

# **South Deschutes/North Klamath Groundwater Protection: Report and Recommendations**

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State of Oregon  
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Environmental  
Quality

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State of Oregon Department of Environmental Quality

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# Executive Summary

There is a long history of groundwater contamination from septic systems in Southern Deschutes County. Severe groundwater contamination in the area of La Pine motivated partners to build a wastewater treatment and disposal plant to serve the city in the late 1980s. Conditions within the City of La Pine have improved, but regional shallow groundwater outside of the city has shown continued elevated levels of nitrates, which can be a “tracer” indicating the presence of partially treated sewage. Testing and research indicate the vast majority of contamination comes from onsite (septic) wastewater treatment systems, meaning discharge from residential septic systems is seeping into the groundwater that is used as a primary drinking water source.

The problem is caused by existing developed and undeveloped platted lots, local geology and geography. The area has porous, sandy pumice soil derived from volcanic events and many shallow groundwater aquifers, both of which allow the potential for contamination. These local conditions are unusual, as other parts of the state have finer silt and clay-like surface and sub-surface soils that can form protective layers above groundwater.

In an effort to protect groundwater throughout the area, Deschutes County passed an ordinance in 2008 requiring homeowners to upgrade their septic systems. Voters overturned that ordinance in a special election the next year, spurring Deschutes County to seek DEQ’s assistance in addressing the problem. Soon after, DEQ sought volunteers for a local citizen Steering Committee to recommend affordable solutions to protect area groundwater. DEQ solicited volunteers through a direct mailing that went to more than 10,500 residences in the area.

DEQ interviewed two dozen candidates and selected 11 regular members and three alternates. Members met regularly for almost three years, spending considerable time learning and discussing many issues related to septic systems and groundwater contamination. The group studied topics including geology, soils, hydrogeology, toxicology, and septic system technology. They also learned about the political, financial and regulatory entities involved in wastewater management.

The committee ultimately considered and approved a list of ten recommendations to address groundwater contamination in the area. They also conducted extensive public outreach to talk directly with the community about the problem and the potential solutions.

The recommendations include a range of ideas, strategies and best practices. Among these recommendations is an exception to state planning rules that would allow multi-residence wastewater treatment systems outside of existing urban growth boundaries and sanitary districts, and allow establishment of a sanitary authority. They include establishing a groundwater monitoring program and a moratorium of the current Alternative Treatment Technology (ATT) requirement while some of the recommendations are being pursued. There is also a recommendation to continue offering education and outreach to the community.

In June 2013, the committee fulfilled its goal of providing these recommendations to DEQ. Having fulfilled its mission, the committee then voted to disband.

# Committee Background and History

The committee began with a question: Does the area have a groundwater contamination problem? In a word, the answer was yes. The area's shallow, unprotected groundwater and pumice-based sandy soils mean that water soluble substances put on or in the ground will likely end up in the groundwater. While fertilizers, pesticides and livestock manure can contribute contaminants to the groundwater, most groundwater contamination comes from individual onsite septic systems. All types of onsite systems in the region – standard septic, sand filter and ATT systems -- discharge contaminants into the ground. Over time, many of these contaminants drain through the sandy, porous soil and reach the groundwater, which can be as low as two feet below the ground surface in some areas.

Compounding the risk is the fact that there are about 14,000 properties in the area with over 75% of the properties in neighborhoods having parcels of 2 acre or less in size. Add in the fact that there is minimal precipitation in the area to dilute contaminants and the problem becomes clear: too many septic systems are discharging to porous soil and over time there will be increasing contamination of the shallow vulnerable aquifers that many people are using as their drinking water supply.

Members learned to distinguish between the slower rate of aquifer-wide contamination and the more immediate threat to contaminated wells located in some neighborhoods. The committee also learned a lot about how the pumice soils naturally filters some pathogens, while more water-soluble substances like nitrates, detergents, pharmaceuticals and personal care products were more likely to reach groundwater. The committee also reviewed well test data, confirming that the risk of contamination varied by neighborhood based on a range of factors.

Another important realization by the committee was learning that there was very little risk of the contamination reaching the deep wells that serve places like Bend and Sunriver. Although many people – including elected officials and the media – claimed otherwise, analysis showed very little risk of contamination extending beyond the Upper Deschutes River-La Pine Sub Basin. Water quality tests and studies conducted on the regional aquifers indicate that the risk to people outside of this area is actually quite low.

In order to obtain more current data, the committee urged DEQ to conduct re-testing on about 51 sites throughout the region. Those results showed slight – though statistically significant – increases in groundwater contamination when compared to testing on the same sites conducted years earlier. However, that increase was not as great as previously predicted.

Although the committee was established by DEQ, members recognized that the breadth of the problem would require assistance from a number of other agencies. Whenever possible, the committee relied on personnel and resources from those agencies, including inviting guest speakers to some meetings. Those speakers were useful in helping committee members see the problem from other perspectives.

Once the committee members had a comprehensive grasp of the problem and its causes, they considered the options. They could:

1. Do nothing and maintain the status quo
2. Protect public health by treating the drinking water supply
3. Promote more monitoring and site-specific testing
4. Take a phased approach to reduce contamination
5. Promote a “one size fits all” solution and apply it to the entire area

A lot of thought and discussion went into the five options listed above. In general, the thought process behind each of the above considerations is as follows:

1. The committee very much wanted to be good stewards of the environment, so doing nothing was not determined to be a viable option. Also, with the requirement to install ATT systems, “doing nothing” meant continuing to require homeowners to spend considerable money on a “solution” that actually resulted in significant contamination for a majority of residents.
2. Members also believed that if the community did not take steps to address the problem now, it would only grow worse in the coming years. Once groundwater contamination becomes widespread, it can be difficult – if not impossible – to get rid of. Addressing the problem relatively early, rather than waiting decades longer, seemed the most prudent action. For all of these reasons, doing nothing to address groundwater contamination was not considered an option for the committee.
3. The committee talked about whether the problem was really related to drinking water, groundwater, or both. While some people believe the problem can best be addressed by ensuring safe drinking water, that approach ignores the environmental damage being caused to the groundwater and to local rivers and streams. Members discussed numerous ways to ensure safe drinking water, including filtrations, requiring public water systems and drilling deeper individual wells. But each of these solutions was insufficient in treating the larger issues, and they presented a whole new set of technical challenges not dissimilar from dealing with wastewater itself. Ultimately, the committee felt that treating drinking water might solve some of the human health impacts, though it would do nothing to address the larger environmental problems of groundwater contamination.
4. Throughout the nearly three years that the committee met, the importance of monitoring became more and more evident. Members talked about how any potential solution should include widespread monitoring of groundwater and well testing. Monitoring was seen to be the only reliable way to gauge the seriousness of the problem, and the more data that is available the easier it is to start working toward site/neighborhood-specific solutions to the problem. Additionally, a good monitoring program would be useful in determining effectiveness of the protective solutions.
5. When the committee looked at neighborhoods throughout the region, it became clear that some areas would need different approaches and solutions. Members spent a lot of time considering different risk criteria, including housing density, depth of the first groundwater, depth of drinking water wells, local subsurface geology and the relative age of septic systems. Also, in some areas, different solutions might need to be phased in over a longer period of time. With all of these variables taken together, members realized they may need to take a phased, long-term approach to the problem.

