

**Draft Addendum to the 2006  
Southern Willamette Valley  
Groundwater Management Area Action Plan**

## **Introduction**

The Southern Willamette Valley Groundwater Management Area (GWMA) is the result of many years of studies and analyses of the shallow groundwater in the lowlands of the Southern Willamette Valley. The GWMA has officially existed since May, 2004 when it was declared a GWMA by the Department of Environmental Quality (DEQ). Since that time, the stakeholder based GWMA Committee, supported by an extensive list of state, federal, and local agencies, have focused efforts on the development of and realization of an Action Plan aimed at restoring the area's groundwater quality. The Action Plan was completed by the GWMA Committee and approved by the DEQ in December of 2006. Many activities and support information have arisen since the approval of the Action Plan. Original Goals and strategies in the Action Plan have been implemented or in some cases are no longer viable. This addendum serves as an update to the 2006 Action Plan documenting activities that have occurred in the GWMA that may influence future direction and decision making.

### **Addendum Items Related to Action Plan Chapter 1:**

#### **Introduction and Background**

### **Action Plan 2010 Evaluation (Appendix 1)**

Incorporated into the Action Plan are a number of actions and measures aimed at evaluating progress on the Action Plan. With the help of partner agencies, LCOG conducted a thorough review and evaluation of the Action Plan in 2010. The evaluation summarizes the progress that had (and had not) been made on the Action Plan's Strategies, Actions and Measures of Implementation. Progress in the evaluation is quantified generally on a "measure of implementation" level. These "ratings" are based on progress reporting provided by GWMA partners.

Action Plan reporting revealed progress in each of the four focus areas (Agriculture, Residential, Commercial/Industrial/Municipal and Public Water Systems). Although the high-level progress ratings for strategies and focus areas do not assume to be a fully comprehensive conclusion of progress, they do provide a good sense for which focus areas and strategies may require added attention or scrutiny.

### **Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis (Appendix 2)**

At part of the evaluation of the Groundwater Management Area (GWMA) Program and Action Plan in 2011, Lane Council of Governments conducted a strengths, weaknesses, opportunities and strengths (SWOT) analysis with the GWMA Committee and staff. The SWOT evaluation is broad, looking for factors that do and/or will impact program and Action Plan implementation. The overall goal was to have better success reducing nitrate levels by examining the internal and external factors related to the GWMA Program and Action Plan.

The basic questions asked during the SWOT session to achieve the goal included:

1. What types of things have worked well and why?

2. What types of things have not worked well and why?
3. What should the GWMA Program's future direction and focus be? What should be changed?

### **Nitrogen/Nitrate Budget (Appendix 3)**

To better address high nitrate values, the GWMA needed a comprehensive picture of nitrate sources and quantities. The Nitrogen/Nitrate Budget Report (LCOG, 2008) describes the development of a nitrogen/nitrate budget for the GWMA. It provides a view of the region's history, status, and projected impacts from land uses on groundwater nitrate concentrations. The nitrogen budget is a planning tool that is based on the estimation of gross nitrogen contributions from four land uses throughout the GWMA. After establishing loading values, the project assessed the application of land use changes to reduce nitrate contamination. This budget also examines soil features that influence nitrate contamination risk, such as permeability and denitrification potential. Estimating potential changes of nitrate loading under various land use practices combined with soil features provides a better understanding of where nitrogen reduction efforts will be best focused to lead to lower nitrate levels. The purpose of the project included:

- Provide a tool for assessing nitrogen/nitrate contributions in the GWMA.
- Identify and quantify how much nitrogen specific land uses are contributing and an estimation of how much nitrogen reduction can be expected as strategies from the GWMA Action Plan are implemented.
- Facilitate sound decision-making that results in policy adoption and geographically prioritized strategy development and implementation to reduce nitrate contributions.
- Preserve and enhance the health of the aquifer while maintaining traditional and/or locally appropriate land uses. Emphasis is on the development of specific voluntary strategies that avoid leaching nitrate to groundwater.

### **Rural Residential and Agricultural Focus Groups (Appendix 4)**

In 2013 and early 2014 the GWMA Team organized and met with two focus groups – Rural Residential and Agricultural. A series of questions and focus group input achieved the purposes of each group.

The purpose of the Residential Group was two-fold 1) explore barriers to residents having their well water tested; and 2) probe barriers to residents taking action to protect groundwater. Key concepts that arose from the focus group discussion that have implications for future social marketing purposes include:

- Barriers to well water testing;
- Barriers to taking action to protect groundwater;
- Potential marketing messages; and

- Potential media outlets;

The purpose of the agriculture focus group was to 1) Understand growers perceptions of groundwater, and 2) Probe barriers to farmers taking action to protect groundwater. Key concepts that arose from the discussion that have implications for future outreach purposes include:

- Perceptions and barriers that influence marketing approaches;
- Potential marketing messages and strategies
- Potential messaging outlets, events, and partner agencies

### **Social Marketing Approach in the Southern Willamette GWMA (Appendix 5)**

Using social marketing techniques allows the GWMA partnership to refine, expand, and explore new marketing techniques that have a greater likelihood of resulting in people changing behavior. The social marketing approach is primarily guided by the results of the two focus groups (agriculture and rural residential). Outreach methods are further supported by a combination of staff professional judgment, social and scientific research, the 2010 GWMA Evaluation, and the results of a strengths, weaknesses, opportunities, and threats (SWOT) analysis. The Social Marketing Approach Report covers an overview of the two focus group results and the resulting outreach tools.

### **Groundwater Quality Studies and Results Update (Appendix 6)**

DEQ, EPA and other organizations have conducted various monitoring programs, including nitrate and pesticide testing, and analyses for stable oxygen and hydrogen isotopes. Quarterly groundwater monitoring occurred from 2006 until 2014 before making changes to the long-term monitoring strategy. Overall, nitrate levels in the GWMA are not rapidly decreasing; and, in general, are not increasing. The final monitoring strategy, and the rationale behind it, is presented in Section 4: Long Term Groundwater Monitoring.

### **Partnership to Improve Nutrient Efficiency (PINE) Project (Appendix 7)**

This project (formally referred to as the RARE Project) is jointly funded and works with collaborators from EPA, Benton, Linn and the Upper Willamette Soil & Water Conservation Districts, ODEQ, ODA, NRCS, Lane Council of Governments, and the Willamette Partnership. The project assesses the effectiveness of current fertilizer management practices in the GWMA for reducing nitrate-N contamination of groundwater. The over-arching goal is to quantify nitrate leaching to groundwater and to provide a tool that will help farmers, managers and conservation groups quantify the water quality benefits of farming. Information will be used to set priorities and inform water quality trading.

PINE project objectives include:

1. Building stakeholder involvement and outreach
2. Determining the effectiveness of current farming practices and emerging technologies in reducing nitrate leaching;
3. Calibrating and validating the USDA's Agriculture Policy/Environmental Extender (APEX) model and associated Nutrient Tracking Tool for the southern Willamette Valley; and

#### 4. Applying the verified the APEX model to GWMA stakeholder questions.

The work also involves isotope source water tracking, farmer interviews, lysimeter and groundwater well monitoring and pre and post-harvest soil sampling. The field aspects of this work use over 50 lysimeters on 15 farm fields working with 10 land owners in Benton, Linn and Lane Counties to test field nitrate-N losses below the crop rooting zone. This work is able to utilize some still functioning lysimeters from a study conducted in Lane County, in the 1990's by OSU researchers.

### **Addendum Items Related to Chapter 3: Sources and Solutions (Appendix #8)**

GWMA Committee members and other interested parties divided areas of attention into four categories (Agriculture, Residential, Commercial, Industrial, and Municipal, Public Water Supplies). These four sections of Chapter 3 in the Action Plan have been modified in the following way:

#### **Agriculture**

The Agriculture section of Chapter 3 was fully updated in 2012. ODA staff coordinated with a working group of Committee members and staff from the Soil and Water Conservation Districts, Natural Resource Conservation Service, and OSU Extension. This group reviewed and revised the background information, goals, strategies, and actions in the Agricultural section of the 2006 Action Plan. Several presentations were made to and the revisions were approved by the GWMA Committee. In 2015, ODA also provided a "progress" report on activities associated with Action Plan implementation.

#### **Residential**

Education and outreach continue to be the primary methods used to increase residents' awareness of the importance of the groundwater resource and to provide information to help prevent contamination in higher risk areas. There are many activities detailed in the 2006 Action Plan that have been very advantageous to the GWMA. These actions should continue as long as funding is available, as they have been a reliable means of serving the GWMA public.

In addition to those actions other strategies are recommended as Priorities for 2015-2020 in the Residential Update. Staff and select GWMA Committee members reviewed the goals and strategies of the Residential section of the Action Plan and identified priority strategies for the 2015-2020 time frame.

#### **Commercial, Industrial, and Municipal**

The past 10 years has seen the completion of several significant strategies that were described in the Commercial, Industrial and Municipal Section of the Action Plan. In addition, the passage of time has also heightened awareness of issues that still need to be addressed. Staff and select

GWMA Committee members reviewed the goals and strategies of the Commercial, Industrial, and Municipal section of the Action Plan. The group eliminated strategies that have already been accomplished or are no longer viable and identified priority strategies for the 2015-2020 time frame.

### **Public Water Supplies**

Staff from Oregon Health Authority (OHA), DEQ, and LCOG reviewed and recommended revisions to the Public Water Supplies section of Chapter 3 in 2015. The staff group eliminated strategies in the Action Plan that have already been accomplished or that are no longer viable. Staff also prioritized activities related to protecting public water supplies. Focus included those strategies considered to be the most important and doable within a five-year time horizon.

## **Addendum Items Related to Chapter 4: Implementation: Measuring Success through Performance Indicators and Groundwater Monitoring**

### **Long-Term Groundwater Monitoring Program (Appendix 9)**

In 2006, DEQ installed 26 small diameter monitoring wells and gained permission from 17 landowners to allow DEQ to monitor their domestic wells. The majority of these wells were sampled 4 times a year. Depth to groundwater measurements were gathered (monitoring wells only) and all wells were tested for: pH; specific conductance; dissolve oxygen; temperature; nitrate; and twice a year, sulfate. Occasionally, other parameters were included in the sampling program. In 2012, EPA started testing these water samples for stable isotopes.

After more than 9 years of routine monitoring, the GWMA Committee accepted a modified monitoring approach that included: 25 wells monitored quarterly; 9 wells semiannually and 5 wells tested annually. Twenty-four of these wells will comprise the Long-Term Monitoring Network that will be used to gauge future changes in water quality. The 2014 Groundwater Nitrate Evaluation found the following nitrate concentration trends for the 24 wells in the Long Term Monitoring Network: increasing for 9 wells; decreasing for 10 wells; and remained steady for 5 wells.

### **Measuring Success and Rescinding the GWMA Through Performance Indicators (Appendix 10)**

Oregon law is vague on how a GWMA is rescinded. One approach would be to look at the process used when this GWMA was declared (briefly discussed in Chapter 2 of the Action Plan) to infer that a similar process would be applicable for the repeal. Any process for rescinding a GWMA should address nitrate contamination in both regional groundwater quality and public/private well water quality. It must also recognize that once groundwater is contaminated, remediation takes a long time. Both quantitative and qualitative performance indicators can assist in determining whether groundwater quality is improving or not.

## **Appendix 1**

### **2010 Evaluation of the Action Plan**

## ***Evaluation Introduction and Summary***

### **Introduction**

The Southern Willamette Valley Groundwater Management Area (GWMA) is the result of many years of studies and analyses of the shallow groundwater in the lowlands of the Southern Willamette Valley. The GWMA has officially existed since May, 2004 when it was declared a GWMA by the Department of Environmental Quality (DEQ). Since that time the stakeholder based GWMA Committee supported by Oregon DEQ, Department of Agriculture, Oregon State University and Extension Service, Department of Human Services along with local government agencies have focused efforts on the development of and realization of an Action Plan aimed at restoring the area's groundwater quality. The Action Plan was completed by the GWMA Committee and approved by the DEQ in December of 2006.

Incorporated into the Action Plan are a number of actions and measures aimed at evaluating progress on the Action Plan. It is now April 2010, over three years since the Action Plan was enacted. This evaluation summarizes the progress that has (and has not) been made on the Action Plan's Strategies, Actions and Measures of Implementation. Information in this evaluation is presented in order of increasing specificity and detail with high level summary tables included at the beginning and more specific reporting included towards the end. Progress in this evaluation is quantified generally on a "measure of implementation" level. These "ratings" are provided by LCOG staff and are based on progress reporting provided by GWMA partner agencies (which are contained in full in Attachment A).

To aid interpretation, ratings are summarized at a strategy level in Tables 1 thru 4. Each measure of implementation was given a 0-5 rating in terms of how much has been accomplished towards reaching each measure. Each individual measure of implementation rating is presented by focus area in Tables 5 thru 8. The measure of implementation rating score also takes into account the activities leading to that measure. Tables 9 thru 12 contain a more comprehensive focus area summary including strategies, actions, measure of implementation ratings and a summary of agency activities. It is important to note that the strategy level rating is based on the sum total of the ratings of each measure of implementation. Some strategies have one measure while others have up to five. Therefore overall strategy ratings are reported as fractions as well as percentages in Tables 1 thru 4. As an example of this, Strategy 1.1 of the Agriculture focus area contains four measures of implementation in the Action Plan, which were rated as 5/5, 5/5, 4/5, and 4/5 for a total of 18/20 or 90%. No weighting was attempted to reflect the relative "importance" of any measure, action or strategy. Finally, Table 13 presents the measures of implementation summarized by theme. Themes selected by staff include Funding, Tracking/Monitoring, Coordination, Instructional, Information Sharing, Policy and Research & Development. This is done to emphasize distinctions in progress from these "themed" perspectives.

### **Summary**

Action Plan reporting reveals progress in each of the four focus areas (Agriculture, Residential, Commercial/Industrial/Municipal and Public Water Systems). Although the high-level progress ratings for strategies and focus areas do not assume to be a fully comprehensive conclusion of progress, they do provide a good sense for which focus areas and strategies may require added attention or scrutiny. Progress, as measured by total reported ratings divided by total possible ratings for measures of implementation, is most significant in the focus area of Agriculture (65%), followed by Commercial/Industrial/Municipal (45%), Residential (43%), and finally Public Water Systems (36%). However, another way to look at progress is by simply examining total of implementation measure ratings for each group. Using this type of measurement we find the most significant progress in the area of Agriculture (101 points), followed by Public Water Systems (89 points), Residential (67 points), and Commercial/Industrial/Municipal (65 points).

Table 13 suggests the greatest activity being reported within the themes of Tracking & Monitoring, Coordination, Instruction, and Research & Development. Much of this can be attributed due to significant progress in the form of workshops, articles and other forms of outreach, particularly in the Agriculture focus area. Several areas that showed less significant progress were Funding, Information Sharing and Policy. These patterns can be understood more specifically by referencing the more thorough Tables 9-12.

An important question that could guide response to this evaluation is whether certain actions which have seen no progress should be removed. Some agency comments suggested that certain actions were less realistic. For example, sending out GWMA materials with utility bills may not be practical because utilities often use an independent tri-fold letter or post card or the fact that certain Tax Credits identified in actions are not realistic in this economy. Another important question is how much of the progress reflected in this evaluation is the result of "business as usual" for many partner agencies? More specifically, how much activity is being independently generated and motivated through the strategies and actions identified in the Action Plan? And perhaps more importantly do we know if people are changing behaviors to address GWMA issues?

Further effort will be taken by GWMA staff and committee members to analyze this progress and identify priority areas/themes for future focus.

