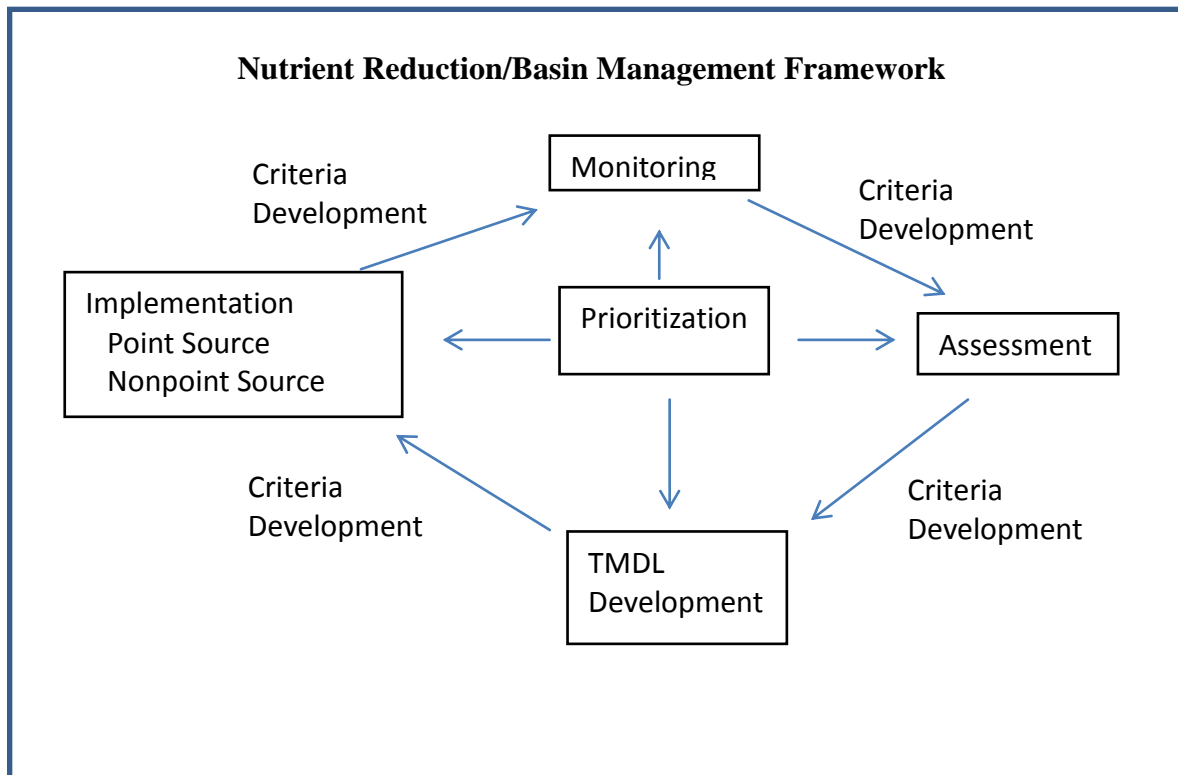


Figure 1. Nutrient Reduction/Basin Management.

All of the information discussed in these meetings can be found online in the meeting summaries.

Approach for Including Nutrient Limitations within NDPDES Permits

The next topic on the agenda was a presentation by Dallas Grossman, North Dakota Department of Health. Dallas began his presentation stating that as far as writing permit procedures, you want to make sure you protect the near-field and far field waterbody (river, stream, lake). The narrative for the permit will be based on water quality standards, TMDLs, observed impacts, response variables, and accelerated monitoring. We will need to focus on total nitrogen for streams and total phosphorus for lakes and reservoirs.

Next, Dallas' discussion focused on developing loads and concentrations. There are two different effluent limitations we will be dealing with—technology based effluent limitations (TBELs) and water quality based effluent limitations (WQBELs). When developing loads and concentrations, Dallas pointed out that

it is important to consider the magnitude, duration and frequency of the discharge and loading. He also recommended reviewing background and support documentation, as well as response variables including existing TMDLs, the 2000 Ecoregional Nutrient Criteria, 1986 Gold Book, and chlorophyll *a*). Dallas mentioned that permit writers can also use USEPA's technical support document to conduct a reasonable potential analysis to determine loads and concentrations. Lastly, you will also need to establish the selection of critical stream and effluent flow and concentrations.