6. The one-size-fits-all solution was rejected by both the voters and committee members. As the committee learned more about the situation it became clear that the ATT one-size-fits-all solution would not have adequately protected the groundwater in some areas while requiring expensive alternative solution that were unnecessary in other areas. Because of the unique characteristics of affected neighborhoods, the inflexibility of a one size fits all solution would be extremely costly while not adequately protecting the groundwater.

After significant discussion, the committee decided to focus their time and attention on options three and four. So, with those aims in mind, the committee met with many experts in a variety of related fields. They spoke with science and research-based experts, including a hydrologist, soil engineer, chemist, and toxicologist. They learned directly from industry experts about the various types of septic treatment systems available.

The committee also learned quite a bit about sanitation authorities, special districts and state laws pertaining to the extension of sewer lines outside of urban growth boundaries and existing districts. Members also discussed low interest loans, grants and other financing options.

The committee met nearly 50 times, including 33 regular meetings, eight work sessions and five community outreach meetings. The committee also visited the Sunriver Resort and Eagle Crest Resort Wastewater Treatment Plants and staffed an information booth at the 2012 La Pine Frontier Days 4<sup>th</sup> of July Celebration. A list of people who presented information to the committee is included in the appendix. People can also access audio files of every meeting and find other reference materials at <http://www.southdeschutesnorthklamathgroundwater.com/documents>. More project information is also available at <http://www.deq.state.or.us/wq/onsite/sdesch-nklam.htm>.

After nearly three years of discussing nearly every facet of the problem and debating potential solutions, the group turned their focus to the recommendations. The committee finalized those recommendations in June 2013.

# Recommendations

## Goal 11 Exception (Unanimously Approved 1/9/13)

- Provide a Goal 11 exception for the at-risk areas in South Deschutes and North Klamath counties for the following reasons:
  - Lots were platted prior to statewide goals requiring 10 acre rural lots (in Deschutes County).  
South Deschutes County currently of 10271 non-sewer lots:
    - 6174 (60%) are 1 acre or less
    - 8737 (85%) are 2 acres or less
  - North Klamath County currently of 4181 lots
    - 2177 (52%) are 1 acre or less
    - 3140 (75%) are 2 acre or less
  - Provide better treatment opportunities than individual on site systems for the protection of groundwater, both in reducing nitrates and better treatment of other contaminants
- This exception will allow the extension of sewers into the area
- This exception will allow groups of citizens to implement public sewage treatment systems, such as cluster systems. These decentralized cluster systems would not require huge infrastructure expense
- These centralized systems will allow better treatment of contaminants beyond nitrates and better treatment than ATT onsite systems.
- This Goal 11 exception would not mandate a system be installed.

## Groundwater Monitoring (Unanimously Approved 3/5/13)

- Request that DEQ design a testing program to determine whether there is a groundwater contamination problem, and if so, where it might be located.
  - Tests first water
  - Start with highest risk sections (neighborhoods) identified by (existing well test data, density, well depth). See MonitorCriteria.xlsx for simple ranking.
  - Uses representative samples of the neighborhoods
  - Do 10% – 20% of neighborhoods each year
- If sample results from the first water test warrant it, increase the number of wells tested to possibly include additional first water wells and drinking water wells in the neighborhood. Alternatively, provide an on-demand targeted testing approach that tests source, receptor, and transport.
- What should be tested for?
  - Nitrates cheap test – 10 minute sample for nitrate testing only. Flush take sample.
  - Retest wells with highest nitrate detection levels for other contaminants (such as pharmaceuticals...)
- Monitoring managed by a sanitation authority with DEQ doing the monitoring until a sanitation authority is established.
- Use this monitoring program in addition to the real estate transaction data
- The DEQ should pursue all sustainable funding opportunities to support groundwater monitoring in the area.

### **Governance (Unanimously Approved 4/2/13)**

Form a Sanitation Authority to protect the groundwater in the affected area spanning South Deschutes and North Klamath counties.

- The Authority will manage groundwater monitoring.
- The Authority will help with neighborhood implementation of community waste water systems (allowed under the Goal 11 exception).
- The Authority can assist in establishing Local Improvement District (LID), a special district or similar entity to finance community waste water systems for areas within the Authority where they are necessary.
- Authority will explore financing options that may include: grants, loans and taxes
- Provide required maintenance and management for community waste water systems within the Authority
- Ensure individual systems are maintained (pumped and serviced as necessary)
- Manage the overall basin nitrate load and risk to groundwater
- Monitor performance based standards for alternative solutions (see green solutions)

### **Livestock (Unanimously Approved 1/9/13)**

- In Deschutes County (Klamath has an ordinance) institute an ordinance that limits the number of livestock per acre to reduce risk to groundwater contamination. For instance Klamath ordinance is: R2 zone allows two large animals (horse, etc.) and 24 small animals (chickens, etc. not dogs or cats) PER ACRE.
- Provide education about how best to manage livestock to reduce risk to groundwater
  - How to treat waste
  - How to dispose of deceased livestock

### **Point Sources (Unanimously Approved 1/9/13)**

- Point Sources (nurseries, golf courses)
  - Investigate establishing a permitting/groundwater monitoring program for all golf courses, nurseries and other point sources
- Commercial RV and Manufactured/mobile Home Parks.
  - Require equivalent treatment as residential (ensure equal regulations and treatment for residence and commercial).
  - Require a Water Pollution Control Facilities Permit for new and existing properties.

### **ATT Moratorium (Approved 7-1 on 6/4/13)**

- The moratorium will have an end date with specific community actions to include a Goal 11 exception, a monitoring program and a governance entity or substantial progress toward its creation must have been made. Five years seems reasonable. An extension might be necessary, based on progress made toward the above goals.
- When the Governance Entity is created, it will work with DEQ and the counties to determine what happens at the moratorium end date.

- During the moratorium, property owners that have to do a major repair have the option of installing an ATT or repairing or replacing existing systems without an upgrade. This is done with the understanding that if progress is not made toward program goals (listed above in paragraph 1), they will have to upgrade. The moratorium would extend to undeveloped lots that already have existing systems in place.
- The moratorium would apply to new development.

### **Disadvantaged Community Financing Solutions (Approved 7 - 1 on 6/4/13)**

- DEQ shall research how other states have established financial aid for sewage treatment solutions and propose an approach to use in Oregon.