**Table 1. Agriculture --Strategies Overall Scoring**

Strategies	Total Score	%
1.1 Coordinate agricultural surface water and groundwater pollution control efforts	18/20	90%
2.1 Write and publish articles	4/5	80%
2.2 Share information and coordinate with agribusiness, producers, and producer groups	13/15	87%
2.3 Organize and deliver workshops and demonstration projects	20/25	90%
2.4 Hold workshops to educate producers about federal assistance programs	8/15	53%
3.1 Develop a groundwater monitoring plan for agricultural areas	21/25	84%
3.2 Document groundwater-related violations	3/5	60%
4.1 Research and document BMP effectiveness	4/15	27%
4.2 Measure the Success of BMP Implementation efforts	0/10	0%
5.1 Obtain sufficient funding to support priority research needs	4/10	40%
5.2 Obtain sufficient financial assistance	6/10	60%
<b>TOTAL</b>	<b>101/155</b>	<b>65%</b>

**Table 2. Residential Measures --Strategies Overall Scoring**

Strategies	Total Score	%
1.1 Launch public information campaign	6/10	60%
1.2 Offer new groundwater education programs focusing on GWMA communities	12/15	80%
1.3 Extend K-12 groundwater education and outreach	7/20	35%
1.4 Provide groundwater-friendly lawn and garden information	9/20	45%
2.1 Establish volunteer well monitoring network	8/10	80%
2.2 Establish a site-visit program	2/10	20%
3.1 Offer educational services to interested local governing bodies	3/5	60%
3.2 Develop list of possible planning strategies for interested local governing bodies	8/15	53%
4.1 Ensure that site-suitable wastewater treatment technologies can be used to reduce nitrate	3/10	30%
4.2 Provide financial incentives to encourage use of nitrate reducing technologies	7/15	47%
5.1 Inform residents of the risk of nitrate reaching groundwater via problem wells and assist in resolving any issues	2/15	13%
5.2 Provide assistance to help well owners overcome financial barriers	0/10	0%
<b>TOTAL</b>	<b>67/155</b>	<b>43%</b>

**Table 3. Commercial/Industrial/Municipal --Strategies Overall Scoring**

Strategies	Total Score	%
1.1 DEQ-regulated point sources should not be permitted to exceed 7.0 mg/L nitrate at the point of compliance.	7/10	70%
1.2 Promotion of alternate treatment technologies for sewerage and land applications	4/10	40%
2.1 Mechanisms for reducing future groundwater impacts from new commercial, industrial or municipal developments with large onsite systems planned to be built in "high-risk" areas	5/10	50%
2.2 Support for the City of Coburg to centralize wastewater treatment.	4/5	80%
3.1 Write and publish articles and brochures	6/15	40%
3.2 Utilize existing forums and create new opportunities to discuss the GWMA and present information on successful approaches	6/10	60%
3.3 Provide technical assistance opportunities and coordinate with targeted and interested organizations and property owners.	9/15	60%
3.4 Recognize those commercial, industrial or municipal entities that set a good precedent	0/15	0%
4.1 Gather accurate baseline groundwater data	12/15	80%
4.2 Monitor and evaluate groundwater improvements	9/15	60%
5.1 Research and document wastewater treatment technologies	0/10	0%
6.1 Document and evaluate funding options to support priority research and resource needs. Incorporate the scientific literature review in the process to prioritize research needs	3/15	20%
<b>TOTAL</b>	<b>65/145</b>	<b>45%</b>

**Table 4. Public Water Systems --Strategies Overall Scoring**

Strategies	Total Score	%
1.1 Notify local emergency response planners of the locations of the Drinking Water Source Areas	5/10	50%
1.2 Distribute materials through local planning departments, with permit applications, and at public works offices	4/10	40%
1.3 Erect signs along major roadways	0/15	0%
1.4 Mail a booklet on proper septic system care, maintenance, and inspection to rural residents	2/10	20%
1.5 Mail letters on recipients location within the Groundwater Management Area	0/5	0%
2.1 Document all available funding sources to address drinking water protection issues	5/10	50%
2.2 Explore the possibility of holding region-wide free household hazardous waste collection events	6/10	60%
2.3 Institute tax credits for pollution control technologies and alternative treatment septic systems	0/10	0%
3.1 Develop a format for utility bills to show water conservation equals costs savings	2/5	40%
3.2 Provide access to water-saving products	0/10	0%
4.1 Establish a region-wide annual awards program	0/10	0%
4.2 Explore the possibility of extending an auto shop certification program into the Southern Willamette Valley	0/10	0%

**Table 4. Public Water Systems -- (Continued)**

Strategies	Total Score	%
5.1 Form and coordinate a multi-jurisdiction Pollution Prevention team for the Southern Willamette Valley	5/10	50%
5.2 Provide technical assistance and training opportunities to water systems, local government officials, and planning staff	5/10	50%
5.3 Partner with agricultural organizations to offer on-farm assessments	8/10	80%
5.4 Establish a business mentoring program	4/10	40%
6.1 Work to establish drinking water protection overlays in the 5-year Time-of-Travel zones in the GWMA	4/10	40%
6.2 Provide information to staff and local officials about model ordinances	5/10	50%
6.3 Request county and city planning departments notify water system operators of all proposed development actions in the 5-year time-of-travel zones	6/10	60%
7.1 Help the WRD to prioritize enforcement efforts regarding temporary and permanent well abandonment	3/10	30%
7.2 Alert DEQ to the presence of confirmed leaking underground storage tanks (USTs) and USTs of unknown status	10/15	67%
7.3 Notify DOGAMI of the sand and gravel mining operations within Drinking Water Source Areas	4/10	40%
7.4 Provide ODA with a map of the CAFO's drinking water source areas	7/10	70%
7.5 Request that DEQ make the GWMA a priority area	4/10	40%
<b>TOTAL</b>	<b>89/240</b>	<b>36%</b>

**Table 5. Agriculture Measures of Implementation Completeness Scoring**

Measures of Implementation	Completeness Score (5 = completed, 0 = nothing done)
1) SWCDs contacted about revising Scopes of Work (1 year)	5
2) SWCD Scopes of Work revised (2 years)	5
7) Establish systems for tracking groundwater quality contacts (1 year)	5
21) Monitoring plan implemented and results presented every two years (3+ years)	5
17) Agreement reached on baseline data collection protocol (1 year)	5
18) Data collection begins to gather baseline data (1 years)	4.5
3) Develop groundwater quality items for the Water Quality Management Area Plans (1 year)	4
4) Include groundwater quality items during Water Quality Management Area Plans review (2 years)	4
5) Articles written and published (1+ years)	4
6) Meeting with agribusiness field representatives (1 year)	4
8) Track groundwater quality contacts (2+ years)	4
9) Demonstration projects designed (1 year)	4
10) Demonstration projects implemented (2+ years)	4
11) Tours offered (2+ years)	4
12) Workshops offered (2+ years)	4
23) Create a priority list of ideas to research (1 year)	4
28) Create a priority list of ideas to research (1 year)	4
15) Hold workshops (2+ years)	4
13) Track attendance at tours and workshops (2+ years)	4
14) Design workshops (1 year)	3.5
19) Data compiled into report and updated annually (2+ years)	3
20) Long-term monitoring plan developed (2 years)	3
30) Develop baseline understanding of current funding to assist producers in the GWMA (2 years)	3
31) Track changes in funding amount and allocation (2+ years)	3
22) Track the number of groundwater violations (1+ years)	3
25) Summary of research findings produced (5+ years)	1
16) Track producers and number acres enrolled in conservation programs (2+ years)	0
24) Create a research plan (2 years)	0
26) Design mechanism to develop baseline of BMP awareness (2 years)	0
27) Repeat measurement of BMP awareness and report on findings (5+ years)	0
29) Grant applications prepared and submitted (1+ years)	0

**Table 6. Residential Measures of Implementation Completeness Scoring**

Measures of Implementation	Completeness Score (5 = completed, 0 = nothing done)
3) Three well and septic classes per year, serving approximately 100 Residents (ongoing)	5
4) Outreach at five or more events per year within GWMA counties (ongoing)	4
10) Offer "Water-Friendly Gardening" training to Master Gardeners (annually)	4
14) Establish volunteer monitoring network of at least 50 residential wells (June 2007)	4
15) 50% of volunteer monitors have discussed groundwater issues with at least three other households (June 2007)	4
1) Average of six contacts/year per GWMA household via newsletters, press releases, displays and posters, etc. (June 2007)	3
5) Partnerships formed with Realtors and health care providers for dissemination of groundwater information (3 years)	3
6) Contact every school in GWMA; teachers from at least three schools will integrate groundwater activities in curriculum (June 2007)	3
7) Event participation by students and parents from GWMA schools with drinking water protection plans (June 2007)	3
11) At least one demonstration garden (3 years)	3
18) Interested local governing bodies have received requested information (1 year)	3
19) Planning kit available for review (within 1 year following funding)	3
22) Technical team has made recommendations to DEQ regarding rule changes (within 2 years of Action Plan approval)	3
25) Research and report on tax credit viability completed (3 years)	3
2) Awareness of nitrate issue by 80% of GWMA residents aware of nitrate issues as indicated by random survey (Spring 2009)	2.5
8) K-12 students involved in at least three GWMA projects (June 2007)	2.5
20) Interested users report that they were adequately involved (6 months after planning kit developed)	2.5
21) Interested users received necessary information (2 years after planning kit developed)	2
24) State Revolving Loan Funds available for septic improvements (1.5 years)	2
26) At least one septic system in each GWMA county has benefited from incentives (2 years)	2
27) 50 landowners with problem wells are identified and have received Well Action Packet (June 2007)	2
16) Partners and funds in place to develop program (1 year)	1
17) Site visits conducted at 250 GWMA residents (3 years)	1
9) At least one issue of GWMA Teachers' Newsletter available (June 2007)	0
12) All retail garden businesses in GWMA contacted (1 year)	0
13) 80% of all retail garden businesses participating in project (3 years)	0
23) If deemed necessary, Geographic Rule for GWMA adopted (within 3 years of submitting supporting reports to DEQ)	0
28) 25 residents served by pilot incentives program and program report available (2 years)	0
29) Sufficient funding to address increased requests for assistance (3 years)	0
30) Financial assistance available to low-income well owners (1 year)	0
31) At least 10 wells repaired or decommissioned with financial assistance (2 years)	0

**Table 7. Commercial/Industrial/Municipal Measures of Implementation Completeness Scoring**

Measures of Implementation	Completeness Score (5 = completed, 0 = nothing done)
1) Completed inventory of permitted facilities within GWMA (2 year)	5
15) DEQ has provided technical assistance to all bulk fertilizers facilities in the GWMA (2 years)	5
22) Long-term monitoring plan developed (June 07)	5
4) A demonstrated increase in the number of facilities using alternative technologies (2 years)	4
7) Coburg connected majority of homes and businesses within UGB to a permitted wastewater treatment system by November 2011.	4
13) Lead Agency has at least 10 contacts with County Sanitarians, property owners and/or DEQ onsite or land application staff (1 year)	4
19) Agreement reached on baseline data collection protocol (Dec 2006)	4
20) Data collection begins to gather baseline data (1 years)	4
21) Data compiled into report and updated annually (2+ years)	4
23) Monitoring plan implemented and results presented every two years (3+ years)	4
6) At least one county has conducted a review of groundwater protection options to apply to new developments (3 years)	3
9) Two articles published (1+ years)	3
10) At least one major media coverage event (2 years)	3
11) GWMA representatives present information about the GWMA at appropriate venues (1+ years)	3
12) Lead Agency has made at least 100 groundwater quality contacts with Commercial/Industrial/Municipal representatives (Every year)	3
2) Annual documentation of the number of new or renewed Water Quality permits with GWMA concerns addressed by incorporating the compliance limit of 7.0 mg/L nitrate (1+ years)	2
5) One or more counties evaluate an overlay zone map (2 years)	2
27) Literature review of wastewater treatment technologies completed (1+ years)	2
28) Funding database prepared and maintained (1+ years)	1
3) Annual documentation of the numbers of wastewater operators and land applicators that received guidance, training, or educational materials (2+ years)	0
8) Annual status report to GWMAC on Commercial/ Industrial/Municipal activities (2 years)	0
14) Lead Agency documents an increase in the number of grounds maintenance enterprises using fertilizing, watering and mowing techniques to minimize or eliminate groundwater contamination	0
16) Recognition program established and operational (2+ years)	0
17) Prepare a website to house industry-specific BMP materials and to track progress in specific programs (3 years)	0
18) At least 50 BMP pamphlets are distributed annually to appropriate Commercial/industrial/ Municipal or grounds maintenance companies	0
24) Existing Passive Capillary Stations (PCAPS) sampled and new PCAPS installed at existing large onsite facilities	0
25) Literature review of wastewater treatment technologies completed (2 years)	0
26) Meeting with interested agencies occurs (2 years)	0
29) Priority needs identified (2 years)	0

**Table 8. Public Water Systems Measures of Implementation Completeness Scoring**

<b>Measures of Implementation</b>	<b>Completeness Score</b> (5 = completed, 0 = nothing done)
40) DEQ program staff contacted (1 year)	5
29) Prepare and advertise program (2 years)	4
30) Track number of assessments completed (3+ years)	4
41) All leaking USTs removed or replaced (5 years)	4
45) Maps created and ODA staff contacted (1 year)	4
1) One-hundred percent of emergency response planners have been notified (1 year)	3
11) Completion of funding source matrix (1 year)	3
13) Increase in the number of events held (2 years)	3
14) Increase in the number of participants and waste collected (3+ years)	3
25) Participation in regional team (2 years)	3
27) Hold training session (2 years)	3
35) Information compiled (1 year)	3
37) Maps created and planning departments notified (2 years)	3
38) Track contacts made to water system operators (2+ years)	3
46) All CAFOs contacted and given materials (2 years)	3
48) Track efforts initiated by DEQ (2+ years)	3
33) Information delivered to all local jurisdictions (2 years)	3
39) Document the number of wells decommissioned (2+ years)	2.5
2) Water system operators contacted about all emergency situations with potential impacts (2+ years)	2
3) Four cities and three counties distributing information (1 year)	2
4) One-hundred percent of new development applicants receive information (2 years)	2
8) Mail 1,000 booklets (1 year)	2
12) Track number of funding sources identified (1+ years)	2
17) Monitor and compare municipal water consumption annually (1+ years)	2
26) Track financial assistance received (3+ years)	2
28) Annual meeting of local public water system operators (2+ years)	2
31) Available spill response resources identified and compiled (1 year)	2
32) Spill response resources distributed to at least 5 small businesses (2 years)	2
36) Meetings held to discuss options with all local jurisdictions (2 years)	2
43) DOGAMI staff notified (1 year)	2
44) Track changes made (2+ years)	2
9) An increase in number of inspection and/or pumping requests to local onsite companies (3+ years)	1
34) Track the number of overlay zones adopted (3+ years)	1
42) All "unknown" USTs classified (5 years)	1
47) Maps created and distributed to agency staff (1 year)	1
5) Signs installed (2 years)	0

**Table 8. Public Water Systems (Continued)**

<b>Measures of Implementation</b>	<b>Completeness Score</b> (5 = completed, 0 = nothing done)
6) Informational phone number established (2 years)	0
7) Track the number of calls received (2+ years)	0
10) Mailings sent to all residents (2 years)	0
15) Program proposal to DEQ and state legislature (5 years)	0
16) Track the number of credits granted (5+ years)	0
18) Programs presented to local jurisdictions (3 years)	0
19) All four cities and three counties have considered programs (4 years)	0
20) Track the number of products obtained (5+ years)	0
21) Awards program designed and implemented (2 years)	0
22) Track number of applicants for the award (2+ years)	0
23) All local auto shops contacted (2 years)	0
24) Track the number of auto shops participating (3+ years)	0

**Table 13. Measure of Implementation Ratings by Focus Area and Theme**

Themes	Funding	Tracking/Monitoring	Coordination	Instructional	Information Sharing	Policy	Research/Development
	<b>Agriculture</b>						
# of Measures	3	13	4	6	1		9
Average Measure Rating (1-5)	<b>2.0</b>	<b>3.1</b>	<b>4.5</b>	<b>3.9</b>	<b>4.0</b>		<b>3.1</b>
Number of 0 and 1 Ratings	1	3					2
<b>Residential</b>							
# of Measures	6	1	13	17	7	3	2
Average Measure Rating (1-5)	<b>1.0</b>	<b>4.0</b>	<b>2.0</b>	<b>2.6</b>	<b>1.6</b>	<b>1.7</b>	<b>2.0</b>
Number of 0 and 1 Ratings	4		4	3	2	1	1
<b>Comm/Indust/Munic.</b>							
# of Measures	1	14	7	6	7	3	7
Average Measure Rating (1-5)	<b>1.0</b>	<b>2.9</b>	<b>2.0</b>	<b>1.8</b>	<b>1.7</b>	<b>1.7</b>	<b>1.9</b>
Number of 0 and 1 Ratings	1	4	3	3	3	1	2
<b>Public Water Systems</b>							
# of Measures	3	13	18	18	11	2	10
Average Measure Rating (1-5)	<b>2.3</b>	<b>1.5</b>	<b>2.3</b>	<b>1.9</b>	<b>1.8</b>	<b>0.5</b>	<b>2.0</b>
Number of 0 and 1 Ratings		6	3	6	3	2	4
<b>ALL FOCUS AREAS</b>							
# of Measures	13	41	42	47	26	8	28
Average Measure Rating (1-5)	<b>1.5</b>	<b>2.4</b>	<b>2.3</b>	<b>2.4</b>	<b>1.8</b>	<b>1.4</b>	<b>2.3</b>
Median Rating	<b>2.0</b>	<b>3.0</b>	<b>2.8</b>	<b>3.0</b>	<b>2.0</b>	<b>1.5</b>	<b>2.0</b>
% of total possible rating	<b>31%</b>	<b>48%</b>	<b>47%</b>	<b>48%</b>	<b>37%</b>	<b>28%</b>	<b>45%</b>
Number of 0 and 1 Ratings	6	13	10	12	8	4	9

Note: Total number of measures in Table 13 are not equal to the Action Plan total because measures that represent multiple themes are double or triple counted

## **Appendix 2**

### **Strengths, Weaknesses, Opportunities, and Strengths (SWOT)**

#### **Summary Report**

**Produced by Lane Council of Governments  
For the Department of Environmental Quality**

This project has been funded wholly or in part by the United States Environmental Protection Agency  
under assistance agreement C9-00045110

## **Strengths, Weaknesses, Opportunities, and Strengths (SWOT) Work Session**

### **Overall Goal:**

During the SWOT exercise we are essentially evaluating the Groundwater Management Area Program and Action Plan that was established to reduce nitrate levels in the region. This past year we conducted a detailed review of the Action Plan implementation. This SWOT evaluation is broad, looking for factors that do and/or will impact the GWMA Program and Action Plan implementation. The overall goal of the SWOT exercise and analysis is to: Have better success at reducing nitrate levels in the Groundwater Management Area by examining the internal and external factors related to the GWMA Program and Action Plan that influence current and future strengths, weaknesses, opportunities and threats.

The basic questions that will be asked during the SWOT session to achieve the goal are:

What types of things have worked well and why?

What types of things have not worked well and why?

What should the GWMA Programs future direction and focus be? What should we change?

In the following months the land use working groups will take both the information from the detailed Action Plan evaluation and the SWOT analysis to identify recommended changes to the Action Plan.

### **Issues and questions to consider might include, but are not limited to:**

- Are GWMA partners tapped to their fullest, new partners needed?
- Is the attitude, trust, and/or knowledge of the general public (including farmers and business people) such that behaviors are changing as a result of GWMA efforts?
- How will existing and future funding issues influence the Program?
- Are we balancing our efforts appropriately or should more effort be made in some areas of land use and less in others?
- Do we have what is needed in terms of data, research, technology, or staff expertise to make informed decisions?
- Is the structure, role, composition of the GWMA Committee relevant to current and future work?
- What group/groups should we focus efforts on and are there groups we should spend less effort on?
- Are there areas/efforts where the cost is not worth the benefits?
- Are there programmatic overlaps or gaps that need to be addressed?
- Are there political elements that influence the direction of the Program?