Dallas then discussed the translation of all of this to a permit. The standard individual and general permits for facilities in a watershed may have different permit cycles. For watershed permits, there will be one permit for all facilities in that watershed and effluent limitations for each facility will be established at the same time. Dallas mentioned that we want to avoid nutrient trading because of the need to establish a nutrient trading program, develop contracts between each facility, and facilities with TBELs cannot trade above the TBEL.

Dallas mentioned a few other items to consider when developing permits:

- Variances - recommend avoiding variances for small lagoon systems
- Seasonal limitations – different limitations may be established based on the season
- Compliance schedules
- Antidegradation procedures – if nutrient limitations cannot be met

In conclusion, Dallas mentioned that NDDoH will need to establish protocols for including nutrient criteria within permits.

Wastewater Treatment Technologies for Nutrients

The final presentation on the agenda was given by Scott Schaefer, AE2S.

Scott began his discussion reiterating the different types of discharge limits.

- Technology Based Effluent Limits (TBELs)
- Water Quality Based Effluent Limits (WQBELs) – based on in-stream standards
- Total Maximum Daily Load (TMDL) - too much existing load, need to figure out reduction
- Antidegradation

Next, Scott referred to slides in his presentation looking at Minnesota and Montana. These states fall under Ecoregion III based nutrient criteria. Scott also mentioned ecoregion IV where the standards are established with greater detail. Both Minnesota and Montana include ecoregions that extend into North Dakota, and these ecoregions all have in-stream criteria of 0.15 mgTP/L.

Scott then approached the subject of not being able to meet the limit. He recommended considering that if you are not able to meet the limit, you incorporate a variance procedure (MT). Scott used Montana as an example. They recognized that the limits were unattainable and incorporated individual variances to assist in meeting requirements. Some of the details of the nutrient standards general variance include use up to 20 years, review every three years, and changes can be incorporated at permit renewal time. Montana also

issued non-binding guidance on what the likely variance levels would be throughout the 20 year variance period for different sized facilities.

Scott then discussed how the nutrient criteria would affect different types of treatment facilities.

Lagoons: the seasonal nutrient criteria will generally be avoided for lagoons that already have seasonal discharges outside of the nutrient windows. TMDLs could still impact lagoon systems.

Mechanical treatment systems: there are many types of systems, so it is difficult to generalize. However, most systems will require significant changes to meet future nutrient standards.

Scott then explained the general nutrient removal mechanisms of nitrogen (biological ammonification, nitrification, denitrification) and phosphorus (chemical precipitation or biological removal by incorporation into specialized biomass) with the realistic effluent concentrations that can be achieved by different removal mechanisms. Further detail was also provided on suspended growth, attached growth, and hybrid biological systems. Tertiary treatment and sidestream (recycle flow) treatment systems were also discussed.

Water Environment Research Foundation (WERF) published cost comparisons (capital and operating) for different levels of effluent nutrient limits were also presented.

Finally, Scott provided a brief mention of water quality trading with the comment that trading programs have been successful in other areas of the country and that the concept of trading is relatively simple, but that the difficulty is in the details of implementation.

Following his presentation, Scott asked if anyone had any questions. The audience did not have any questions at this time.

Next Steps

The final agenda item discussed outcomes for the strategy and next steps. Karl Rockeman, North Dakota Department of Health, took the lead. Karl asked, "Where do we go from here?" He stated that as a group, we need to focus on translating our water quality standards to a permit. He pointed out that there is a lot of structure available on how to accomplish this. We need to further identify issues related to implementation of criteria into permits. We need to figure out what treatment and optimization approaches are available to reduce nutrients. The other point he made was, as a workgroup, we need to look at identifying interim steps that can be implemented while NDDoH continues to develop criteria. Several possibilities include monitoring requirements for majors, lagoon systems, existing mechanical plants, and new facilities.

In closing, Karl stated that feedback from the workgroups is very important at this point in the process. If there is something you want to share, now is the time.