### **Outreach and Community Education (Unanimously Approved 6/4/13)**

- With the delivery of these recommendations the Citizen Advisory Committee has completed our charter and will disband
- Prior to disbanding initial outreach materials will be developed
- To ensure ongoing community involvement with groundwater protection an outreach committee should be formed that will
  - Identify and outreach opportunities
  - Coordinate outreach delivery. Members from the current committee may be called on to participate in or lead the outreach events
  - Maintain and improve outreach materials
- This committee should be made up of people with marketing/outreach interest and experience, and should be a small team of no more than 5 people with support from DEQ and the counties.
- This committee should have access to enough funding to make outreach successful

### **Alternative “Green” Solutions (Unanimously Approved 6/4/13)**

Disposing of human waste is a worldwide problem. There are many innovating approaches being developed. People in the affected areas must be able to use new approaches to treat human effluent.

In order to use current and future new technologies the DEQ must develop performance standards for treatment and any system that provides the necessary performance level should be acceptable if effective safeguards are in place to ensure the new systems are properly used and maintained. With the advent of Oregon grey water permitting a composting toilet solution should be acceptable. To ensure the toilets are used effectively:

- Inspection of composting systems could be added to or included in current grey water permit language; an additional fee for that inspection of the composting component might need to be considered.
- Language and parameters for disposal of the composted material is already established.
- The cost of permits for composting toilets should remain affordable.

# Arguments

## Goal 11 Exception: Argument in Favor

All onsite systems discharge contaminants including nitrates. Chart 6.2 below shows the nitrate discharge from various systems tested during the La Pine National Demonstration Project.

The discharge and water soluble substances are pulled down by gravity until they meet the groundwater. Area precipitation also joins the groundwater. Because we have a low amount of precipitation in the area the effluent discharge doesn't get diluted like it does in wetter areas. As neighborhood lot sizes decrease the concentrations of discharge in the groundwater increases geometrically.

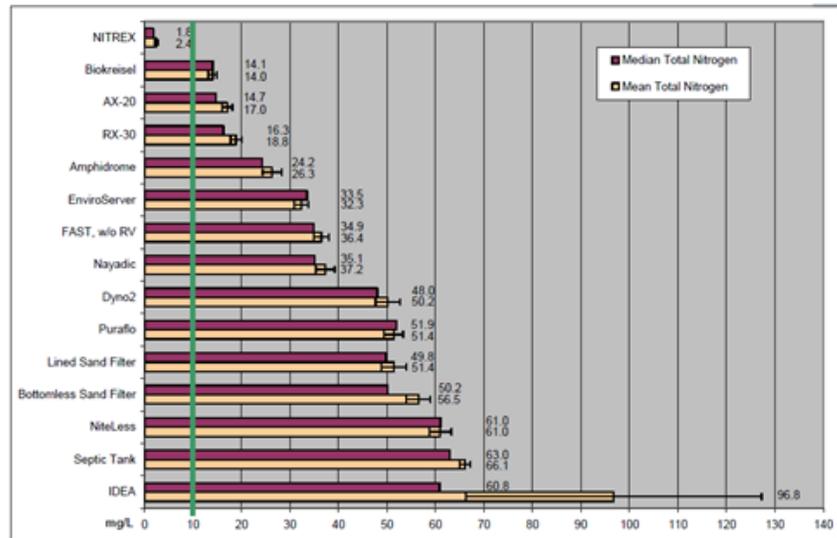
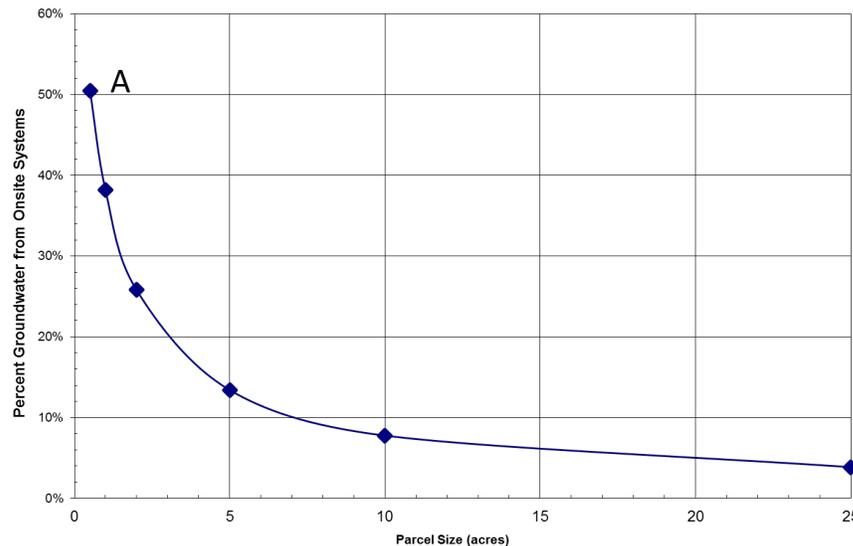


Figure 6-2. Rank, by Total Nitrogen, of all systems in the La Pine Project.

### Effect of Parcel Size on Effluent Concentrations in Groundwater –

the chart on the right shows that 1/2 acre lot neighborhoods (point A) will reach an equilibrium point where over 50% of the groundwater comes from onsite septic systems. The type of system installed doesn't affect this ratio, though it may reduce certain pollutants in the groundwater.

Effect of Parcel Size on Effluent Concentrations in Groundwater



Because many lots in the South Deschutes/North Klamath area were platted before Oregon's land use rules were in place the number of small lots in the area resemble a more urban configuration. The breakdown of lot sizes for each county in the area are:

South Deschutes County currently of 10271 non-sewer lots:

- 6174 (60%) are 1 acre or less
- 8737 (85%) are 2 acres or less

North Klamath County currently of 4181 lots

- 2177 (52%) are 1 acre or less
- 3140 (75%) are 2 acre or less

Based on these lot sizes 85% of Deschutes and 75% of Klamath county properties in the area are at risk of having groundwater that is comprised of at least 25% of partially treated sewage.

In addition there are a number of sewer systems in the area and some required a Goal 11 exception. These exceptions clearly indicate the onsite systems are not adequate in densely populated neighborhoods.

Clearly onsite systems are not an adequate approach to protect the groundwater and therefore we need a broadly defined Goal 11 exception for the area so protection of groundwater and drinking water is adequate.

Committee Member Comment on the Goal 11 Exception (John Blakinger): I think one of the key successes the committee had was bringing Department of Land Conservation and Development (DLCD), DEQ and Deschutes and Klamath counties together about the Goal 11 exception. We've come a long way toward a Goal 11 exception.

## **Groundwater Monitoring: Argument in Favor**

Having reliable data about groundwater contamination in the area is essential to deciding when and where additional treatment approaches must be installed.