## Strengths and Weaknesses, Opportunities and Threats (SWOT) Results

### Groundwater Management Area (GWMA) Program and Action Plan

The points listed below were identified to be strengths, weaknesses, opportunities and threats by the members of the GWMA committee and staff through a SWOT analysis in February 2011. This list highlights aspects of the Action Plan, and GWMA Program that fit into each category.

#### Strengths

---

1. The diversity, strength, and collaboration of partnerships in terms of staff, agencies and participation from committee members.
2. Continued productive GWMA meetings for both members and non-members .
  - Staff support- at meetings and materials (LCOG/DEQ)
  - Grassroots nature and long term participation of GWMA committee members

#### Weaknesses

---

1. Limited financial resources make actionable work more difficult.
2. Need better data and understanding of:
  - a. Hydrogeology
  - b. Well area of influence
  - c. Sulfur
  - d. Source of nitrate (is it historical or current)
3. Outreach- lack of a consistent message
  - a. Need a diverse group of agencies to partner with
  - b. Inconsistent participation by all agencies
  - c. Message may not be consistent for all target groups (Ag/residential/commercial, etc.)
  - d. Only 15% of residents know about the GWMA
4. Unclear what 7ppm means? How do we know when the Action Plan has achieved its goal, definition of success? Is 7ppm fixed or will it change over time?

#### Opportunities

---

1. Move from the general to the specific in terms of areas of emphasis, problem solving based on reliable data.
  - a. Target specific outreach campaigns to specific geographic areas and audiences
  - b. Coburg bottom loop is an opportunity for a focus area
  - c. Work outside of the GWMA boundary (maybe a working boundary makes more sense?)
2. Identify future funding opportunities (Grants.)
  - a. Apply for drinking water protection grants
  - b. Specifically find ones that are available for groundwater
  - c. Investigate surface water funding sources.

3. Long term maintenance plan for GWMA, sustaining membership, interest, committee, outreach, possible non-profit status, etc.
4. Identify opportunities to include information about groundwater and the GWMA with existing groups with other water related outreach being done within the GWMA.
  - a. Watershed councils
  - b. Wetlands work
  - c. Drinking water protection
  - d. Agriculture groups
5. Identify other organizations, groups that could help advocate for and help with the GWMA
  - a. Faith based groups, Grange halls, Speak up, neighborhood groups
  - b. Tap into existing groups and expand partnerships
  - c. EPA, USGS, ODA, and DEQ Assistance with their resources
6. Develop and encourage researchers, extension and others to inquire and develop BMP's for new and expanding crops to minimize new sources of nitrate.
7. Do more outreach to schools specifically administration.
  - a. Develop educational curriculum and get GWMA information out to kids using programs like "Teach the teacher" and "Agriculture in the classroom" to do so.
  - b. Collaborate on developing GWMA Specific curriculum
  - c. Adapt for elementary school children
  - d. Discuss issues about source water protection for schools with their own water supply.
8. Identify and recruit future GWMA Committee members in different interest areas.
  - a. Medical representation
  - b. Educational representation
9. Develop and do outreach directed at the BMP's for well construction and septic systems.

## **Threats**

---

1. Unknown future of the GWMA (staffing, funding, etc.).
2. Recruiting and identifying future Committee members.
  - a. Committee should consider and plan for what happens when staff reach retirement or leave committee
3. Difficult to maintain momentum, given that many of the easy to implement aspects of the Action Plan have been completed. How do we go after the more complex issues and still maintain momentum.
4. Reconciling agency priorities and GWMA priorities which do not always match.
5. Need a consistent level of effort with some areas getting very little support

The SWOT analysis was further refined by the full GWMA Committee following the SWOT analysis work session. This list highlights prioritized aspects of the Action Plan, and GWMA Program that fit into each category.

- Denotes items added by the GWMA Committee
- ❖ Denotes prioritization “votes” by GWMA Committee and staff. **Items receiving 5 or more votes are in bold.**

## Strengths

---

1. The diversity, strength, and collaboration of partnerships in terms of staff, agencies and participation from committee members.
  2. Continued productive GWMA meetings for both members and non-members .
    - Staff support- at meetings and materials (LCOG/DEQ)
    - Grassroots nature and long term participation of GWMA committee members
- Continuity of the Committee and staff is of high value along with action happening and the time spent.
  - Water/Groundwater is life so people are interested in the issue.
  - High quality reports, studies, presentations.

## Weaknesses

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3. Limited financial resources make actionable work more difficult.
4. **Need better data and understanding of:**
  - a. **Hydrogeology**
  - b. **Well area of influence**
  - c. **Sulfur**
  - d. **Source of nitrate (is it historical or current)**
  - ❖ 13 Committee Votes, 8 staff votes (**21** total)
5. Outreach- lack of a consistent message
  - a. Need a diverse group of agencies to partner with
  - b. Inconsistent participation by all agencies
  - c. Message may not be consistent for all target groups (Ag/residential/commercial, etc.)
  - d. Only 15% of residents know about the GWMA
  - ❖ 1 Committee Vote, 1 staff vote (2 total)
6. **Unclear what 7ppm means? How do we know when the Action Plan has achieved its goal, definition of success? Is 7ppm fixed or will it change over time?**
  - ❖ 3 Committee Votes, 3 staff votes (**6** total)
  - **Not everybody agrees that there is a problem.**
  - ❖ 6 Committee Votes, 2 staff votes (**8** total)

- **Question as to whether data will ever tell us what we really want to know or will it just lead to more data needs.**
- ❖ 1 Committee vote, 4 staff votes (5 total)

## **Opportunities**

---

7. **Move from the general to the specific** in terms of areas of emphasis, problem solving based on reliable data.
  - a. Target specific outreach campaigns to specific geographic areas and audiences
  - b. Coburg bottom loop is an opportunity for a focus area
  - c. Work outside of the GWMA boundary (maybe a working boundary makes more sense?)
  - ❖ 2 Committee votes, 1 staff vote (3 total)
8. **Identify future funding opportunities (Grants.)**
  - a. **Apply for drinking water protection grants**
  - b. **Specifically find ones that are available for groundwater**
  - c. **Investigate surface water funding sources.**
  - ❖ 2 Committee votes, 8 staff votes (10 total)
9. **Long term maintenance plan for GWMA**, sustaining membership, interest, committee, outreach, possible non-profit status, etc.
  - ❖ 2 Committee votes, 2 staff votes (4 total)
10. **Identify opportunities to include information about groundwater and the GWMA with existing groups with other water related outreach being done within the GWMA.**
  - a. **Watershed councils**
  - b. **Wetlands work**
  - c. **Drinking water protection**
  - d. **Agriculture groups**
  - ❖ 2 Committee votes, 3 staff votes (5 total)
11. **Identify other organizations**, groups that could help advocate for and help with the GWMA
  - a. Faith based groups, Grange halls, Speak up, neighborhood groups
  - b. Tap into existing groups and expand partnerships
  - c. EPA, USGS, ODA, and DEQ Assistance with their resources
12. **Develop and encourage researchers, extension and others to inquire and develop BMP's for new and expanding crops to minimize new sources of nitrate.**
  - ❖ 7 Committee votes, 6 staff votes (13 total)
13. **Do more outreach to schools specifically administration.**
  - a. **Develop educational curriculum and get GWMA information out to kids using programs like "Teach the teacher" and "Agriculture in the classroom" to do so.**
  - b. **Collaborate on developing GWMA Specific curriculum**
  - c. **Adapt for elementary school children**
  - d. **Discuss issues about source water protection for schools with their own water supply.**
  - ❖ 2 Committee votes, 4 staff votes (6 total)

14. Identify and recruit future GWMA Committee members in different interest areas.

- a. Medical representation
- b. Educational representation

❖ 1 Committee vote, 0 staff votes (1 total)

**15. Develop and do outreach directed at the BMP's for well construction and septic systems.**

❖ 5 Committee votes, 4 staff votes (9 total)

10. **Connect with the Willamette 2100 Project and look for partnering opportunities with others to share information.**

❖ 4 Committee votes, 5 staff votes (9 total)

## **Threats**

---

16. Unknown future of the GWMA (staffing, funding, etc.).

17. Recruiting and identifying future Committee members.

- a. Committee should consider and plan for what happens when staff reach retirement or leave committee

**18. Difficult to maintain momentum, given that many of the easy to implement aspects of the Action Plan have been completed. How do we go after the more complex issues and still maintain momentum.**

❖ 4 Committee votes, 3 staff votes ( 7 total)

19. Reconciling agency priorities and GWMA priorities which do not always match.

20. Need a consistent level of effort with some areas getting very little support

## Appendix 3

### Nitrogen/Nitrate Report Summary

The Nitrogen/Nitrate Budget Report (LCOG, 2008) details work to link public policy and planning with best available science and associated data. The project identifies potential sources of elevated levels of nitrate in drinking water in the Southern Willamette Valley Groundwater Management Area (GWMA). A better understanding of the quantities of nitrogen applications and potential nitrate contributions, provide a tool to help guide future choices in land use management practices.

The GWMA is an area with historically high monitored levels of groundwater nitrate. The area is home to about 21,000 residents most relying on the shallow groundwater for drinking water. The area is predominantly agricultural (93 percent), with four relatively small cities. About 2,700 rural residents rely on domestic wells for drinking water and septic systems for sewage disposal. The combination of the use of the shallow aquifer for drinking water and a mixture of land uses that contribute to high nitrate levels in an area of complex groundwater movement and geo-chemistry, gives rise to the need to envision changes in landscape management—landscape trajectories. These changes could produce conditions of quality drinking water for the residents of the area, robust and efficient agricultural practices, and sound environmental conditions.

The efforts this project details, occur within the context of a longer relationship with researchers, planners, and the full range of stakeholders of the area in addressing the nitrate problem. This relatively simple nitrogen budget provides an assessment of the relative contributions of sources and the potential benefit of changes in management practices in the GWMA. The report provides decision-makers and the public with a regional planning level impact analysis of potential nitrate contributions in the GWMA. The goals are to:

- Provide a tool for assessing nitrogen/nitrate contributions to groundwater in the GWMA.
- Identify and quantify how much nitrogen/nitrate specific land uses are contributing and how much nitrate reduction can be expected as strategies from the GWMA Action Plan are implemented.
- Facilitate sound decision-making that results in policy adoption and prioritized strategy development and implementation to reduce nitrate contributions.
- Preserve and enhance the health of the aquifer while maintaining traditional and/or locally appropriate land uses. Emphasis is on the development of specific voluntary strategies that avoid leaching nitrate to groundwater.

This project relies on simple methods to estimate, using best available data, the amount of nitrogen contributed to groundwater from four primary identified sources for which data could be collected spatially: agricultural crops, confined animal feeding operations (CAFO's), large on-site sewerage systems, and rural residential septic systems. No

effort has been made to specifically model groundwater chemical processes or flows. Spatial correlations between estimated nitrogen contributions from modeled sources to sampled groundwater nitrate levels are made at an aggregate scale on a one square-mile grid.

Not surprisingly, given the land use make-up of the GWMA, agricultural land use practices are the largest contributor to groundwater nitrate levels as measured by gross spatial correlation of estimated nitrogen inputs to groundwater and total volume of input for the area. This is not unexpected given the predominance of intensive agricultural land use in the management area. While none of the data produced in this report is statistically significant, stronger correlations are seen to CAFO's and to crops, particularly crops under modeled good and poor utilization which incorporates good and poor management practices. Overall, residential septic systems appear to be a smaller contributor to groundwater contamination on a regional scale, though locally constrained conditions certainly exist, especially in Lane County. Large permitted wastewater treatment facilities contribute the smallest amount although data for these facilities are limited.

Future efforts to reduce contributions to groundwater contamination from nitrate should focus on all land use sectors with priority given to agricultural land uses. The model demonstrates the gains that can be made through good crop utilization which incorporates using best management practices to control nitrate leaching to groundwater. There is an opportunity to reduce nitrogen contributions from a handful of livestock operations. In addition, progress can likely be made with localized reductions in nitrogen contributions from septic systems. For large permitted wastewater treatment facilities further data collection will allow these systems to have a better cross-program, cross environmental media analysis.

Though the best effort to provide a useful tool has been made, the quantification of the nitrogen cycle within a given area, such as the GWMA, is an extremely complex task. Several factors that affect nitrogen transport, deposition, and uptake by crops, vegetation, and soil were beyond the scope of this project to specifically quantify. In some cases these factors are nearly impossible to quantify for such a specific area (e.g., atmospheric deposition from out-of-state sources), and are therefore not included. It is for this reason that this report should be used as an informational tool rather than a definitive calculator of all nitrogen sources and the fate of nitrogen entering the groundwater within the GWMA.

The report is organized into three sections:

*Section One – Introduction and Background* includes a regional profile describing the area's characteristics such as land use and local jurisdictions. This Section also provides an overview of the sampling studies conducted in the area, health concerns related to nitrate, and a broad overview of potential nitrate sources in the region.

*Section Two – Methodology* identifies specific potential nitrate contamination sources within the GWMA and how they relate to land use. This Section also explains the sources and collection of data and how it was used to develop the nitrate budget.

*Section Three – Results, Findings, and Recommendations* explains and displays the results of the nitrogen/nitrate budget model. This Section also provides suggestions and prioritization of geographic area and strategies to reduce contamination risk.

## **Appendix 4 Rural Residential and Agriculture Focus Group Summaries**

### **Rural Residential Focus Group Summary**

An invitation letter was mailed to nearly all rural residential households generally within a 5 mile radius of Children's Farm Home and Fairplay Schools in Northwest Benton County. Of those, 33 people responded with interest in participating in the rural residential focus group. Of those 33 people, ultimately 11 were selected to participate based on a mix of demographic characteristics such as age and whether they had children or not.

The Rural Residential Focus Group met on May 16<sup>th</sup> 2013 at the Children's Farm Home campus. The purpose of the focus group was two-fold 1) Explore barriers to residents having their well water tested and 2) Probe barriers to residents taking action to protect groundwater. Over a two hour period the facilitator worked through a series of questions with the group. Key concepts arose from the focus group discussion having implications for future outreach purposes (See Social Marketing Approach Report).

### **Summary of barriers to well water testing and taking action to protect groundwater:**

1. Both well water testing and learning about groundwater protection competes for time in busy lives
2. Residents don't know where to take their well water samples
3. There is a belief that separate households cannot do anything about the problem.
4. Residents have a lack of knowledge of the health risks of nitrate.
5. The "problem" is not perceived as being "close to home" so individuals are less likely to take action.
6. There is little that individuals can personally do because the problem is too large and they are not personally responsible.

### **Agriculture Focus Group Summary**

The Agriculture focus group of 7 participants met on January 29<sup>th</sup> at the Children's Farm Home campus. The meeting was scheduled for a 1.5 hour period although most of the growers stayed and talked for nearly four hours. Staff explained to the group that the goal of the Groundwater Management Area is to reduce the amount of nitrogen/nitrate going in groundwater. To do this, we needed to understand what knowledge/perceptions/barriers people may have. The purpose of the focus group was two-fold 1) Understand growers' perceptions of groundwater, and 2) Probe barriers to farmers taking action to protect groundwater. During the initial 1.5 hour period the facilitator worked through a series of questions with the group. Key concepts that arose from the focus group discussion have implications for future outreach purposes (See Social Marketing Approach Report).

## **Growers summary of perceptions and barriers that influence marketing approaches**

- The perception that much of the groundwater nitrate is coming from the river and originates from urban areas allows growers to not take responsibility for potential contamination coming from farming activities.
- Group participants (and likely the general farming population), want “proof” rather than speculation that the nitrate contamination is coming from farming activities.
- Most of the time, fertilizer application rates are based on the “best available information” such as OSU Extension application guidelines, field representative recommendations, and/or precision agriculture modeling. It is possible/probable that the “best available information” is not always the “best” in terms of leaching to groundwater. In addition, applying a “little extra” fertilizer may be contributing to the nitrate in groundwater issue.
- Farmers do not always have “control” over leaching due to elements such as weather that they cannot always predict.
- Farmers want/need flexibility in how to address issues such as nitrate leaching. They do not want to be told what to do. Techniques to reduce nitrate leaching come at a cost (time, money, etc.) to farmers.
- More could be done to promote the “good work” farmers are doing to protect land and water quality and foster better relationships with local residents. As rural resident populations increase or as urban areas expand near agricultural lands, there is an increase in tensions between residents and farmers.
- Farmers do not want to apply more fertilizer than what the plants will consume primarily because it is a waste of money.

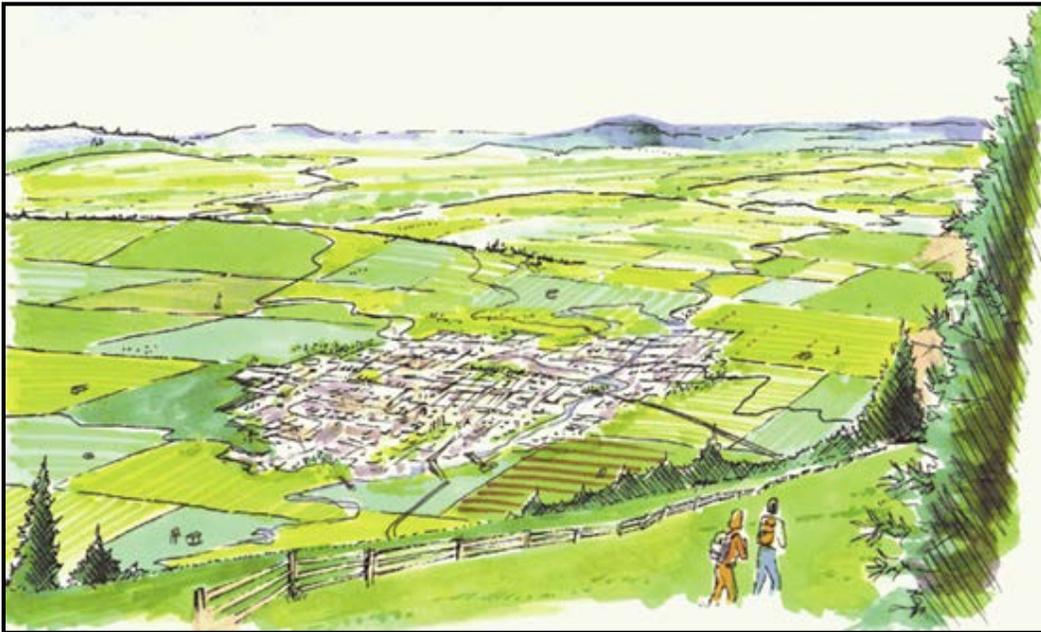
**Appendix 5**

**Social Marketing Approach in the**

**Southern Willamette Valley Groundwater Management Area (GWMA)**

Report

**Social Marketing Approach  
in the Southern Willamette Valley  
Groundwater Management Area (GWMA)**



**Prepared by: Lane Council of Governments**

**Prepared for:**

**Department of Environmental Quality and  
Groundwater Management Area Partners**

November, 2015



## Introduction

Since the declaration of the Groundwater Management Area (GWMA) in 2004, various outreach approaches have been applied and evolved over time. Outreach was initiated in 2006 with the drafting of the Action Plan. A series of open houses invited residents, farmers, public leaders and other stakeholders throughout the GWMA to learn about issues in the GWMA and the proposed Action Plan. Since that time outreach has generally been more focused, targeting individual types of stakeholders (farmers, rural residents, public officials, etc.). Outreach has been driven by strategies identified in the Action Plan and has usually been instigated by agencies/entities that already have a lead role and/or connection in working with the targeted group.

One way of measuring outreach success is to examine elements like number of workshops held, water samples tested, or people contacted – to name a few. Of these there have been many and varied approaches across the land use sectors. Although outreach has become more targeted over the years it has generally relied on a “best professional guess” or in some cases a best funded approach.

The success of outreach activities is more difficult to measure in terms of answering the question “did the outreach change behavior?” To that end, GWMA staff began exploring and applying social marketing techniques to better understand target audiences and to have a greater likelihood that behaviors will change. Confirming that awareness and attitudes are changing and behaviors are being adopted in the GWMA is one way to demonstrate progress toward water quality goals. Social indicators provide consistent measures of social change and can be used by managers at local, state, and federal levels to estimate the impacts of efforts and resources.

Using social marketing techniques allows the GWMA partnership to refine, expand, and explore new marketing techniques that have a greater likelihood of resulting in people changing behavior. The social marketing approach is primarily guided by the results of two focus groups (agriculture and rural residential) conducted in 2014. Outreach methods are further supported by a combination of staff professional judgment, social and scientific research, the 2010 GWMA Evaluation, and the results of a Southern Willamette Valley GWMA strengths, weaknesses, opportunities, and threats (SWOT) analysis.

Social marketing seeks to develop and integrate marketing concepts to influence behaviors that benefit individuals and communities for the greater social good. It uses the same marketing principles being used to sell products to consumers although the concept shifts to that of selling ideas, attitudes and behaviors. Like commercial marketing, the primary focus is on the consumer--on learning what people want and need rather than trying to persuade them to buy what we happen to be producing.

People naturally have barriers to changing behavior - and there is a need to know what these are to facilitate change. To understand the barriers that residents and farmers face in order to add protecting the groundwater quality to their behavior, the GWMA team initiated a barrier assessment with a literature review and surveys (phone and paper). The literature review and surveys helped to refine work conducted with the two focus groups which served as the core instrument of the barrier assessment.

Rural residents and farmers are distinguished as two separate target markets in the GWMA. Members of the two focus groups were selected from, or representative of, residents and/or farmers in north Benton County within the GWMA. This area has two schools having public water systems with elevated nitrate levels. Like much of the region, the area is a mixture of rural residential and agricultural land uses. The focus groups helped the GWMA team craft approaches and messages designed to address some of the specific barriers for either residents or farmers in the region.

Following is a summary of the process and identified barriers for each focus group. Discussions with each group and the acknowledged barriers allowed the identification of appropriate messaging, media outlets, and potential partner entities. These marketing tools are also included below for each target audience (rural residents, farmers).

## **Rural Residential Focus Group Results and Messaging Strategies**

The Rural Residential Focus Group met in May, 2013 at the Children's Farm Home campus. The purpose of the focus group was two-fold 1) Explore barriers to residents having their well water tested and 2) Probe barriers to residents taking action to protect groundwater. Over a two hour period the facilitator worked through a series of questions with the group. Key concepts that arose from the focus group discussion having implications for outreach purposes include barriers to well water testing and taking actions to protect groundwater.

### **Barriers to Well Water Testing**

Barriers can be related to factors such as level of knowledge, attitudes, beliefs, structure and/or time. Focus group questions for rural residents were designed to draw out these factors.

- None of the group were aware of the GWMA. Participants perceived a GWMA to mean that there is some sort of problem, within a certain area, that needs to be managed.
- Most participants had a basic understanding of groundwater. There was some perception groundwater was like an underground water body (river, lake, etc.).

- There is a mixture of belief in whether their personal drinking water is safe.
- Taste is important and sometimes associated with “safe”. Perceptions are not based on testing. Only one participant tested on a “regular” basis whereas others tested infrequently.
- Most participants had some sort of “treatment” (UV, reverse osmosis, softener, charcoal filter, etc.) indicating a willingness to purchase a “treatment” system for an identified problem (iron, sulfur smell/taste, hardness, etc.). With the exception of one participant however, nitrate was not an identified problem that treatment addressed.
- Most participants agreed that it was difficult to know where to take water samples and results are difficult to interpret.
- Participants varied in terms of the level of nitrate that they would be concerned about ranging from about 4 mg/L to the 10 mg/L standard. Participants were generally not aware of nitrate being a health problem and would be more likely to take action in their busy lives if a health issue is known.
- Awareness and concern levels seem to be greater the closer to a known problem (neighbor has high nitrate vs. the GWMA has high nitrate.)

### **Barriers to Taking Action to Protect Groundwater:**

- The group was successful in identifying a wide range of potential nitrate contributors including: HP Industrial Complex, farming, orchards, row crops, grass seed, pasture, Christmas tree farms, livestock, Rural Residential, Institutional, Wetlands, Oregon State University (OSU) Research, Sand and Gravel, Nursery/greenhouse, lifestyle farms, recreation, transportation, septic systems, agricultural industrial, gardening and lawns, golf course.
- The land uses perceived as having the highest risk include agriculture (fertilizers and pesticides) and rural residential (primarily septic systems).
- Group members thought that the big contributors should be identified and address problem. They also thought that with a public health issue that the government should solve the problem.
- Participants were not sure what they can do, because the problem is so large.

- None of the group were aware of the Southern Willamette Valley Groundwater Management Area (GWMA), although one focus group participant was also involved with OSU and well water nitrate testing.

### **Summary of Barriers Experienced by rural residents:**

1. Both well water testing and learning about groundwater protection competes for time in busy lives
2. Residents don't know where to take their well water samples
3. There is a belief that separate households cannot do anything about the problem.
4. Residents have a lack of knowledge of the health risks of nitrate.
5. The "problem" is not perceived as being "close to home" so individuals are less likely to take action.
6. There is little that individuals can personally do because the problem is too large and they are not personally responsible.

### **Potential Marketing Messages for Rural Residents**

Based on the identified barriers to getting their well water tested and taking actions to protect groundwater, the types of marketing messages and strategies that would most likely resonate with rural residents include the following:

- Focus messages on the need to get well water tested because of a health risk.
- Target higher risk neighborhood scale areas within the GWMA. Messages could be tailored to "speak to" the smaller area rather than the GWMA as a whole.
- Messages should include where residents can get their water tested (OSU Extension, certified labs, events, etc.) and what the results mean. Ideally these messages would be delivered separately (residents would learn what the results mean at the time they get the results).
- If possible, expand nitrate testing avenues. For example, once "neighborhoods" are identified recruit one of the neighbors to provide a water sample drop off site. That person could either conduct the test (if trained and provided a test kit) or agree to take the samples to OSU Extension. OSU Extension could then be the conduit for distributing information on test results.
- Provide treatment option information for people with "high" nitrate test results.

- Messages should be engaging, relatively simple, and brief
- Messages should avoid jargon and acronyms
- Include a “call to action” but keep that action doable and outside of the confines of the barriers identified.

### Potential Media Outlets

The Rural Residential Focus Group participants were asked in a survey about where they get their information/news about groundwater from. Table 1 presents the results of the frequency participants rely on various potential media outlets. Use of the internet followed by the OSU Extension Service are the main avenues for gaining information about groundwater. Four of the nine participants also get information from Oregon Public Broadcasting although no distinction was made between radio or television programming. Four of the nine participants also get information from Universities, environmental groups, and the Department of Environmental Quality (DEQ). Radio, television and information from utilities are rarely relied on and information from elected officials, newspapers, or watershed councils are almost never used as information outlets by participants.

**Table 1: Frequency of Use of Potential Media/Communication Outlets**  
**Rural Residential Focus Group**

	Never	Infrequently	Frequently	Very Frequently
Internet		2	3	4
Extension Service		2	4	2
Oregon Public Broadcasting	2	3	1	3
Universities/Colleges	2	3	3	1
Environmental Groups	2	3	3	1
Dept. of Environmental Quality	4	1	3	1
Radio Programs	2	5	1	1
Television	4	2		1
Utilities	4	4	1	
State Elected Officials	5	2		1
Gazett Times Newspaper	6	2		1
Other local Newspapers	5	3	1	
Watershed Councils	6	3		

Based on the results of participant responses, electronic media would be an effective tool for communication. This could be accomplished through avenues such as developing/supporting a facebook or other social media page, encouraging greater access frequency to the GWMA web site and/or producing short You-Tube videos within the GWMA. Although electronic media is likely the “best” way to reach many GWMA rural residents the challenge with using this media is in establishing the initial contact information for a significant portion of GWMA rural residents.

Producing a segment on OPB could also garner awareness of the nitrate issue. Since OPB audiences are broader in scope than the GWMA, the message could be tailored to generating greater awareness about nitrate contamination and potential health effects in general.

Outreach could and should be sought with a variety of agencies and organizations. Institutes of higher education, environmental groups, and the DEQ were used for information frequently or very frequently for four of the nine participants. Although most participants currently do not get their information about groundwater from these sources there is potential to bolster the roles that these entities play in outreach so that they become more frequent sources of information.

## **Agriculture Focus Group Results and Messaging Strategies**

The Agriculture focus group of 7 participants met in January 2014 at the Children’s Farm Home campus. The meeting was scheduled for a 1.5 hour period although most of the growers stayed and talked for nearly four hours. To reduce the amount of nitrogen/nitrate going in groundwater from agriculture, staff needed to understand what knowledge/perceptions/barriers people may have to protecting groundwater. The purpose of the focus group was two-fold 1) Understand growers’ perceptions of groundwater, and 2) Probe barriers to farmers taking action to protect groundwater. During the initial 1.5 hour period the facilitator worked through a series of questions with the group. Key concepts arose from the focus group discussion that guide potential outreach.

### **Perceptions and barriers that influence marketing approaches**

- Grower participants are incredibly knowledgeable about geology, groundwater, well operations, agriculture, etc.
- Some farmers have their own test plots. Some are testing their own water.
- Nearly all participants had heard about the GWMA and understood that the overall issue was high nitrate. There was a lack of knowledge of some of the

details such as when the GWMA was declared, how big it is, how it is funded, how the focus group is funded, etc.

- The Willamette River and urban runoff were perceived to be a major source of the N in groundwater. One participant told a story about HP having to shut down because of high N in the Willamette River during a rainstorm.
- The same rainstorm that impacted HP also caught many farmers off guard (lots of rain after a major fertilizer application period).
- Several participants felt that nitrate in groundwater is a cyclical and long-term issue with fluctuations occurring over time. They were curious if this is a natural cycle and where 'we' are now?
- Field agents are the most trusted source of information. Even though they are trying to sell a product they know that if they "oversell" that they will not remain the trusted field agent and the grower will buy the products elsewhere.
- Agriculture has changed since the late 50s early 60s. The "Grandfathers generation" – only had manure – every farm would be considered organic. The group talked about fertigation (the practice of adding fertilizer to a well) that used to happen but is rarely used now. They don't rinse out spray cans next to a creek like in the old days. Agriculture practices changed again and by early 90s everyone was pretty much on the same page that these practices are not acceptable.
- Post WWII it is assumed that the average lb/acre has already plateaued. Economics drive some of this. "We don't want to put on more than what our crop will consume". However, additional fertilizer is sometime added as insurance. The goal is to grow the best crop possible and not spend more money on fertilizer than needed.
- Growers all thought they were managing fertilizer in the correct manner, but knew there were other growers out there that are still managing their crops the way they did 20 or so years ago,
- Growers cannot wait to see if the plant is "green" enough, because by then it is too late to add fertilizer.

- Sometimes, the modeling for Precision Ag fertilizer amounts will indicate adding more N to sandier soils (high permeability) which is contradictory to protecting groundwater.
- At least one participant thought that for those schools with public water systems that either municipalities should bring water out to the schools, or the schools should be removed from the area because the water was not suitable. Same participant thought because there are no standards for domestic wells, that the area should be converted to residential use.
- Group felt residents need to be better educated about agricultural practices and the substantial work farmers are doing to protect the land and water quality.
- The group stressed that if there is a problem show us what it is. Don't force regulations on us – if there is a problem – let us address it! There are often multiple ways to address an issue and the “best” solution can vary depending on a variety of variables (farmer, soil conditions, etc.).
- Some techniques pose barriers. For example, cover crops take time and money. First you have to plant it, grow it, and then kill it before planting the “real” crop. Slow release fertilizer tends to not “pencil out” in terms of additional cost.

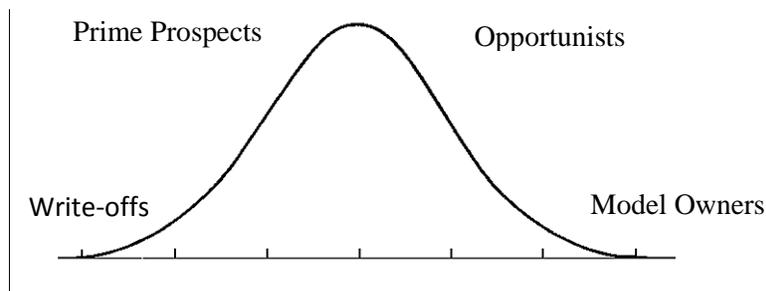
### **Summary of growers perceptions and barriers that influence marketing approaches**

- The perception that much of the groundwater nitrate is coming from the river and originates from urban areas allows growers to not take responsibility for potential contamination coming from farming activities.
- Group participants (and likely the general farming population), want “proof” rather than speculation that the nitrate contamination is coming from farming activities.
- Most of the time, fertilizer application rates are based on the “best available information” such as OSU Extension application guidelines, field representative recommendations, and/or precision agriculture modeling. It is possible/probable that the “best available information” is not always the “best” in terms of leaching to groundwater. In addition, applying a “little extra” fertilizer may be contributing to the nitrate in groundwater issue.
- Farmers do not always have “control” over leaching due to elements such as weather that they cannot always predict.

- Farmers want/need flexibility in how to address issues such as nitrate leaching. They do not want to be told what to do. Techniques to reduce nitrate leaching come at a cost (time, money, etc.) to farmers.
- More could be done to promote the “good work” farmers are doing to protect land and water quality and foster better relationships with local residents. As rural resident populations increase or as urban areas expand near agricultural lands, there is an increase in tensions between residents and farmers.
- Farmers do not want to apply more fertilizer than what the plants will consume primarily because it is a waste of money.

### Strategies and Potential Marketing Messages for Farmers

In general, the agriculture target audience can be depicted on a bell curve. There are extremes on both sides of the curve---landowners who are unwilling or unable to participate in groundwater protection programs; and on the other side of the spectrum; landowners who are very actively engaged in groundwater protection. Generally, the landowner audience can be categorized into four segments (based on market research from the small woodland owners association):



Prime Prospects – Stewardship mindset, but not actively engaged in water quality protection. Prime prospects typically don’t have management plans, don’t often consult with farm specialists like OSU Extension or NRCS, and don’t participate in programs such as cost shares and easements. However, since these farmers have a stewardship mindset, they may participate in a program if encouraged and motivated to do so.

Opportunists – Doing some management actives, but not really of a stewardship orientation. They may find these actions to be financially beneficial or otherwise convenient.

Write Offs – People who are not managing their land sustainably and don’t demonstrate a stewardship mindset toward their land.

Model owners – Have a stewardship mindset and are already taking many of the actions that natural resource professionals recommend. These landowners can be valuable mentors/spokespeople for groundwater protection programs

Generally, the goal is to reach those people in the middle of the curve – the prime prospects and opportunists. Target audiences for agriculture can be further broken out by differences in size of the operation (large or small farm), operation type (grass seed, row crop, mint, etc.), geographic region (county, soil type, level of risk, etc.) and demographics (age, sex, etc.). Selecting appropriate messages can help to influence them to participate, inspire them to take action, and convince them that different water and/or nutrient management techniques will benefit them. Based on focus group input, the following are the types of messages that would be well responded to by most farmers in the region.

- Convey that groundwater nitrate contamination rarely if ever comes from the Willamette River. Even with runoff coming from urban areas nitrate levels in the Willamette River tend to be very low in part due to dilution.
- Present to growers and agriculture field representatives, in a factually based manner, situations where leaching below the root zone occurs such as:
  - ❖ Results of the PINE lysimeter study (if applicable)
  - ❖ Over irrigation such as not shutting off systems during rainy weather
  - ❖ Applying a "little extra" above recommended rates
  - ❖ Application in soil areas of high contamination susceptibility/sensitivity such as rapidly draining soils.
  - ❖ Application according to the OSU Fertilizer guidelines may not be protective of groundwater.
- Portray loss of fertilizer as a loss/waste of money just as much as or more than loss of fertilizer as a contamination issue. Reduce your loss - Reduce your cost.
- Identify "hot spots" of areas where it can be more easily demonstrated that farming activities are the cause of the nitrate problem. Present area/farm specific information where possible. Share area specific monitoring information that indicates the nitrate issue is likely from current practices.
- Provide messages identifying the top reasons for fertilizer loss and that highlight various options for reducing the loss of fertilizer (beyond the root zone). Identify the pros and cons of each option.