The committee urged DEQ to conduct re-testing on about 51 sites throughout the region. Those results showed slight – though statistically significant – increases in groundwater contamination when compared to testing on the same sites conducted years earlier. However, that increase was not as great as previously predicted.

The real-estate transaction well test data may be a useful indicator of where a problem may be. One limitation of real estate transaction test data is that it is not designed to provide contamination levels of first water, which the committee wanted to protect. Instead of sampling first water, it sampled wells of various depths.

To get a more accurate picture of groundwater contamination in the area, a monitoring program must be implemented. Such a program would also support a phased approach chosen by the committee, and could help dictate where more or less treatment is needed.

## **Governance Entity: Argument in Favor**

A governance entity will manage and analyze the groundwater monitoring data. It would also help implement community wastewater treatment solutions. The entity could oversee maintenance of all systems and provide cost savings through economies of scale.

When it is determined an area must implement a special treatment solution the Governance entity could help with bridge financing.

The entity will have access to funding through long-term loans, grants and taxes. By pooling our money together we'll be able to assist those who have financial limitations, and spread the cost of treatment solutions over time.

Financing examples:

- Loan: For example, if a solution that costs \$15,000 per property where financed through a 2% 30 year loan, the payment for each property (not including operational costs) would be \$55.44 per month.
- Taxes: if a \$0.50 per \$1000 of assessed value (\$50/year for a \$100,000 property) were instituted it would bring in about \$600,000 per year for the area.

The governance entity will be managed by an elected board of residents so it will be under community control.

Committee Member Comment on Governance (David Crider): The public will have to decide if they want another governance entity governing our septic issues. The public may want to address septic issues by neighborhood and or subdivisions without the governance entity and the taxes that go with it. The solution is to start now working on a phase solution to groundwater protection and carry it forward.

## **ATT Moratorium: Argument in Favor**

What value does de-nitrification offer?

1. In some USGS reports nitrates are referred to as a tracer or indicator of septic effluent. Why would we want to reduce the indicator? Won't that give people a false sense of security when nitrate levels in drinking water is 2 mg/l instead of 5 mg/l - even though the percentage of well water coming from septic is unchanged (at 10 %)?
2. The health impact of nitrates is controversial. The blue baby syndrome concern that triggered the EPA nitrate standard set in 1951 has been widely discredited. There are some medical journal articles that suggest a health risk link, but the evidence is mixed. See appendix for links to nitrate health impact studies.
3. The impact to rivers in the area from high nitrates is questionable. Quoting from report, Scientific Investigations Report 2007–5239.

“Contributions of toxic ground water, and therefore, potential contributions of NO<sub>3</sub> - to rivers in the study area probably are limited primarily to areas where rivers bend toward the outside of the riparian environment. Thus, contributions of NO<sub>3</sub> - to rivers likely are restricted to relatively small areas of river reaches. However, the potential effects of such N loads to rivers might not be negligible because rivers can be highly sensitive to changes in nutrient fluxes (nutrient over-enrichment represents the single greatest source of impairment to rivers in the United States; U.S. Environmental Protection Agency, 1998).”

In dense neighborhoods ATT systems will not protect the groundwater even from nitrates (see Goal 11 argument above), therefore the ATT systems should not be installed in dense neighborhoods (less than 2 acre lots).

There are limited funds in the area so we should use them to solve the long-term problem. The moratorium would be for 5 years so the long-term solution: Goal 11 Exception, Groundwater Monitoring and Governance Entity can be put in place.

A moratorium would have wide support and demonstrate to the community that the government agencies are interested in long-term concerns and solutions. The moratorium will help generate community support for those long-term solutions.

Nitrate contamination is not an imminent threat to human health. While there is an increasing trend of contamination, it is progressing slower than predicted, which allows more time to address the problem over the long term.

## **ATT Moratorium: Argument in Favor**

The original ATT ordinance was an area-wide requirement largely put in place based on predictions of future contamination in the area.

In 2011 the committee initiated a retest of some of the wells measured in previous studies. A statistician reviewed the results of the 39 wells that were retested, and based on a t-test determined there is an increasing trend in the measured contaminant - Nitrate-Nitrogen (or Nitrate-N). This trend is below the rate that led to the ordinance. The retest was done about 16 years after the original samples, with an average increase in the contaminant of .17 (median) to .49 (mean) over that period.

In addition he reviewed the Real-estate transaction database to determine area-wide trends in contamination levels (based on Nitrate-Nitrogen (or Nitrate-N). Again he determined there was an increasing trend though not at the rate that led to the ordinance. The 10 year increase of the contaminant: Regression analysis .005 - .444 mg/liter, Sen Slope analysis .25 - .405 mg/liter.

This analysis demonstrates that the contamination is not increasing at the rate that was predicted before, and therefore we have time to implement an effective, long-term solution.

## **ATT Moratorium: Argument Against (David Crider)**

Public water systems have a set-back from septic systems. However, in Northern Klamath County along the river and wetlands, four public water systems well fields are being protected by the current ATT system requirement. An ATT moratorium would put those four system's shallow wells 70 feet deep at risk for unknown contamination! Those public water systems and an unknown number of private wells in the same area provide drinking water to 300 plus households. An ATT Moratorium is not protecting groundwater while someone else is going to try for a long-term solution.

## **Groundwater Monitoring Funding: Argument in Favor**

Monitoring is important, and it takes money. We believe money dedicated to increasing monitoring is well spent, and DEQ should pursue all options to secure funds for this purpose.

## **Livestock Ordinance: Argument in Favor**

Klamath County limits the number of livestock allowed per acre in an effort to reduce the risk of groundwater contamination. Deschutes County could benefit from a similar ordinance. The county could also provide education to people about how to treat livestock waste and dispose of animal carcasses.

## **Point Source Regulation and Monitoring: Argument in Favor**

DEQ should consider establishing a monitoring system for such sources as nurseries and golf courses. Both have the potential to contaminate groundwater, mainly through the application of fertilizers. In addition manufactured home and RV parks should also be monitored to ensure safe treatment of human sewage. The agency currently does not monitor such potential sources. A monitoring program could provide more information and lead to regulation in order to protect the groundwater from those sources.

## **Disadvantaged Community Financing Solutions: Argument in Favor**

Other states have recently approved language that directs state environmental agencies to more closely consider cost before requiring community solutions to environmental problems. As some parts of south Deschutes and north Klamath counties are economically challenged, DEQ should analyze the financial cost to homeowners before taking further action to address groundwater contamination. Some homeowners in the area are living on fixed monthly incomes and may not be able to afford the septic upgrades DEQ will require. This recommendation doesn't ask DEQ to do anything except look at how other states have approached these types of situations, and then to consider the financial means of the community before requiring solutions, while still protecting the groundwater.