- Craft messages that can help those who are fearful of regulation; How can we all have the best water possible? Make it a fun, non-regulatory focus on the science and importance of protection to prevent regulation down the road!
- Keep messages relatively simple with one idea per message. Include a request for a particular action making sure that the action requested is not constrained by the barriers identified.
- Avoid jargon and acronyms. When talking about best management practices (BMPs) at a GWMA Committee meeting, one farmer spoke up and said “My definition of a BMP is what I did last year to make more money”.

### **Potential Messaging Outlets**

The most promising media outlets for the agricultural community are those sources of information that are most “trusted” by the agriculture community. The sources most trusted tend to be in some way associated with the agriculture business or those that have a long standing respect by the agriculture community. For example, information coming from a business field representative or from the Farm Bureau would likely (but not always) resonate more than the same information coming from an environmental agency. The following list highlights potential media outlets for growers and others with agricultural interests:

- Newsletter articles especially in newsletters sponsored by entities like the Soil and Water Conservation Districts and OSU Extension Service. The GWMA has traditionally published its own newsletter but there are also opportunities to publish articles in other organizational newsletters.
- Press releases sent to local newspapers can highlight significant events and successful projects occurring within a localized area. The Capital Press has statewide distribution but is likely the most established paper specifically for agriculture related issues and news. With solid media relations, stories can be “pitched” to newspaper or television outlets.
- Postcard mailers have been used successfully to reach specific target audiences or to target a specific geographic area. Post cards are useful in sharing a limited amount of information and/or for announcing upcoming events.
- Print products such as flyers, brochures, and posters can be used as displays or handouts at a variety of settings and gatherings. The GWMA Team produced a 4 page handout providing an overview of the GWMA and related nitrate issues. Having an attended poster display at agriculture related workshops and events

has also been found to be an effective way to communicate both visually and personally.

- Phone Calls have been found to be very effective when wanting to contact a small number of people. Personal phone calls asking people to participate was found to be more effective than general outreach (mailers and presentations at meetings) when recruiting for the agriculture focus group.
- Video clips are becoming a more popular mechanism to highlight issues and success stories in the GWMA. Video clips should generally be relatively short - a few minutes - and can be a good way to start a presentation.
- Workshops are a good point of outreach for targeted groups. GWMA staff have avenues for presentations at workshops and meetings such as those held by grass seed farmers or meetings of the Farm Bureau. Although more preparation work, staff also have been successful in developing workshops centered around a common topic such as the *Agriculture Research and Demonstration Needs* workshop or the Nutrient Management workshops.
- Local Landowner Tours have been successful in some parts of the GWMA especially when organized as part of a workshop. Tours provide an opportunity for farmers to talk with and show other farmers innovative practices.

#### **Potential Partnering Agencies/Entities for Rural Residents and/or Agriculture**

Work in the GWMA has been successful to date in part due to the extremely active involvement of many partners including: staff and public officials from all three counties and five cities; staff from Environmental Health, Planning, and Public Works departments of local jurisdictions; Oregon Department of Land Conservation and Development; Oregon Water Resources Department; Long Tom Watershed Council; Cascade Pacific Resource Conservation and Development Council; Natural Resource Conservation Service; Soil and Water Conservation Districts; Oregon Department of Agriculture, the Environmental Protection Agency; OSU and OSU Extension Service; and public water system providers.

Forward movement in outreach will require coordinating oversight from the Lead Agency (DEQ) and/or other entities willing and able to coordinate at least portions of the outreach activities. Using a voluntary approach has benefits and challenges. There has been considerable support from many local governments and individuals to restore

groundwater quality to a safer level. An active Lead Agency should offer support and guidance to those entities and individuals who are the best fit for implementing various outreach activities. Partners and potential roles include the following:

**Institutes of Higher Education:** Two Universities sit on the edges of the GWMA with resources that can be tapped. The proximity of Oregon's largest universities offers many opportunities to draw upon scientific, planning, and public policy expertise that can be conveyed through outreach. The universities bring opportunities for student research to be conducted and tie in with programs such as the Resource Assistance for Rural Environments (RARE) and/or the Community Planning Workshop Programs. OSU and OSU Extension Service bring important research to the region and direct contact with residents in the GWMA through outreach and education efforts. OSU Extension Service is an obvious and respected organization using hands-on mechanisms possibly in conjunction with establishing electronic communication with rural residents. OSU Extension excels in working with "small farm" land owners in both livestock and small farm management techniques that protect groundwater. OSU Extension also works with large growers in the region helping with farm management techniques. There is an opportunity to continue working with OSU Extension Service to examine and possibly adjust fertilizer application rate/timing guidelines and possibly promote new guidelines more protective of groundwater while still maintaining economic viability.

**Environmental Groups:** Most "environmental" groups and watershed councils focus on surface water issues. The Oregon Environmental Council (OEC) is one organization that shows leadership and commitment also to groundwater issues. An OEC representative was added to the GWMA Committee in 2014 and is effective in introducing new legislation that protects groundwater and/or the health of residents that rely on groundwater for drinking water. The OEC will continue to be a key instrument in promoting groundwater protection in the future.

**Watershed Councils:** The Long Tom Watershed Council is the primary active watershed council in the GWMA. Although participants in the focus group did not rate watershed councils highly as a source of information, the Council can serve as a source of information for a range of residents in the area. Additional public meetings focused on groundwater, like that held in November 2015 will be an asset to the GWMA outreach portfolio.

**State, Federal, and Local Agencies:**

- The Oregon Department of Agriculture (ODA) and Soil and Water Conservation Districts (SWCDs) can continue to play a role in outreach. ODA has shown remarkable foresight and commitment in evaluating the means and methods for reducing the potential agricultural impact to groundwater quality. Their willingness to work with the local SWCDs and DEQ to identify outreach mechanisms and develop funding requests and allocations will most assuredly assist with the progress in outreach to agricultural land users.

- Oregon Health Authority (OHA) in conjunction with the DEQ Drinking Water Program primarily works with the 51 public water systems in the GWMA. With a vested interest in protecting the public water supply the Drinking Water Program can continue to play a vivid and vital role in outreach to residents that may influence public water supplies. Activities that protect the public water wells are also likely to protect the rural resident groundwater wells. The Drinking Water Program can continue to explore rural “high risk” septic system areas (areas with high density and/or old systems) and provide outreach to those residents. With the Drinking Water Program’s involvement in developing a pilot social marketing approach consider developing a “social marketing template” for a range of public water systems to benefit from.
- The Water Resources Department (WRD) can assist with outreach to rural domestic well users. Currently in the GWMA there are an unknown number of unused wells that have not been properly abandoned and which pose a risk to groundwater. The WRD could contact and work with landowners to identify these wells and encourage abandonment using WRD standards.
- Lane Council of Governments (LCOG) - LCOG brings their regional coordination expertise to the GWMA by helping to integrate the efforts of multiple jurisdictions, entities, and land use groups into the process. Their data and mapping resources bring a better understanding of the area, helping to guide future actions.

**Local Businesses:** Several types of businesses have natural links to groundwater and could be more fully engaged in outreach activities in the GWMA. These include realtors, septic tank pumping businesses, health professionals, local food markets, and chemical supply businesses.

- Realtors - At time of sale, realtors can play a pivotal role in ensuring that well water and septic systems meet standards. The Willamette Realtors Association has been and should continue to be actively involved in educating realtors about groundwater issues so that in turn they can educate both buyers and sellers of rural properties.
- Septic System Businesses - Septic system repair and pumping businesses not only provide the direct services of septic system pumping and repair but also can be a voice for proper ongoing septic system maintenance. Education materials, such as the “Treat it Right” Septic System Maintenance booklet could be distributed by these businesses.

- Convenience Stores - Most rural areas have local convenience markets that could potentially provide information related to local water quality. These convenience stores and/or farmers markets could also serve as a place for local residents to drop off water samples for testing (if arranged with the market).
- Health Professionals - Local health professionals/clinics can also be instrumental in providing distribution of outreach information related to the health effects of high levels of nitrate in drinking water. Small local clinics such as the Junction City Urgent Care and Monroe Health Center are the ideal locations for distributing information about and discussing local health issues related to drinking water.
- Chemical Supply Stores – Chemical supply businesses can range from stores such as Home Depot to farm supply businesses such as SureCrop. Businesses that serve the broader public could offer and highlight products that are “groundwater friendly” such as slow release fertilizers and alternatives to pesticides. Field representatives working for the larger farm supply distribution companies are a trusted source of information among farmers and can serve a greater role in discussing how to address groundwater quality issues while maintaining the desired crop yield (and economic benefit).

**Potential Events:** The above organizational partners can individually or together sponsor outreach activities at a variety of events within or near the GWMA. These might include the following:

Daffodil Festival  
 Earth Day events  
 County Fairs  
 Farmers Markets  
 Monroe Health Fair  
 Harrisburg 4<sup>th</sup> of July  
 Kids Day for Conservation  
 Rural Forums  
 Horse events  
 Home and garden shows

## Appendix 6

### Groundwater Quality Studies and Results-Update

After the 2002 Groundwater Study, which provided confirmation results of the nitrate contamination of groundwater, DEQ in partnership with ODA conducted a 'synoptic' event [a collection of observations that give a broad view of an area in a single snapshot] in late 2005 and early 2006. Approximately 100 wells were sampled and analyzed for pesticides and nitrate. The results, along with any appropriate risk communication information, were shared with homeowners. Nitrate results were compatible with the current understanding of groundwater impacts; however when pesticides were present in water samples, they were only at very low levels. All pesticide detections were at concentrations significantly less than any known health or risk level.



In 2006, licensed DEQ staff used a GeoProbe Direct Push Drill rig to install 26 small diameter wells averaging 20-25 feet deep. In addition to those monitoring wells, 17 domestic well owners also agreed to participate in this study. The GWMA monitoring program of 2006 started in August. For many years all wells were sampled every three months (quarterly) for nitrate and semi-annually for sulfate. Occasionally, other parameters were included in the sampling program. Several wells were eliminated from the original monitoring program, due either to physical or geochemical incompatibilities. Overtime, three additional domestic wells and one groundwater well were added to the groundwater monitoring program. (see Section 4: Long Term Groundwater Monitoring Program.)

In 2009 and again in 2013, DEQ performed pesticide testing of selected domestic wells. These studies were conducted to determine if contemporary pesticide usage in the area had adversely affected the groundwater quality. Both events identified low levels of numerous pesticides;

and as was seen previously, no pesticide was present at concentrations greater than 1/3 of any applicable health or risk reference level.

In May of 2012, EPA began analyzing stable hydrogen and oxygen isotope analyses for all monitoring locations. These data are invaluable, and has helped to determine where and when the Willamette River affects the groundwater quality of some wells. Isotopic information can also help classify some of the groundwater recharge sources. More detailed isotopic information and reports can be found on the GWMA website (<http://gwma.oregonstate.edu/>.)

DEQ continued to conduct quarterly groundwater monitoring of the modestly revised monitoring program until 2014 before making changes to the monitoring strategy. Although homes may have changed ownership over that time-span, none of the homeowners requested that DEQ stop monitoring their domestic wells. Overall, nitrate levels in the GWMA are not rapidly decreasing; and, in general, are not increasing. The final monitoring strategy, and the rationale behind it, is presented in Section 4: Long Term Groundwater Monitoring.

# Nutrient Tracking for Surface and Groundwater Protection

Innovative Research for a Sustainable Future

## RARE

Regionally Applied Research  
Effort Grant Program  
ENVIRONMENTAL PROTECTION AGENCY

**A project to examine nutrient management to improve surface and groundwater quality in the southern Willamette Valley Groundwater Management Area (GWMA)**



### Water quality trading:

An innovative approach to achieve water quality goals more efficiently. Trading is based on the fact that sources in a watershed can face very different costs to control the same pollutant. Trading programs allow those facing higher pollution control costs to meet regulatory obligations by purchasing environmentally equivalent (or superior) pollution reductions from another source at lower costs, achieving the same water quality improvement at lower overall cost.

### Goal

To assess the effectiveness of current fertilizer management practices in the GWMA for reducing nitrate contamination of groundwater, and to test models that can support nutrient and ecosystem services trading to improve surface and groundwater quality.

The Nutrient Tracking Tool (NTT) and Agricultural Policy/Environmental Extender (APEX) are models used by USDA and others to quantify reductions in nitrogen and phosphorus leaving the field. This project makes the link between improvements in fertilizer management and groundwater improvements.

### Approach

Over a two year period, the Project Team will collect samples from existing and newly placed lysimeters in the GWMA. Water samples will be analyzed to determine levels of nitrate leaching below rooting zones in crops using precision agriculture and other innovative fertilizer management practices. Measurements of soil parameters will be used to determine the influence of practices on soil quality. Results will be used to calibrate and validate the APEX for the GWMA, and compare those methods and results to the NTT. The NTT model could be used to support ecosystem service trading and improving surface water and groundwater quality in the GWMA and elsewhere in the nation.

# Nutrient Tracking for Surface and Groundwater Protection

## Innovative Research for a Sustainable Future

### Outcomes

- Build stakeholder involvement with farmers, land owners and Project Team
- Determine the effectiveness of selected innovative fertilizer management strategies in reducing nitrate leaching
- Calibrate and validate the APEX Model
- Apply the NTT model in the GWMA
- Work with stakeholders to develop scenarios of management practices of interest
- Provide final reports and fact sheets on BMP effectiveness

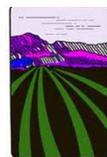


Above: DEQ Hydrogeologist sampling one of the 25 monitoring wells installed to assess the groundwater quality of the GWMA.



Above: Lysimeters measure the amount of nitrogen leaving the root zone.

### Project Team Members



Oregon  
Department  
of Agriculture



State of Oregon  
Department of  
Environmental  
Quality



Oregon State  
UNIVERSITY  
Extension Service



Linn Soil & Water  
Conservation District



### Project Support

- Fertilizer Grant from ODA/Benton County for water sample collection, outreach and associated workshops
- Funding from EPA for lysimeters, general project support and contractor support
- In-kind from DEQ for water sample analyses
- Soil Analysis by Benton SWCD
- In-kind support from NRCS, SWCDs, GWMA, Land Owners
- Contract Support – Willamette Partnership, LCOG

## **Appendix 8**

### **Updates to Chapter Three – Sources and Solutions**

Agriculture

Residential

Commercial, Industrial, and Municipal

Public Water Supplies

*SOUTHERN WILLAMETTE VALLEY  
GROUNDWATER MANAGEMENT AREA  
ACTION PLAN*

*UPDATES TO AG SECTIONS ONLY:*

2012

## Overview of Nitrate Sources

Nitrate is an inorganic compound that naturally occurs at low levels in soil, air, and water. Low levels of nitrate (3-4 mg/L) are generally considered to be naturally occurring background concentrations (Lamond et al., 1999). Human activities can increase nitrate levels and cause contamination of water supplies. Nitrate is essential to life because it is used and converted by plants to meet some of their nutrient requirements for nitrogen. Nitrate is highly soluble in water and mobile in the soil. This makes it relatively easy for nitrate from a variety of point and non-point sources to leach through the soil and into the groundwater.

The Clean Water Act defines the term 'point source' very broadly. A point source is any discernible, confined, and discrete conveyance of pollution, such as a pipe, ditch, channel, tunnel, or conduit from which pollutants are or may be discharged.

Non-point sources of pollution are caused by rainfall, snowmelt, or irrigation water moving over and through the ground. As the water moves, it can pick up and carry away natural and human-made pollutants, ultimately depositing them into ground and surface waters. Non-point sources of pollution can originate from relatively large areas, can be associated with particular land uses, and may consist of several pollutants. These features make it extremely difficult to trace all individual sources and identify which pollutant came from which specific source. In general, these pollutants can arise from activities that a landowner has control over.

Potential point and non-point sources of nitrate pollution in the Southern Willamette Valley are found across land use sectors in the region and include:

- Fertilizers
- Animal waste
- Septic systems
- Wastewater
- Unused or poorly constructed wells

*Fertilizers:* The four fertilizer manufacturing and sales facilities in the GWMA are potential point sources for fertilizer contamination. A bulk fertilizer facility generally offers commercial quantities of various custom-blended fertilizers, herbicides, and pesticides for the agricultural community and other large fertilizer applications. There are no known releases of fertilizers from existing businesses in the GWMA. Previous manufacturing facilities at these same locations, however, may have had periodic releases to the ground that could still have residual contributions.

Non-point sources of nitrate can come from fertilizers used by homeowners, commercial and

industrial businesses, farmers, and city and county parks. The use of a fertilizer is not necessarily a practice that contributes nitrate to the groundwater. Rather, it is the amount, timing, frequency and type of fertilizer, as well as the timing of irrigation relative to fertilizer application that can cause nitrate to be flushed beyond the root zone.

Fertilizers come in many different forms such as granular, water soluble, foliar applied, quick release, and slow release. Slow-release fertilizers, as their classification implies, release nutrients at a slower rate throughout the season and are less likely to leach to the groundwater. Although they are initially more expensive, they may deliver a higher percentage of the applied fertilizer to the target crop.

Regardless of the form of nitrogen applied, some of it is eventually converted in the soil to nitrate. Nitrate in soil water solution is readily taken up by actively growing plants. However, if plants are not actively growing or are unable to take up all available nitrate, nitrate dissolved in water percolates through the soil below the root zone into groundwater. Over-watering practices combined with over-fertilizing can exacerbate the problem and be a cause for groundwater impacts.