## **Outreach and Community Education: Argument in Favor**

Community education is about more than these recommendations. It is about spreading better information about stewardship, including how we can make more informed decisions to protect our groundwater. It is also important for people to better understand the shallow groundwater that exists in most of the region. In particular, it is important to understand how susceptible the groundwater is to contamination, including from things like herbicides.

It is crucial that citizens have as much information as possible about groundwater contamination in South Deschutes and North Klamath counties. They need to be made aware of the problem and the various solutions being proposed. The committee made a big effort to educate the community about the issue, and that effort should continue even after the committee itself has disbanded. The issue of groundwater contamination is not going away any time soon, and the more people know about it the more likely it is that they will be committed to finding solutions.

## Green Solutions: Argument in Favor

Simple doesn't mean less effective. The use of composting toilets and greywater treatment can be an effective solution, and consideration for their use should not be so readily dismissed.

With the area of concern so broad this decentralized use should be embraced as it has been in Scandinavian countries since the 70's. A huge reduction in water in composting toilets as compared to conventional flush toilets would be a benefit.

Pharmaceuticals, including amoxicillin for example, are reduced in the composting process (see <http://www2.gtz.de/Dokumente/oe44/ecosan/en-degradation-of-amoxicillin-in-composting-toilet-2006.pdf>). Nitrate loading of streams and rivers that result in low oxygen issues would be negligible with the use of composting toilets.

Nitrate reduction is accomplished to a greater degree than the currently mandated ATT's. Where an ATT has issues on property used only as a vacation home, composting toilets do not have this problem; they continue to work when not in use.

A greywater septic system with a smaller requirement for its leach field is a viable solution for smaller lots in some of the area of concern.

# Appendix A

Nitrates impact are controversial, may even be healthful

<http://www.ncbi.nlm.nih.gov/pubmed/18268290>

Individual studies that suggest potential health risks:

Nitrate can help create carcinogenic N-nitroso compounds in obese men:

<http://www.ncbi.nlm.nih.gov/pubmed/22833653>

Nitrates plus vitamin pills = higher breast cancer rate:

<http://www.ncbi.nlm.nih.gov/pubmed/22642949>

Nitrates plus Viagra = hypotension and syncope:

<http://www.ncbi.nlm.nih.gov/pubmed/23140258>

Nitrates can cause subclinical hypothyroidism in women:

<http://www.ncbi.nlm.nih.gov/pubmed/22339761>

Nitrates can cause papillary and follicular thyroid cancer in older men:

<http://www.ncbi.nlm.nih.gov/pubmed/20824705>

Nitrate is a dietary risk in stomach cancer: <http://www.ncbi.nlm.nih.gov/pubmed/22844547>

Gastric cancer: <http://www.ncbi.nlm.nih.gov/pubmed/22757672>

Esophageal cancer: <http://www.ncbi.nlm.nih.gov/pubmed/22146401>

Colon cancer: <http://www.ncbi.nlm.nih.gov/pubmed/21976196>

# Appendix B

## Meeting Dates/Times

Steering Committee Work Session

6 p.m., June 19, 2013

Steering Committee Meeting

6 p.m., June 4, 2013

Steering Committee Meeting

6 p.m., May 7, 2013

Steering Committee Community Outreach

6:30 p.m., April 22, 2013

Steering Committee Meeting

6 p.m., April 2, 2013

Steering Committee Community Outreach

6:30 p.m., March 20, 2013

Steering Committee Meeting

6 p.m., March 5, 2013

Steering Committee Work Session

6 p.m., February 28, 2013

Steering Committee Meeting

6 p.m., February 5, 2013

Steering Committee Community Outreach

6 p.m., January 24, 2013

Steering Committee Meeting

6 p.m., January 9, 2013

Steering Committee Work Session

6 p.m., December 13, 2012

Steering Committee Meeting

6 p.m., December 4, 2012

Steering Committee Work Session

6 p.m., November 14, 2012

Steering Committee Meeting

6 p.m., November 6, 2012

South Deschutes/North Klamath Groundwater Protection Project Steering Committee

Steering Committee Community Outreach  
6:30 p.m., October 25, 2012

Steering Committee Meeting  
6 p.m., October 2, 2012

Steering Committee Community Outreach  
6 p.m., September 13, 2012

Steering Committee Meeting  
6 p.m., September Sept. 4, 2012

Steering Committee Work Session  
2 p.m., August 30, 2012

Steering Committee Work Session  
6 p.m., August 21, 2012

Steering Committee Work Session  
2 p.m., August 15, 2012

Steering Committee Meeting  
6 p.m., August 7, 2012

Steering Committee Meeting  
6 p.m., July 11, 2012

Steering Committee Meeting  
6 p.m., June 5, 2012

Steering Committee Meeting  
6 p.m., May 1, 2012

Steering Committee Meeting  
6 p.m., April 3, 2012

Steering Committee Meeting  
6 p.m., March 6, 2012

Steering Committee Meeting  
6 p.m., February 7, 2012

Steering Committee Meeting  
6 p.m., January 9, 2012

Steering Committee Meeting  
6 p.m., December 6, 2011

Steering Committee Meeting  
6 p.m., November 1, 2011

South Deschutes/North Klamath Groundwater Protection Project Steering Committee

Steering Committee Meeting  
6 p.m., October 4, 2011

Steering Committee Meeting  
6 p.m., September 13, 2011

Steering Committee Meeting  
6 p.m., August 2, 2011

Steering Committee Meeting  
6 p.m., July 14, 2011

Steering Committee Meeting  
6 p.m., June 15, 2011

Steering Committee Meeting  
6 p.m., May 3, 2011

Steering Committee Meeting  
6 p.m., April 5, 2011

Steering Committee Meeting  
6 p.m., March 1, 2011

Steering Committee Meeting  
6 p.m., February 1, 2011

Steering Committee Meeting  
6 p.m., January 4, 2011

Steering Committee Meeting  
6 p.m., December 7, 2010

Steering Committee Meeting  
6 p.m., November 9, 2010

Steering Committee Meeting  
6 p.m., September 9, 2010



**Steering committee Co-Chair John Blakinger engages the public at a community outreach session at Thousand Trails Community Club near Sun River on March 20, 2013**