*Animal Waste:* Animal waste has the potential to contribute nitrate to groundwater if not managed properly. All animal waste contains nitrogen/nitrate although the amount is largely dependent on animal species and diet. Nitrate contributions from animal waste can come from either point or non-point sources. By law, confined animal feeding operations (CAFOs) are considered point sources. These facilities are often permitted and hold relatively large numbers of animals including chickens, swine, and cattle. Small acreage, rural residential lots with fewer animals are considered non-point sources and can also contribute to nitrate loading in the groundwater. Even the family dog can contribute a small amount of nitrate. Like fertilizer, animal waste does not have to be a source of nitrate to groundwater. Larger permitted facilities address nitrate leaching by implementing Animal Waste Management Plans. Animal waste on small acreage lots can often be managed by covering manure during the rainy season and then using the waste as a soil amendment at agronomic rates during the growing season.

*Septic Systems:* Septic systems can be a non-point source of nitrate contamination. Standard septic systems used at individual households release water containing nitrate from the drainfield even if they are functioning properly. While values can vary depending on the system and household load, nitrate in effluent percolating through the soil one to three feet below the drainfield trench can be as high as 40 mg/L (Anderson and Gustafson, 2004). A large number of septic systems in close proximity may introduce more nitrate than can be diluted by the underlying groundwater, and thus contribute to increased groundwater nitrate levels. Sand-filter septic systems provide some additional treatment of the water leaving the septic tank before it reaches the drainfield. While results vary, sand-filters generally do not reduce the nitrate concentration by more than half. There are also alternative treatment technology wastewater systems that can substantially reduce nitrate levels, some of which can nearly eliminate nitrate contributions to the groundwater. While more effective than standard systems in treating nitrate, they are also more expensive.

*Wastewater:* Potential point sources of nitrogen/nitrate include permitted public wastewater treatment facilities. Most of the cities within the GWMA, and many of the commercial and industrial facilities located outside of cities have their own permitted wastewater treatment system. These systems include relatively large on-site treatment that uses a drainfield (similar to an individual septic system only at a larger scale), or treatment lagoons followed by land applications. The water usage in these facilities is different than a typical household, because water is primarily used for kitchen and restroom purposes and rarely includes shower and laundry facilities. Total nitrogen levels in the effluent are typically higher in these larger systems than for household septic systems because the waste is more concentrated. Treatment lagoons have the potential for nitrate contributions if the lagoon is not sealed properly. Certain organic waste materials such as processed municipal sewage sludge, reclaimed water, food processing wastes, and other similar materials may be recycled and land applied under DEQ regulations and permit. Some of these wastes may be high in nitrogen or nitrate, and must be properly managed through land application.

*Unused or Poorly Constructed Wells:* Wells properly installed to meet Oregon Water Resources Department (OWRD) Minimum Well Construction Standards help prevent surface water from reaching groundwater by way of the well opening. However, wells that may have been improperly constructed, damaged or altered, or are no longer in use may provide a pathway for nitrate and other surface contaminants to enter groundwater. Driven wells, sometimes referred to as sand-point wells, typically consist of a pipe, two inches or less in diameter, pounded into the earth until groundwater is encountered. Driven wells provide an easy access to water; but, in many cases, these wells were not installed by an Oregon licensed well contractor.



# Agricultural

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## Overview

There are 111,350 acres under agricultural use encompassing over 93 percent of the GWMA. These lands are mostly in crop production but also include eight CAFOs. Rural residential properties with a small number of large animals (such as horses, llamas, cows, etc.) are also under the umbrella of agricultural land uses.

The Willamette Valley is one of the most highly productive agricultural areas in the world. Today, hundreds of commodities are grown in the Southern Willamette Valley. Grains, hay and forage, seed crops (grass and legume), field crops (primarily peppermint), vegetables, fruits, and various specialty crops make up the bulk of the crop production. Map 6 displays the predominant crops in the GWMA.

Crop producers use fertilizers to boost production and maintain economic viability in a competitive world marketplace. Beginning in the 1990s, there have been a number of changes in fertilization and irrigation practices in Southern Willamette Valley agriculture. These changes resulted in the reduction of nitrogen loss below the root zone as well as lower overall fertilizer and irrigation water applications. During this period, Oregon State University Extension Service (OSU Extension) embarked on an intense outreach and education effort to area growers. Some experts believe that many producers responded with appropriate management changes to reduce nitrogen loss to both ground and surface waters.

At about the same time, the primary vegetable processing facility in the Southern Willamette Valley closed, the price of peppermint (a plant with high fertilizer and water needs) declined, and nitrogen fertilizer prices began to rise, a trend that continues today. Vegetables and peppermint represent the primary high value crops in the region. They are also grown extensively on the highly productive and permeable soils located mainly on the west side of the Willamette River. The loss of the primary vegetable processing facility and the lower price of peppermint resulted in a decline in acreage planted to these high value crops and conversion primarily to grass seed production. While this conversion may result in a small decrease in total nitrogen applications (because of generally lower required rates), the primary benefit may be the ability of grass seed crops to scavenge and store soil nitrogen. In addition, the soaring fuel costs and very high nitrogen costs of the mid-2000s provided another incentive for members of the farming community to only apply fertilizer when absolutely necessary and/or to apply slow release fertilizers to reduce the number of applications necessary. OSU Extension has updated fertilizer guides for many crops grown in the Willamette Valley. Over the last several years, with the loss of field burning as a management tool and a decline in market demand, there has been a shift from grass seed to cereal grains, legumes and small seeded crops (clovers). It is important to note that both legumes and clovers are nitrogen-fixing crops.

Today the area's most productive producers continually work to capture input efficiencies, and this

ongoing effort includes evaluating their operations to reduce nitrogen applications, increase irrigation efficiencies, and take advantage of research to reduce nitrogen losses. Successful growers know this is vital to protect the area's natural resources as well as to operate a profitable business in an extremely competitive marketplace.

## **Map 6: Crop Types**

In addition to crop producers, livestock operations constitute another important agricultural activity in the GWMA that supports local markets and the economy. These operations are considered to be Confined Animal Feeding Operations, or CAFOs, when they meet at least one of the following criteria:

- Animals confined in a building, or pen, or lot with an improved surface (e.g., concrete, rock, or fibrous material),
- The facility has a waste treatment works (manure pile, lagoon, tank, etc.), or
- The facility has potential to discharge or is discharging waste.

Initially, the program regulating CAFOs was complaint driven. In 1999, ODA introduced the Performance Based Inspection requiring all permitted CAFOs receive at least one routine inspection per year. The switch to performance based inspections also included more rigorous groundwater protection requirements (Youse, 2005).

In response to new federal CAFO standards adopted by the U.S. EPA in 2008, Oregon again revised the CAFO program and issued a new CAFO general permit in 2009. The new CAFO permit incorporates both state and federal CAFO definitions and regulations.

As the population continues to expand in the Southern Willamette Valley, residents recognize that the area provides an ideal rural landscape for an increasingly popular country life. Many people include livestock such as horses, llamas, cows, or sheep as part of their country lifestyle. While these operations do not require a permit, they are regulated by ODA's Agricultural Water Quality Program, and are prohibited from discharging waste to surface or groundwater. The Agricultural Water Quality Program regulates all potential agricultural sources of nitrate other than permitted CAFO's. ODA's Water Quality Program responds to water quality concerns or works to prevent and control water pollution with assistance from the Linn, Benton, and Upper Willamette SWCDs at the local level. Regulatory oversight is based on a complaint-driven system. Many of the complaints received by ODA relate to waste from a few animals on small acreages or uncovered manure piles.

Three of ODA's Agricultural Water Quality Areas overlap or fall partially within the geographic boundary of the GWMA including the Middle Willamette, the Upper Willamette/Upper Siuslaw, and the South Santiam. Area Plans for the Management Areas were developed in partnership with ODA, the Local SWCD, and Local Advisory Committees consisting of stakeholders residing in the area. The Area Plans outline voluntary and regulatory mechanisms to help landowners to achieve

compliance and for surface and groundwater to meet water quality standards. For more information on the Area Plans and Rules see: [http://oregon.gov/ODA/NRD/water\\_agplans.shtml](http://oregon.gov/ODA/NRD/water_agplans.shtml).

Southern Willamette Valley agriculture must continue to make changes as it works with neighboring land uses to lower groundwater nitrate levels. Following is the identification of the potential sources of nitrate from agricultural land uses and the goals and strategies to achieve success.

## **Inventory of Potential Agricultural Sources of Nitrate**

Potential agricultural sources of nitrate in the groundwater include:

- Fertilizer and irrigation
- Confined animal feeding operations
- Small acreage landowners with livestock

### *Fertilizer and Irrigation*

A number of groundwater studies in the 1990s indicated that nitrate has been leaching from both irrigated and non-irrigated cropland soils. These sources may contribute to nitrate groundwater contamination in the Southern Willamette Valley. These studies emphasize the need for greater awareness of potential nitrate issues and the incorporation of this awareness into fertilizer and irrigation practices.

Many studies show that where intensive agricultural production occurs with high nitrogen inputs and irrigation practices, groundwater nitrate levels can be expected to approach and exceed the 10 mg/L drinking water standard. Studies measuring nitrate loss to groundwater from vegetable fields, mint crops, and even organic growing operations found nitrate levels exceeding 10 mg/L below the root zone (Feaga and Selker, 2004). ODA, SWCDs and EPA are rewriting the 2004 Selker sites and conducting another 2-years of soil and lysimeter samples under different crop types to update the nitrate leaching information. Both timing and amount of fertilizer are often a factor in nitrogen loss. OSU Extension Service found that applying nitrogen late in the season or applying amounts above the recommended 225 lbs/acre (mint crop rate) resulted in excess soil nitrogen remaining after harvest. In one study of grass seed production, Mark Mellbye (2002) found increased residual soil nitrate levels at rates of 180 lbs/acre on annual ryegrass. He also found that maximum profit per acre was reached at lower nitrogen application rates, showing that careful fertilizer applications can protect water quality and maximize income. Attendees of the 2011 agriculture workgroup supported a repetition of this research to better understand what is happening below the root zone for different cropping and fertilizer application scenarios.

## Nutrient and Irrigation Efficiency Management Practice Recommendations

<b>Practice</b>	<b>Resource Concerns Addressed</b>	<b>Benefits to Producer</b>	<b>Costs to Producer</b>
Apply fertilizer at the correct rate and time applications for crop uptake.	Reduces the risk of excess nitrogen in the soil at the end of the growth season.	Precise application saves the producer money in fertilizer costs.	Time related to precision application.
Sample soil prior to fertilizer application to know existing nutrients.	Prevents the application of excess nutrients.	Precise application saves the producer money in fertilizer costs.	Cost of soil sampling and analysis.
Plant winter cover crops to take up excess nitrogen left over after crops are harvested.	Takes up extra nitrogen and limits potential for leaching into ground water.	Stores extra nitrogen in plant matter for later release when cover crop is incorporated into the soil.	Cost of seed and fuel to plant cover crop.
Properly maintain irrigation systems to prevent over-irrigation.	Prevents leaching of excess nitrogen past the root zone.	Uniform irrigation application and save producer money on nitrogen costs.	Replacement nozzles at least every four years is recommended.
Monitor soil water content and adjust irrigation schedules to maintain soil water content in an appropriate range in the root zone.	Prevents over-irrigation and leaching of excess nitrogen past the root zone.	Allows accurate irrigation application and keeps nutrients available to crops.	Soil monitoring equipment and time to evaluate soil water content.
Schedule irrigation applications based on expected evapotranspiration rates.	Prevents over-irrigation and leaching of excess nitrogen past the root zone.	Allows accurate irrigation application and keeps nutrients available to crops.	Time to evaluate expected evapotranspiration rates.

Selker et al, 2004

### *Confined Animal Feeding Operations (CAFOs)*

There are currently eight CAFOs in the GWMA permitted by the CAFO Program of the ODA (see Map 7). These include dairy, beef, hog, and chicken facilities. As mentioned previously, these facilities hold annual operating permits, must meet state requirements, and are inspected once a year to ensure compliance. The potential for nitrate from these facilities is predominantly associated with manure waste leaching into groundwater.

### *Small Acreage Landowners with Livestock*

There are an unknown number of smaller animal operations, such as horse farms that do not require a permit for operation due to limited size, lack of confinement, and other factors. In addition, many of the rural homeowners outside of city limits in the GWMA, have a small number of large animals such as horses, llamas, goats, sheep, and or cows.

## **Map 7: Confined Animal Feeding Operations**

### **Agricultural Goals, Objectives, Strategies, and Actions**

The goals and associated strategies focus on integrating GWMA efforts with the three existing Agricultural Water Quality Management Area Plans in the Southern Willamette Valley. Education and outreach is the primary mode for helping producers understand the best and most economical means for making any necessary changes to reduce nitrate loading to groundwater. Regulatory mechanisms are in place through ODA's Agricultural Water Quality Program. Agricultural Water Quality Rules state that agricultural practices cannot pollute waters of the state, including groundwater. The most important objective that is likely to impact groundwater nitrate levels is implementation of BMPs by landowners. Monitoring and research goals are vital to accurately measure how well the Action Plan and Area Plans are performing and to continually improve management options for producers. Finally, financial resources are necessary to undertake actions for the protection and improvement of the groundwater resource. The funding strategies suggest ways for producers, agribusiness, and government partners to collaborate in the development of successful initiatives.

The following section identifies the objectives, strategies and actions associated with two goals for achieving continued reduction of nitrate inputs from agricultural lands. The GWMA Committee has identified the following as high priority goals, objectives, strategies, and actions with the intent of improving groundwater quality in the GWMA. The GWMA Committee recommends that ODA, DEQ, the Linn, Upper Willamette, and Benton SWCDs, watershed councils, and other partners implement these strategies and actions to address groundwater quality. The Committee recognizes that this list is not all-inclusive, that other strategies may also be effective in improving water quality, and that resources may not permit these objectives, strategies, and actions to be completed in the specified timeframes.

**Goal 1: Prevent and control pollution of groundwater from agricultural activities and achieve applicable water quality standards that protect beneficial uses through voluntary management actions.**

**Goal 2: Reduce existing concentrations of nitrate and prevent further contamination from agricultural sources of groundwater in the GWMA. Identify: practices contributing to contamination, best management practices to prevent nitrogen inputs to groundwater, and a schedule for implementation of actions.**

**Objective 1: Education and Outreach**—Organize education and outreach efforts to increase the agricultural community's awareness of groundwater vulnerability and best management practices.

**Strategy 1.1** Within the GWMA, coordinate agricultural surface and groundwater pollution control efforts. Coordinate groundwater pollution control efforts among the various agriculture-related organizations and plans in the GWMA.

#### **Actions**

- Annually evaluate the Benton, Upper Willamette, and Linn SWCD Scopes of Work to include groundwater quality tasks. These tasks should focus on nitrogen use efficiency, irrigation use efficiency, and manure management.
- During biennial reviews of the South Santiam, Middle Willamette, and Upper Willamette Agricultural Water Quality Management Area Plans, update groundwater quality items in the Goals and Objectives. The Area Plans Goals and Objectives sections should include a focus on nitrogen use efficiency, irrigation efficiency, and manure management.
- Communicate to NRCS local work groups the priority of spending funds on nutrient use efficiency, irrigation efficiency, and manure management within the GWMA.

**Strategy 1.2** Organize and deliver workshops and demonstration projects aimed at producers to show BMP implementation and increase BMP adoption. At the workshops, educate producers about groundwater conditions, populations at risk from high nitrate levels, federal assistance programs, and sustainable agriculture opportunities.

#### **Actions**

- Each SWCD develop one demonstration project showcasing successful BMPs and systems.
- Organize one tour (field or virtual) of each demonstration project for agricultural managers and producers. Partner with agribusiness for tours of demo projects.
- Each year partners sponsor two small acreage resource management workshops that provide presentations (either as a stand-alone presentation or part of a broader presentation) on surface and groundwater quality issues.
- Include information on sustainable practices, incentive programs, and third-party certification at the workshops. The goal is to attract 100 producers annually to the demonstrations and workshops.

**Strategy 1.3** Write and publish articles to promote/improve the agricultural community's awareness of water quality issues in the GWMA.

**Actions**

- Once per year, provide an update on the status of the GWMA and associated water quality data in the Benton SWCD newsletter. The Linn and Upper Willamette SWCDs do not have a newsletter, and therefore, should provide an update to be included in a partner newsletter or other media source. This may include OSU Extension for the Linn SWCD.
- Publish two media articles or public service announcements per year in the GWMA about successful agricultural resource management practices.

**Strategy 1.4** Share information and coordinate with agribusiness, producers, and producer groups to promote practices and conditions that protect and improve water quality.

**Actions**

- Follow-up meeting with agribusiness field representatives active in the GWMA to review the groundwater nitrate issue and share appropriate outreach materials. This should occur in 2012 and once every three years thereafter. Possible ways to meet with field representatives include:
  - Grower meetings
  - Individual company meetings
  - Oregon Agriculture Chemical and Fertilizer safety training workshops
- Each SWCD will deliver one groundwater quality presentation (either as a stand-alone presentation or part of a broader presentation) at one agribusiness or producer group meeting per year.
- Make at least 100 contacts (total) with landowners about groundwater quality per year within the areas served by the Benton, Upper Willamette, and Linn SWCDs.
- Provide or develop outreach materials for producers that summarizes practical resource management for groundwater quality.

**Objective 2: Resource Management**—Implement BMPs in the GWMA to improve groundwater quality.

**Strategy 2.1** Work with agricultural producers in the GWMA to implement practices to improve groundwater quality.

**Actions**

- Provide technical assistance to producers in the GWMA. Each SWCD will have a minimum of ten contacts with producers within the GWMA annually promoting irrigation efficiency, and nutrient and manure management.
- Promote proper nutrient management, irrigation efficiencies, and manure management to reduce nitrogen loss to groundwater. Each SWCD will work with two producers within the GWMA annually to design and implement best management practices.

**Strategy 2.2** Obtain sufficient financial assistance to support technical assistance to producers and implementation of resource management practices.

**Actions**

- Include tasks in the SWCDs Scopes of Work for technical assistance to producers and to seek funds for implementation of practices related to groundwater quality.
- Communicate to NRCS local work groups the priority of spending funds on nutrient use efficiency, irrigation efficiency, and manure management within the GWMA.
- Include the promotion and support of USDA programs such as the Environmental Quality Incentives Program and the Conservation Reserve Enhancement Program into SWCD work plans and Scopes of Work.
- Seek funds from USDA incentive based financial assistance programs to assist producers to implement groundwater protection practices.
- Seed DEQ 319 funds to assist with agricultural on-the-ground projects and management practices that minimize groundwater nitrate pollution.

**Strategy 2.3** Develop and target a priority area within the GWMA to evaluate progress related to implementation of the Agricultural Water Quality Plans and GWMA Action Plan. (The purpose of the priority area is to evaluate the area before and after targeting and demonstrate progress. Progress is a measurement of improvement of water quality parameters or surrogates.) As resources and time allows, multiple priority areas will be identified for targeting.

**Actions**

- Identify a priority area to target education, outreach, and other resources. This area should be identified by July 2013.
- Identify BMPs that will be promoted for improvement of groundwater quality.
- Identify management practices or conditions that assure agricultural contributions of nitrate to groundwater are at acceptable levels.
- Measure soil nitrate levels at enough sites in the priority area to assess potential of nitrate leaching.
- Contact all landowners within the priority area with information on the GWMA and best management practices to reduce nitrate inputs.
- Develop targets and milestones specific to the priority area.
- Implement management practices with all willing landowners in the priority area.

**Strategy 2.4** Obtain adequate funding for implementation of desired practices within the priority area.

**Actions**

- Develop implementation and funding plan for the identified priority area.
- Work with producers in the priority area to determine interest in implementation of specific practices.
- Work with partners to submit funds proposals to cost-share implementation of practices.

**Objective 3: Monitoring and Research**—Monitor groundwater quality in agricultural areas to evaluate the impacts of agricultural management practices. Research best management practice effectiveness, adoption of best management practices, and priority research needs.

**Strategy 3.1** Evaluate current domestic and monitoring wells to determine monitoring needs in agricultural areas.

**Actions**

- Coordinate with local, state, and federal partners to evaluate current surface and groundwater monitoring network and identify additional monitoring needs, by January 2013.
- Evaluate aquifer characteristics to determine whether the existing monitoring wells provide comprehensive data on nitrate concentrations or if additional wells are necessary to monitor nitrate levels in the GWMA.
- Evaluate LiDAR (light detection and ranging) data to understand connections between wells.

**Strategy 3.2** Measure the success of BMPs implementation efforts.

**Actions**

- Measure producer (within the priority area from Strategy 2.3):
  - Awareness of groundwater quality issues,
  - Level of BMPs implementation,
  - Ease of implementing BMPs, and
  - Barriers to BMPs implementation.
- This measurement should be completed in the fall of 2013 and repeated two years later to determine any changes. Target: 50% of the producers surveyed in 2013 using groundwater protection BMPs as identified by groundwater staff and agricultural partners.

**Strategy 3.3** Document groundwater related investigations and violations of Agricultural Water Quality Management Area Rules and CAFO permit conditions within the GWMA.

**Actions**

- Document the number, issue, validity, and outcome investigations regarding potential violations of Agricultural Water Quality Management Area Rules where the violations could impact groundwater.
- Document CAFO violations and outcomes.

**Strategy 3.4** Research, document and coordinate BMP effectiveness. Implement priority research identified at February 2010 researchers meeting.

## **Actions**

- Follow-up to the February 2010 researchers meeting to track progress related to identified priority research and funding needs. Research needs identified include:
  - Nitrogen budgets and BMPs for other and nontraditional crops (such as specialty seed crops)
  - Nitrogen mineralization under different crop scenarios
  - Bioreactors on tile lines
  - Time of groundwater travel (data needs improved)
  - No till vs. conventional (difference in cost and potential leaching)
  - Study nitrate sources and how nitrate moves
  - Impact of tile lines on nitrate concentration and movement
- Maintain a prioritized research plan and identified sources of funding.
- Work with OSU or other partners to design a nitrate leaching study to further characterize potential nitrate leaching from various agricultural sources in the GWMA.
- Implement research to measure BMP and systems effectiveness and identify factors affecting groundwater nitrate levels from agricultural practices.
- Research and document effectiveness and impacts of specific BMPs on nitrate leaching.

**Strategy 3.5** Obtain sufficient funding to support priority research needs.

## **Actions**

- Submit research grant applications to support high priority research needs. Potential grant sources include the DEQ 319 program, ODA's fertilizer research funds, EPA, the USDA, and other agencies and private organizations.

**Table 7 – Agriculture Measures of Implementation and Potential Implementing Entities**

Strategy	Measures of Implementation	Potential Lead Implementing Entities
1.1 Coordinate agricultural surface water and groundwater pollution control efforts	1) Groundwater quality tasks included in SWCD Scopes of Work (on-going) 2) Groundwater quality items included during Water Quality Management Area Plans review (on-going) 3) Nutrient use efficiency, irrigation efficiency, and manure management identified with NRCS local work groups (on-going)	ODA, SWCDs
1.2 Organize and deliver workshops and demonstration projects	4) Demonstration projects designed and implemented (years 2 and 3) 5) Tours completed (on-going) 6) Workshops completed (on-going) 7) Attendance at tours and workshops (on-going)	SWCDs, NRCS, ODA, OSU Extension
1.3 Write and publish articles	8) Articles written and published in newsletters and other local media (on-going)	SWCDs, OSU Extension, LCOG
1.4 Share information and coordinate with agribusiness, producers, and producer groups	9) Follow-up meeting with agribusiness field representatives (Year 2) 10) Presentation at agribusiness or producer group meetings (on-going) 11) Establish systems for tracking groundwater quality contacts (Year 1) 12) Track groundwater quality contacts (on-going)	SWCDs, ODA, NRCS
2.1 Work with producers to implement practices to improve groundwater quality	13) Landowners provided with technical assistance (on-going) 14) Best management practices implemented by landowners (on-going)	SWCDs, NRCS, OSU extension, ODA
2.2 Obtain financial support for technical assistance and practice implementation	1) Groundwater quality tasks in the SWCD Scopes of Work (on-going) 3) Nutrient use efficiency, irrigation efficiency, and manure management identified with NRCS local work groups (on-going) 15) Track changes in funding amounts and allocations (on-going) 16) Landowners signed up for USDA cost-share programs (on-going) 17) Grant applications submitted and approved for implementation of practices (on-going)	SWCDs, NRCS, ODA, OSU extension.

**Table 7 – Agriculture Measures of Implementation and Potential Implementing Entities**

Strategy	Measures of Implementation	Potential Lead Implementing Entities
2.3 Develop and target priority area to evaluate progress	18) BMPs identified in relation to improvement of groundwater quality (on-going) 19) Soil nitrate levels in the priority area measured (Year 2) 20) Landowners contacted in the priority area (Year 2) 21) Practices implemented in the priority area (Year 2)	
2.4 Obtain adequate funding for implementation in the priority area	22) Landowners interested in implementation of specific practices (on-going) 23) Funds proposals submitted (on-going)	
3.1 Evaluate current monitoring to determine needs in agricultural areas	24) Current monitoring evaluated and additional monitoring needs identified (Year 1) 25) Aquifer characteristics evaluated (Years 2 and 3)	DEQ, ODA, OSU, NRCS, WSCs
3.2 Measure success of BMP implementation efforts	26) Measure baseline of BMP awareness, implementation, ease of implementation, and barriers to implementation (within priority area) (Year 1) 27) Repeat measurement after two years (Year 3)	ODA, SWCDs
3.3 Document groundwater-related violations	28) Track the number of groundwater violations and investigations (on-going)	ODA
3.4 Research and document BMP effectiveness; implement priority research identified in February 2010	29) Meet to update the priority list of ideas to research (Year 2) 30) Maintain research plan and identified sources of funding (on-going) 31) Design and implement nitrate leaching study to further characterize nitrate leaching potential (Year 1) 32) Implement, measure, research, and document BMP effectiveness (on-going)	OSU, ODA, NRCS
3.5 Obtain sufficient funding to support priority research needs	33) Grant applications prepared and submitted (on-going)	OSU, ODA, NRCS

## Agriculture Action Plan Implementation Progress - 2015

### Agricultural Goals, Objectives, Strategies and Actions

The Oregon Department of Agriculture's (ODA) and Soil and Water Conservation Districts' (SWCD) focus for the Southern Willamette Valley Ground Water Management Area (SWV GWMA) has been on providing outreach and education to increase growers' awareness of the importance of the groundwater resource and ensuring that agricultural water quality management area plans include information about the SWV GWMA. ODA Programs that implement actions from the SWV GWMA Action Plan include the Water Quality Program and Confined Animal Feeding Operations Program.

### Water Quality Program

- Soil and Water Conservation Districts (SWCDs) within the SWV GWMA have conducted workshops, developed written materials and conducted outreach with growers regarding actions that will contribute to reducing nitrates leaching into groundwater.

Benton SWCD's Frazier-Jackson Focus Area was chosen, in part, to address SWV GWMA actions. Within the focus area, the District has conducted a pre-assessment of streamside vegetation conditions, is providing outreach, conducting projects and will conduct a post-assessment.

Benton SWCD assisted to coordinate workshops to educate participants about the management area rules and practices to reduce nitrates to groundwater. The District also collaborated to form an Agricultural Focus Group that helped inform our understanding of the social barriers and challenges to implementing SWV GWMA actions.

Benton SWCD secured an ODA Fertilizer Grant to supplement the Environmental Protection Agency's Regional Applied Research Effort (RARE) grant to design a research study and install a number of lysimeters in the GWMA (the District is also monitoring several previously installed lysimeters). By combining the two grants, the District is accomplishing: 1) documentation of current and recent agricultural practices at selected lysimeter sites; 2) monthly collection of soil water samples to be analyzed by DEQ, 3) soil quality analysis of parcels included in the study, to better assess the health and tilth of the soil, 4) development of critical information to be used for incorporating groundwater protection elements of the Nutrient Tracking Tool; and 5) conduct research-oriented workshops and meetings to share the results. This integrated approach results in additional understanding of the effectiveness of current fertilizer BMPs, vadose transport and groundwater protection.

Upper Willamette SWCD participates in the GWMA Lysimeter testing project. Upper Willamette SWCD has also worked with the developer of a new technology probe that measures nutrient uptake to show when a crop is no longer utilizing nutrients for production. This District serves on a technical expert panel that oversees the lysimeter/prenart water quality testing project.

Upper Willamette SWCD continues to work with individual agricultural producers within the GWMA on a voluntary basis to address water quality concerns by partnering with a private agricultural services business located within the GWMA to provide soil nutrient testing for producers to encourage proper applications of nutrients based on soil and plant needs. The District also provides

technical assistance and funding opportunities for producers to update and maintain irrigation systems to ensure proper application rates are achieved.

- The nitrate problem in the GWMA has been as identified as a priority resource concern by the Natural Resource Conservation Service (NRCS) Local Working Group (of which ODA and SWCDs are partners) and the suggested conservation practices have been implemented through Environmental Quality Incentives Program for several years in the GWMA. Recently, NRCS developed a Conservation Initiative Strategy, which again identifies the nitrate contamination as a resource concern in the GWMA.
- ODA tracks compliance investigations located within the SWV GWMA so that education and mitigation can be carried out during the site inspection and corrected. Over the last five years, eight compliance investigations were conducted in the SWV GWMA. Of these, three were considered to have a connection to ground water quality.

These actions will continue to be an ongoing part of the ODA's Water Quality Program and SWCDs' efforts to complete SWV GWMA Actions.

In addition to the actions described above, the Water Quality Program offers the following strategies are recommended priorities for 2015 –2020:

### **Agricultural Water Quality Management Area Plans**

There are three agricultural water quality management areas within the SWV GWMA:

Middle Willamette  
Upper Willamette & Upper Siuslaw  
South Santiam

ODA reviews agricultural water quality management area plans at least every two years with the assistance of Local Advisory Committees and the Soil and Water Conservation Districts. During these reviews:

- ODA will work with the SWCDs and Local Advisory Committees to consider adding specific SWV GWMA agricultural actions to the measurable objectives in Chapter 3.
- ODA will work with DEQ to provide an update on SWV GWMA monitoring for Chapter 4: Status and Trends and to evaluate progress with the Local Advisory Committees.

### **Soil and Water Conservation District Scopes of Work**

- ODA will encourage and provide programmatic and agricultural water quality compliance assistance to the Upper Willamette and Benton SWCDs.
- By June 30, 2015 ODA will encourage the Upper Willamette and Benton Soil and Water Conservation Districts to continue to include SWV GWMA-related tasks in their Scopes of Work and Long Range Plans.

- ODA will encourage the Benton and Upper Willamette Districts to continue consider SWV GWMA needs when choosing where to conduct future Focus Areas.

### **Strategic Implementation Areas**

Since 2003, ODA's Water Quality Program compliance activities have primarily been initiated via response to complaints or agency notifications. In 2012, the Board of Agriculture (BOA) recommended that ODA identify and develop "alternatives to a complaint-based agricultural water quality program." As a result, the Ag Water Quality Program is completing a process to identify high, medium, and low priority watersheds at the 6th field Hydrologic Unit Code (HUC) level, for future SIA implementation. Through this prioritization process, the Ag Water Quality Program will select SIAs for the 2015-2017 biennium. The SWV GWMA is included in the criteria that will be used to identify where potential SIAs will be implemented. Within each SIA ODA will conduct a remote analysis, field evaluation, outreach, mitigation actions and post-implementation reporting.

## Confined Animal Feeding Operations Program

### Current Activities:

- Ongoing inspections and compliance activities with Eight (8) CAFOs currently registered to NPDES CAFO Permit.
- CAFO quantification ideas:
  - Five Year Goal = at least 58 CAFO inspections on existing 8 operations.
  - At least 95% compliance with Routine Inspections.

### Proposed Activities:

- Continue to implement CAFO Permit Program with DEQ.
- Continue to conduct routine, compliance assistance, complaint and follow-up inspections at CAFOs
- Work with proposed new source CAFOs to obtain Permit registration.
- Work with CAFO operators and associated industries to review and implement promising new technology and management information that assist with implementation of nutrient management and Permit compliance.
- Assess Permitted CAFOs located adjacent to the SW GWMA boundaries for GW interaction inside of GWMA.
- Assess imported manure from other non-GWMA, permitted CAFOs as an N source utilized in the GWMA.

## Residential Updates

### Priorities for 2015-2020

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Education and outreach continue to be the primary methods used to increase residents' awareness of the importance of the groundwater resource and to provide information to help prevent contamination in higher risk areas. Focus Groups and social marketing are likely to be projects that will also improve awareness and refine attitudes regarding groundwater protection. There are many activities detailed in the 2006 Action Plan that have been very advantageous to the GWMA. These activities, predominantly conducted by Oregon State University Extension, include but are not limited to:

- website hosting and development of two websites- the SWV GWMA website and the OSU Extension Well Water website;
- providing classes with unbiased information for residences with wells and septic systems. These classes include Rural Living Basics and Living on the Land;
- offering free nitrate screening and consultations on wells, septic systems and water treatment options;
- developing and sending press releases and articles to local media outlets and partner organizations regarding the extent and purpose of the GWMA and tips for groundwater protection;
- educating Realtors who sell property in the rural areas of the GWMA about groundwater quality and private wells;
- conducting rural residential focus groups to better understand awareness and use as a basis to help refine attitudes regarding groundwater protection;
- starting the development of a social marketing campaign to promote residents to engage in groundwater protection actions. Ultimately, this campaign should result in residents remembering to utilize these actions as frequently as their engagement in recycling activities; and
- providing education to public schools using the GWMA Curriculum.

These actions should continue as long as funding is available, as they have been a reliable means of serving the GWMA public.

In addition to those actions discussed above, the following strategies from the 2006 GWMA Action Plan are recommended as **Priorities for 2015-2020** (or until the GWMA is rescinded; whichever comes first.)

- Work with health care providers to address nitrate-related health issues arising from drinking water. **(Strategy 1.2)**
- Establish a volunteer well monitoring network that incorporates neighbor-to-neighbor outreach. This could be done in coordination with LCOG, who was funded (DEQ 319 Agreement #015-15) to identify selected focus areas (hot spots) for in-depth outreach and education. **(Strategy 2.1.)**
- Provide outreach and education to neighborhoods/areas with heavy septic system impacts to assist them in making safe choices (e.g., Pioneer Valley Estates.) **(Strategy 1.2 – with a special emphasis on this task)**
- Start a visual campaign to aid better understanding and communicating between the Rural Residents and the Agriculture communities. Help create new ‘norms’ in perceptions between the two groups. **(Strategy 1.1 – with a special emphasis on this task)**
- Create and distribute a GWMA Teachers’ Newsletter with classroom activities linked to the state curriculum standards. **(Strategy 1.3)**
- In collaboration with local retail garden businesses in the GWMA, launch a “groundwater-friendly” labeling campaign to identify appropriate products. Supply groundwater-friendly lawn and garden information sheets to retail garden businesses on multiple topics, including information reminding people to read the fertilizer labels. **(Strategy 1.4 – has value, may not be practical)**

GWMA Partner Agencies are encouraged to seek and apply for funding for the ongoing Residential Implementation Measures as well as those listed as priorities for 2015-2020.

## Commercial/Industrial/Municipal Priorities for 2015-2020

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Based on the current knowledge of the Commercial, Industrial and Municipal sources of impacts, and in addition to the GWMA's typical outreach and groundwater monitoring activities, the below strategies are recommended as **Priorities for 2015-2020** (or until the GWMA is rescinded; whichever comes first.)