# Appendix C

## List of Presenters

- 02-01-11 - Eric Moeggenberg, Oregon Dept. of Ag, Impacts of Livestock to Groundwater
- 03-01-11 - Rich Hill, DEQ Groundwater Hydrogeologist, La Pine Area Municipal Land Application
- 05-03-11 - Steve Hinkle, USGS - review of USGS Studies of the La Pine Area
- 06-15-11 - Jason Churchill, Orenco Systems, Nitrate & Statistics
- 09-13-11 - Brenda Hoppe, Oregon Health Authority, Nitrate & Private Well Water Safety
- 12-06-11 - Dan Harschbarger, N. Klamath Co. resident, Herbicide-picloram spray event
- 01-09-12 - Brent Nicholas, Oregon Dept. of Ag, Herbicide-picloram spray event
- 02-07-12 - Dale Mitchell, Oregon Dept. of Ag, PARC, Herbicide-picloram spray event
- 03-06-12 - Steve Wert, Individual & Cluster Onsite Wastewater System Technologies
- 03-06-12 - John Huddle, Statistics
- 05-15-12 – Laurie Craighead, Deschutes County District Attorneys Office, Sanitary Authorities and Districts
- 06-21-12 - Ken Jones, Attorney, Specializing In Special Districts in Oregon
- 07-11-12 - Jon Jinings, Dept. of Land Conservation & Development, Goal 11 Exception Criteria
- 08-07-12 - Ron Doughten, DEQ Graywater Reuse Coordinator, Graywater Reuse Requirements
- 11-06-12 - Morgan Brown, Whole Water Systems, Green Solutions to Wastewater Reuse
- 02-28-13 - Bill Cagle, Orenco Systems, Cluster Onsite Systems Technology, Design, Costs
- 02-28-13 - Melora Golden, Mathew Lippincott, Molly Danielsson, Oregon ReCode, Green Methods of Wastewater Disposal

# Appendix D

## Southern Deschutes County and Northern Klamath County Groundwater Protection Project Steering Committee Charter

The Oregon Department of Environmental Quality DEQ has the responsibility and authority for protecting all waters in the state, including groundwater. Through public awareness, outreach and establishment of committees DEQ seeks input and recommendations in these efforts.

For any collaborative process to operate smoothly, it is necessary for those involved to agree at the outset on the purpose for the process and on the procedures by which the group will govern its discussions, deliberations, and decision-making.

The members of the S. Deschutes/N. Klamath Groundwater Protection Project Steering Committee agree to operate under this Charter.

### I. Purpose

The purpose of the committee is to provide recommendations to the DEQ on how to best protect the groundwater and prevent groundwater contamination of surface waters in the area of South Deschutes and North Klamath Counties. These recommendations may impact areas beyond the boundaries of the USGS study described below.

The committee will be an advisory level forum for collaborative efforts related to development of a groundwater contamination reduction and protection plan. The participants are voluntarily working together to achieve a mutually acceptable outcome that satisfies, to the greatest degree possible, the interests of all citizens in the groundwater protection area. The committee will be responsible for all decisions and actions that are publicly identified as the committee's.

### II. Background

In some areas of Oregon, groundwater contamination comes from a combination of agricultural chemicals, animal waste and individual septic systems. Based on studies, the aquifers beneath the developed residential areas in both south Deschutes and north Klamath Counties are showing an increasing trend of nitrate contamination. The major source of contamination is from onsite septic systems.

In 1999 a groundwater work group, jointly formed by DEQ and Deschutes County, recommended taking action and creating an area-wide rule to address groundwater contamination concerns in the southern portion of the county. As a result of those recommendations as well as assistance from local, state and federal agencies and support from political leaders at all levels, DEQ and Deschutes County received federal funding from the United States Environmental Protection Agency EPA for the La Pine National Decentralized Wastewater Treatment Demonstration Project and a USGS groundwater study and modeling project.

Extensive field research and study shows that within the defined study area, the underlying groundwater of south Deschutes and north Klamath Counties is threatened by continued use and

placement of traditional onsite wastewater treatment systems (traditional meaning - standard, pressure distribution and sand filter systems).

The United States Geological Service USGS conducted a hydrological study that included portions of Deschutes and Klamath Counties within Townships, 19, 20, 21, 22, and 23, and Ranges 9, 10, and 11, see figure 1 on page 3. The primary objective of the study was to develop a thorough understanding of the hydrologic and chemical processes that affect the movement and fate of nitrogen within the shallow aquifers of the study area. A secondary objective was to provide a method for analyzing the effects of existing and future development on water quality. Discharge from onsite wastewater (septic) systems is considered a primary and significant source of anthropogenic nitrogen pollution to shallow groundwater in the study area.

The demonstration project showed that some new types of individual onsite wastewater systems that were specifically designed to enhance nitrate removal through de-nitrification can better protect groundwater. In addition, the possible extension of existing community sewer systems and the use of cluster onsite wastewater systems with the same proven de-nitrification capabilities are options to consider in protecting the shallow groundwater aquifers throughout the area.

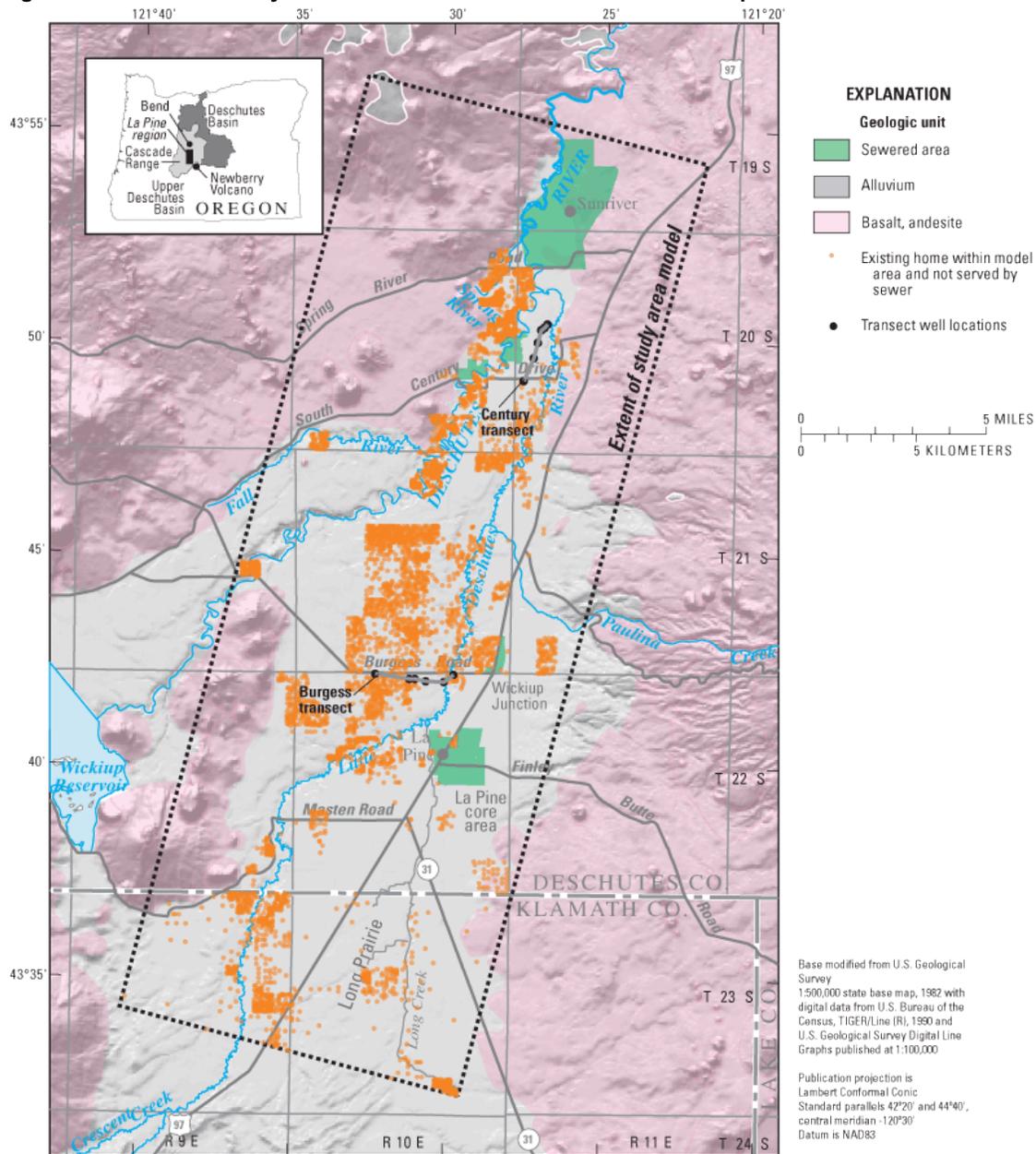
Some area aquifers have no natural protective barriers to the ground surface, are very vulnerable to contamination from surface activities, are interconnected, and have surface water (river) influences.

Generally water tables in the area are shallow, typically is less than 20 ft below land surface, and in some low-lying areas rises seasonally to within 2 ft of land surface. Sandy soils derived from pumice contain little organic matter and allow rapid infiltration of onsite wastewater effluent.<sup>1</sup> Groundwater in the shallow aquifer is becoming contaminated with nitrates and if left unchecked, will eventually reach unsafe levels. The EPA has set a maximum contaminant level for nitrate in drinking water to be 10 mg/l. An increasing trend of nitrate contamination can often indicate that other forms of domestic wastewater contaminants may be entering the groundwater. To protect the quality of drinking water in the local aquifers, Deschutes County Commissioners passed an ordinance in 2008 to require eventual upgrades on all septic systems. County voters overturned the ordinance in a special election in March 2009. As result, in July 2009 Deschutes County Commissioners asked DEQ to take the lead in the efforts to resolve the issue. DEQ hosted town hall meetings in February and May 2010 with citizens and agreed to assemble a steering committee of citizens representing the South Deschutes and North Klamath affected areas to meet with and provide recommendations to DEQ.

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<sup>1</sup> U.S. GEOLOGICAL SURVEY Scientific Investigations Report 2007–5237, <http://pubs.usgs.gov/sir/2007/5237/section2.html>

Figure 1. Location of study area and extent of the nitrate fate and transport model.



### III. Committee Charge

DEQ and the committee will assess information needs and agree on a process to move forward.

1. DEQ and the committee will focus on the following:

- a. How to keep all citizens in the affected area informed of the process
- b. What must we resolve before moving forward
- c. What new information do we need to move forward
- d. What options/solutions need to be considered
- e. Other areas as defined

DEQ and the committee can form subgroups and designate subgroup members as needed. At the direction of DEQ and the committee, subgroup members may develop draft products such as research briefs, planning documents and other items and make recommendations to DEQ and the committee. Subgroups will not make decisions on behalf of DEQ and the committee.

Scientific and technical input will be provided on an “as-needed” basis by DEQ staff, committee members, staff from other identified local, state, and federal agencies, consultants or other designated entities or experts as agreed upon by DEQ and the committee. To the extent DEQ or a committee member is relying on the expertise of scientific or technical staff, those scientific or technical staff must be made available for discussion with other members of the committee if requested or needed. These technical advisers will not make decisions on behalf of DEQ and the committee.

Alternate committee members (see Section X – Committee Membership) are invited to participate in discussions and all related matters. Alternates offer input but may not vote or concur on procedural or substantive decisions unless they are taking the place of an absent member. Alternate members must abide by the operating principles within this document. When a member is absent an attending alternate will be a fully voting member of the committee. The chair will select the alternate in a rotation.

2. The committee will produce a draft report that summarizes research, key discussions and recommendations. DEQ staff will draft the report in collaboration with the committee chair and the committee members will review it for completeness. Once finalized all members will be asked to sign the report.

#### **IV. Decision Making Process**

The committee will operate collaboratively. The committee will strive to reach the consent of all members, and may require voting to determine the positions of members. If the committee cannot agree within a reasonable amount of time, the final report will note the different perspectives on the issue or issues. DEQ is the final decision-maker in the process.

#### **V. Public Involvement**

All meetings will be open to the public. For the committee to function without interruption, public comments will be taken during specified times as noted on each meeting agenda. Additionally, citizens who wish to discuss proposals are encouraged to communicate directly with committee members or DEQ project staff.

#### **VI. Committee Meeting Schedule, Work Plan and Guidelines**

##### **1. Committee Meeting**

At least seven members must be present to make decisions.

Committee meetings will likely be evening meetings (6:00 pm to 9:00 pm) to assist with public outreach and involvement. Half-day meetings (9:00 am - noon or 1:30pm - 4:30pm) or an occasional all-day meeting (9:00 am-4:00 pm with a 1-hour lunch) may be necessary. All meetings will be held in the La Pine area unless an alternate location is identified by the committee. The duration of the committee is one year, but may be extended as necessary. Routine monthly meetings are currently scheduled for the first Tuesday of every month from Dec. 2010 to June 2011 at the Midstate Community Meeting Room located at 16755 Finley

Butte Road in La Pine. The meeting dates are December 7, January 4, February 1, March 1, April 5, and June 7. The meetings will be held in the evening with members arriving at 5:45 PM, the meeting starting at 6 PM and ending at 9 PM. Changes to the meeting schedule or location may occur as necessary.

## 2. Process Overview

- a. Meeting Materials: DEQ staff will prepare and make materials available to committee members through a web posting or mailing at least one week prior to each meeting. The committee chairperson will collaborate with DEQ staff on agenda development.
- b. Meeting Summaries: DEQ staff will prepare and post committee meeting notes and the audio recording on the DEQ website. Minutes will summarize significant issues raised during the discussion and committee recommendations.
- c. Public Records and Confidentiality: Committee records, such as formal documents, discussion drafts, meeting summaries, and exhibits are public records and will be posted with the committee record on DEQ's website. All committee communications are public record and will be disclosed if requested.
- d. Process Conclusion: The committee will submit a report and recommendations to DEQ. The report will include sections for individual views if agreement was not reached on a topic.

## 3. Ground Rules

All committee members commit to each of the following:

- a. Comply with Oregon ethics laws.
- b. Attend each meeting to ensure continuity throughout the process. If a committee member is absent for two consecutive meetings, he or she may be replaced by an alternate member.
- c. Review proposed or draft documents and reports in a timely manner (by a date agreed upon by the committee).
- d. Treat everyone and their opinions with respect.
- e. Engage in good faith discussions.
- f. Act in good faith in all aspects of the collaborative effort.
- g. Refrain from personal attacks or prejudiced statements against other committee members.
- h. Express consistent views and opinions in the committee and in other forums.
- i. Allow one person to speak at a time.
- j. Comment constructively and specifically on issues.
- k. Consult regularly with constituencies and provide their input.
- l. Stay focused on the specific charge as outlined in this charter.
- m. Will not represent one's personal or organization's views as views of the committee.
- n. Will not represent or misrepresent the views of any other member, group, or the committee as a whole.

#### 4. Information Exchange

Committee members will provide information as much in advance as possible of the meeting. The members will also share all relevant information with each other to the maximum extent possible. If a member believes the relevant information is proprietary in nature, the member will provide a general description of the information and the reason for not providing it.

### **VII. Communications and Media Coverage:**

Eric Nigg, DEQ's Eastern Region water quality manager, or Robert Baggett, the steering committee's assigned DEQ staff, will respond to media inquiries associated with the organization, structure, process, and charge of the committee. The chair or appointee of the committee will represent and speak for the committee to the media.

While free to communicate with the media and others, committee members recognize that the collaborative process is enhanced when they raise ideas and concerns at a formal committee meeting. Additionally, members recognize that the way in which positions are publicly represented may affect the ability of the committee to work together.

### **VIII. Process Support**

DEQ is responsible for providing staff support to the committee by providing background and technical information about the technologies available to protect groundwater, public health and the environment. DEQ will consult with other agencies and stakeholders, as needed, to support the committee. Some agencies and stakeholders may be asked to provide or present information to the committee.

### **IX. Committee Membership**

The committee will be comprised of 11 primary members and some alternate members. Alternate members attend meetings and are ready to step in if a primary member is absent or leaves the committee. Alternates will take turns filling in for absent committee members. If a primary member leaves the committee, the remaining primary members will select a replacement from the alternative members. If a tie vote occurs DEQ will make the final selection.

Any member may withdraw from the committee at any time after discussing the withdrawal with the DEQ project staff and committee chair. Any member that withdraws from the committee shall remain bound by the good faith and other provisions of these operating principles.

Present and future committee members will be appointed by DEQ Deputy Director Joni Hammond.

The initial appointment of committee members is for one year. Towards the end of the year, with consultation of the committee, DEQ will consider extending member appointments, rotating alternate members into the committee, and/or seeking some new applicants for the committee.

The committee will be chaired by John Blakinger, and co-chaired by Robert Ray as approved by the DEQ Deputy Director Joni Hammond.

The chair will be responsible for:

- Facilitating meetings;
- Working with DEQ staff to set the agenda
- Keeping members focused on the issues and objectives;
- Ensuring that all members adhere to the process and ground rules;
- Representing the committee to the media.

Primary committee members: John Blakinger; David Crider; Judy Forsythe; Bill Gaetano; Aileen Harmon; Gary Mose; Marietta Qual; Robert Ray; Conrad Ruel; Leon Shields; Lee Wilkins

Alternate committee members: Allen Hammermann; Ray McKinley; Sunni Rounds

Agency-technical advisors: TBA

DEQ project staff:

Linda Hayes-Gorman, Eastern Region Administrator, (541) 633-2018

Eric Nigg, Eastern Region Water Quality Program Manager, (541) 633-2035

Robert Baggett, Natural Resource Specialist 4 and SD/NK GWPP Coordinator (541) 633-2036

Greg Svelund, Eastern Region Communication and Outreach Rep. (541) 633-2008

By my signature I agree to the conditions stated within this charter and any future amendments agreed to by the committee and DEQ.

John Blakinger, David Crider, Judy Forsythe, Bill Gaetano, Aileen Harmon, Gary Mose, Marietta Qual, Robert Ray, Conrad Ruel, Leon Shields, Lee Wilkins, Allen Hammermann, Ray McKinley, Sunni Rounds.



A member of the public addresses the audience at a community outreach session at Thousand Trails Community Club near Sun River on March 20, 2013

# Appendix E

**DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**SOUTH DESCHUTES COUNTY AND NORTH KLAMATH COUNTY**  
**GROUNDWATER PROTECTION PROJECT STEERING COMMITTEE**

STATEMENT OF ETHICS

To serve the public interest with compassion for the welfare of all people in the affected areas, it is our obligation to act with integrity. To that end, we will perform our work without bias.

- We shall avoid a conflict of interest or even the appearance of a conflict of interest in our deliberations.
- We recognize that poor behavior on the part of any committee member can cloud public opinion of this committee's work.
- We will actively listen to the community concerns and endeavor to deal even-handedly to ensure that recommendations are relevant to solutions of community problems.
- We shall have special concern for the long range consequences of this committee's recommendations and we shall pay special attention to the inter-relatedness of the issues.
- We shall not deliberately or with reckless indifference fail to provide adequate, timely, clear and accurate information.

# Appendix F

## Acknowledgements

Thank you to the entities that assisted the steering committee process by allowing use and public access to their facilities:

Midstate Electric, Community Meeting Room, 16755 Finley Butte Road, La Pine, OR  
- 32 Committee Regular Meetings & 5 Committee Work Sessions

La Pine Senior Activity Center, 16450 Victory Way, La Pine, OR 97739  
- Two Public Hearings & 3 Public Information Meetings

Crescent Community Club Building, Crescent Cut-Off Road, Crescent, OR  
- A Community Outreach Meeting

Deschutes River Recreation Homesites (DRRH) Clubhouse, 17200 Milky Way  
- A Community Outreach Meeting

Living Water of La Pine Church, 52410 Primrose Lane, La Pine, OR  
- A Community Outreach Meeting

Thousand Trails Clubhouse, 17480 S. Century Drive, Bend, OR 97707  
- A Community Outreach Meeting

High Lakes Christian Church, 52620 Day Rd., La Pine, OR 97739  
- A Community Outreach Meeting

Special Thanks To:

All Final Steering Committee Members: John Blakinger, Co-Chair, Robert Ray, Co-Chair, David Crider, Bill Gaetano, Allen Hammerman, Lola Nelson, Marrietta Qual, Conrad Ruel, Lee Wilkins,

Other Steering Committee Members: Judy Forsythe, Aileen Harmon, Ray McKinely, Gary Mose, Leon Shields

Shelley Miesen, Executive Assistant, Midstate Electric Cooperative

Tim Berg, GIS Specialist, Deschutes County Community Development

Bill Scally and Ed Criss, KITC FM 106.5

The Newberry Eagle, Central Oregon Nickel Ads and The FrontierAdvertiser