- Within the Southern Willamette Valley, DEQ-permitted point sources should not exceed the GWMA Action Level for Nitrate of 7 mg/L at their respective point of groundwater compliance. To facilitate this strategy, the GWMA 7.0 mg/L Nitrate (as N) Action Level should be integrated into DEQ-permitted pollution control facility permits that have a potential to impact groundwater. To support this effort, the Lead Agency should develop new materials for DEQ Water Quality Permit checklist, which will assist permit writers by having a consistent level of knowledge of the Action Level and the permit requirements necessary to reduce nitrate loading of the groundwater.
- Ensure operators that land-apply C/M/I wastewater and biosolids with moderate to high levels of nitrogen are aware of the groundwater concerns in the GWMA and are applying these materials at or below appropriate agronomic rates, considering current conditions and soil quality. This would include commercial anaerobic digesters that sell or give away their effluent to be applied in the GWMA, and commercial composters. The Lead Agency, Commercial, Industrial and Municipal representatives, and organizations active in the Southern Willamette GWMA should meet to review the groundwater nitrate issue and share appropriate outreach materials from DEQ, LCOG, OSU Extension, and other appropriate sources.
- Promote technical assistance to help property owners determine potential risks to groundwater from wastewater management. Outreach materials on how to prevent over-fertilizing and over-watering are needed and should include information on other successful resource management practices. These materials should be useful for both the commercial, industrial and municipal facilities and for any hired landscape maintenance companies.
- Counties and cities will be encouraged to establish an overlay zone that will require new commercial, industrial and municipal development with wastewater treatment and a potential for an adverse impact to groundwater from nitrate

discharges to meet a GWMA water quality standard.

- Commercial, industrial and municipal landowners who manage their properties, landscaping and/or wastewater/biosolids treatment in a manner that protects the groundwater resource should be included as potential recipients of the Tim Bunnell Community Hero Recognition Program.

# Public Water Supplies

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## Overview

There are 52 water systems providing drinking water to approximately 65 percent of the people in the GWMA (Oregon Health Authority and Oregon Department of Environmental Quality, 1999-2005). Public water systems are defined as having either more than three connections or serving greater than 10 people. Most of the public systems in the region depend on the shallow aquifer to provide a clean, steady supply of water. The Drinking Water Source Areas of public water supplies encompass less than five percent of the total land area within the GWMA.

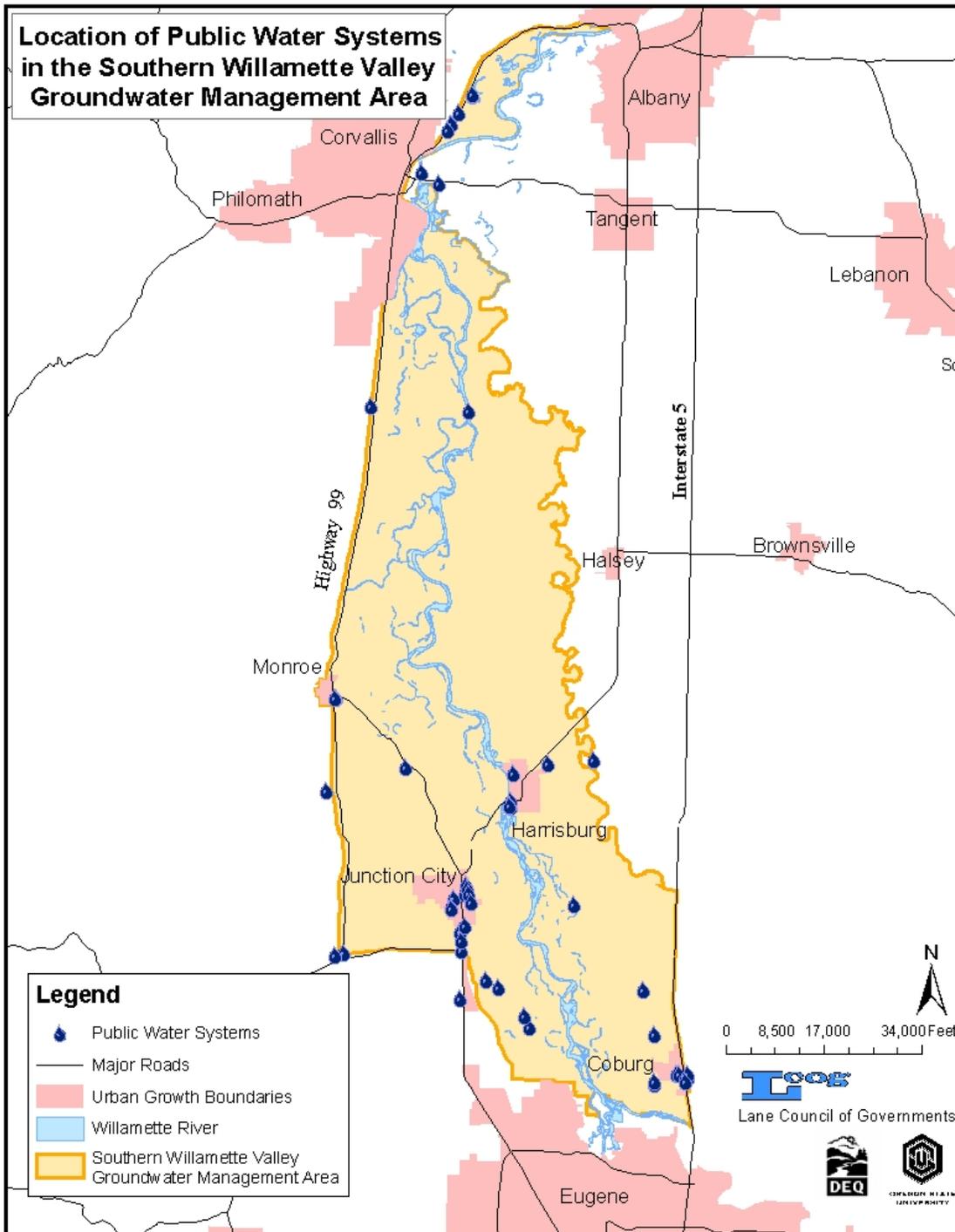
There is a blend of both large and small public water systems in the region. There are 37 larger public water systems (systems serving at least 25 people or having 15 connections) such as Junction City, serving over 5,000 people, and Shadow Hills Park Water Co-Op, serving about 45 people. The remainder of public water systems consists of 15 smaller state regulated systems, such as trailer parks or small businesses, which serve fewer than 25 people or have less than 15 connections. As can be seen on Map 11, the majority of water systems are located in or near municipalities clustered in the southern portion and the northern fringe of the GWMA.

Public water supply systems are concerned about nitrate because they are required to provide safe water that meets federal drinking water standards. Five public water systems in the GWMA have tested positive for nitrate levels greater than 7 mg/L in the past five years (Oregon Health Authority, 2010 through 2014). Nitrate is difficult and expensive to remove from public drinking water systems. Therefore, measures to prevent nitrate contamination can help meet health standards while reducing the need for expensive water treatment. The presence of nitrate in drinking water indicates higher vulnerability to other contaminants such as herbicides, insecticides, and bacteria. The DEQ and Oregon Health Authority Drinking Water Program have completed Source Water Assessments for the public water systems in the GWMA. These assessments clearly identify the area from which public systems get their water and include an inventory of potential risks and risk ratings within that area.

The established methodology of the Source Water Assessments provides a tool to examine all potential risks to groundwater for a limited area within the GWMA. Although not confirmed, some of the same risks may exist for people who rely on household wells. The Source Water Assessment work provides valuable information that, although

specific to a defined portion of the GWMA, can be a useful tool for overall evaluation of groundwater risk in the area.

**Map 11: Public Water Systems**



## **Inventory of Potential Risks to Public Water Supplies**

The Source Water Assessment delineation identifies the area from which a well draws its water. Time of travel zones were developed to give a tangible indication of how quickly contamination could reach the water distribution network. There are one-, two-, five-, and ten-year time of travel zones. According to the models used, a drop of water that enters the aquifer within the two-year time of travel zone could potentially reach the drinking water supply within two years, in the five-year zone it will take five years, and so on.

The Source Water Assessment inventory of potential contaminant sources is designed to identify and locate significant potential sources of contamination within the drinking water protection area. The sites and areas identified are only potential sources of contamination to the drinking water, where water quality is not likely to be impacted if contaminants are managed properly. Potential contaminant sources are assigned a risk rating of high, medium, or low to indicate the level of potential risk to the water supply. The risk ratings were developed by the EPA. These ratings are not site specific, but are based on the general nature of the land use activity.

Within the area that is relatively close to the wells, where it is estimated that a contaminant could reach the water supply within a five-year time frame, there are 40 different types of potential contaminant sources in the GWMA. About 75 percent of those are considered a high or medium risk (Oregon Health Authority and Oregon Department of Environmental Quality, 1999-2005). Table 5 displays the high, moderate, and most prevalent risks in the five-year time of travel zones of assessed public water systems in the GWMA.

According to Table 5, the most common potential contaminant sources identified within the five-year time of travel zones include agriculture (irrigated and non-irrigated), heavily used transportation corridors, large onsite septic systems, wells/abandoned wells, and high-density housing with septic systems. With the exception of transportation corridors, all of these are potential sources of nitrate. Potential sources of nitrate are the same for public water supplies as in other areas of the GWMA and have been discussed in previous sections. There are many additional potential risks to drinking water safety including hazardous waste or fuel spills on heavily used highways or railroads, releases from vehicle and equipment repair facilities, leaks from current and past fuel or chemical storage tanks, and contaminants released from a variety of commercial enterprises.

**Table 5**  
 High, Moderate, and Most Prevalent Risks in the Five-Year Time of Travel Zones  
 of the Drinking Water Source Areas

Potential Contaminant Source	Number of Sources	Risk Rating
Non-Irrigated Crops	13	Lower
Transportation-Heavy Use Roads	13	Moderate
Large Capacity Septic Systems	12	High
Wells/Abandoned Wells	12	High
Automobiles- Gas Stations and Repair Shops	11	High
Crops-Irrigated	11	Moderate
High-Density Housing (with septic systems)	11	Moderate
Underground Storage Tank-Confirmed Leaking, Status unknown, or unregulated	11	High
Above-ground Storage Tanks	10	Moderate
Other	9	
Chemical/Petroleum Storage and Processing	7	High
Historic Gas Stations/Waste Dumps	4	High
Transportation-Railroads	4	Moderate
Furniture/Lumber/Parts Stores	3	Moderate
Machine Shops	3	High
Sewer Lines	3	High
Wood Preserving/Treatment/Pulp/Paper Processing and Mills	3	High
Boarding Stables	2	Moderate
Golf Courses	2	Moderate

Potential Contaminant Source	Number of Sources	Risk Rating
Grazing Animals	2	High
Rural Homesteads- Machine Shops	2	High
Lagoons/Liquid Wastes	2	High
Parking Lots/Malls	2	High
Pesticide/Fertilizer/Petroleum Storage and Processing	2	High
Waste Transfer/Recycling Stations	2	Moderate
Wastewater Treatment Plant	2	Moderate
Construction/Demolition	1	High
Dry Cleaners	1	High
Electric/Electrical Manufacturing	1	High
Food Processing	1	Moderate
Fleet Trucking/Bus Terminals	1	Moderate
Food Processing	1	Moderate
Injection Wells-Class V Underground Injection	1	Moderate
Highly Maintained Lawn Areas	1	Moderate
Medical/Vet Offices	1	Moderate
Mines/Gravel Pits	1	High
Dump Sites	1	Moderate
High-Density Septic Systems	1	High
Stormwater Retention Basin	1	Moderate
Transportation-Right of Ways	1	Moderate

Source: Department of Environmental Quality and Department of Human Services-Drinking Water Program, Source Water Assessment Reports, 1999-2005

Each source water assessment evaluates the sensitivity of the soils present in the delineated drinking water source area (DWSA). Soil sensitivities are determined based on time of travel rates in terms of hours. Groundwater under soils with a higher sensitivity ranking is more likely to become contaminated than groundwater under soils with a lower sensitivity ranking. Water soluble chemicals, such as nitrate, are more prone to moving through the soil. A Public Water System may have few sources inside its 10-year Time-of-Travel zone, but may still be affected by long-term regional problems. Previous studies have shown that agriculture is typically a larger nitrate source than urban development and onsite septic systems (Cepelcha *et al* 2004, McMahon *et al* 2008), but both are important contributors of nitrate (Mueller *et al* 1995). Even relatively low densities of septic systems (0.2 systems per acre) can cause violations of the nitrate drinking water criterion when there is little recharge from other sources (Bauman and Schafer 1985). Nitrate impacts from septic system effluent could be exacerbated by the presence of antibiotics if denitrifying bacteria are damaged, inhibiting the potential for nitrate to be reduced into a less harmful form of nitrogen (Underwood *et al* 2011).

Should priority chemicals and compounds of concern also be included? OHA/DEQ  
Drinking Water Source Monitoring Project (2008-2010) Table 1  
<http://www.deq.state.or.us/wq/dwp/docs/SourceMonitoringProjectPhase1and2Rpt.pdf>

## **Public Water Supply Goals, Objectives, Strategies, and Actions**

The Source Water Assessment information provided a thorough evaluation of the potential contamination sources in the region and ensured that the strategies are targeted to the most pressing risks. The goals, strategies, and actions addressing potential risks to public water supplies focus on pollution prevention to: protect the drinking water source; meet water quality standards; avoid costly remediation; prevent the burden of finding a new source; and uphold the community's reputation for having a clean drinking water supply.

- Goal 1: Increase public awareness of groundwater vulnerability, what can be done to protect drinking water, and resources available to aid protection efforts.
- Goal 2: Recognize and promote actions that are being taken to protect drinking water.
- Goal 3: Supplement existing employee training programs, provide GWMA-specific information to trainers, and seek out technical assistance opportunities

related to drinking water protection.`

Goal 4: Encourage land use planning and public health procedures that prevent or minimize groundwater contamination.

Goal 5: Work with regulatory authorities to provide prioritized, focused, and customized efforts for regulated and permitted activities within the five year time of travel drinking water protection areas.

**Goal 1: Increase public awareness of groundwater vulnerability, what can be done to protect drinking water, and what resources are available to aid protection efforts.**

**Objectives:**

- Increase GWMA population awareness of groundwater vulnerability and groundwater protection activities.
- Increase the number of residents and targeted businesses that have changed at least one practice to improve groundwater protection and/or water conservation.

**Strategy 1.1** Public Water Systems notify state and local emergency response planners of the locations of their Drinking Water Source Areas and ensure that water system operators are notified in case of a spill or other emergency that may impact the water supply.

*Actions:*

- OHA and DEQ prepare and distribute a “tipsheet” including a list with contact information for all agencies involved with spill response, links to GIS-based maps of the Drinking Water Source Areas in the region, and triggers for reporting spills to first responders.
- Public Water Systems coordinate with state, regional, and local emergency responders to identify and address gaps in communication related to spill response.
- Public Water Systems keep information current and make contacts every 2-3 years.
- Public Water Systems request spill response maps from OHA as needed.

**Strategy 1.2** Municipal Public Water Systems distribute GWMA-specific educational materials and drinking water protection materials focused on new development through local planning departments, with permit applications, and at public works offices.

*Actions:*

- Every two years, review available information and develop new GWMA-specific materials as necessary.
- Identify distribution methods and locations, get approval, and continue distribution through OSU Extension, planning department counters, public water suppliers and other appropriate mechanisms.

**Strategy 1.3** Public Water Systems erect signs along major roadways to inform people that they are entering a drinking water supply area and provide a contact number for more information.

*Actions:*

- Public Water Systems include sign strategy as part of Emergency Response Plan.
- Public Water Systems work with stakeholders to determine design and information included on signs.
- Public Water Systems establish informational phone number to include on the sign.
- Public Water Systems determine locations for signs, contact appropriate jurisdictions for approval, and erect signs.
- Public Water Systems explore OHA grant funding to implement strategy.
- OHA/DEQ provide assistance as needed.

**Strategy 1.4** Develop a social marketing template based on focus group outcomes and distribute information to residents, commercial and industrial businesses, and farmers informing them of their location within the GWMA and the Drinking Water Source Area of a public water system and identify things they can do to help protect the resource.

*Actions:*

- Review results from the residential and agricultural focus groups.
- Divide target markets into categories and tailor messages and mechanisms for distribution based on group characteristics.
- Obtain information specific to different land uses that could contribute to groundwater contamination.
- Identify appropriate distribution channels (mailings, workshops, planning counters, etc).
- Public Water Systems work with County to develop address list of residents with on-site systems in high risk areas (such as 5-year time of travel zones, older

systems, etc.).

- Using the address list, Public Water Systems coordinate with DEQ to distribute a booklet on proper septic system care, maintenance, and inspection to rural residents within the five-year time of travel zones of drinking water protection areas. Ensure that each household in the defined high risk areas receives this booklet.

**Strategy 1.5** OHA and DEQ document all available funding sources to address drinking water protection issues and share this information with water system operators, public officials, and interested residents (this strategy is a precursor to many other strategies).

*Actions:*

- Identify all sources and prepare matrix of funding sources.
- Make information available to water system operators via website or mailing.
- Update previously developed funding matrix.
- Public Water Systems consult with OHA and DEQ as needed to secure groundwater protection grant funding.
- OHA and DEQ provide individualized technical assistance to Public Water Systems (prioritizing with Community and Non-transient Non-Community systems) to promote specific best management practices and adequate funding.
- Inform GWMA coordinator of OHA Drinking Water Protection Grant LOI application period dates.

**Goal 2: Recognize and promote actions that are being taken to protect drinking water.**

**Objective:**

- OHA and DEQ establish and/or maintain programs to actively engage Public Water Systems and stakeholders in drinking water protection actions.

**Strategy 2.1** DEQ oversees the Tim Bunnell Community Hero Awards Program for public water system operators that are leaders in protecting drinking water.

*Actions:*

- Identify partners and collaborate with them to advertise award and request nominations.
- Present award and advertise results.

**Strategy 2.2** DEQ promotes programs that can identify and/or reduce contaminant releases including EcoBiz auto shop certification, toxics monitoring in well water, and hazardous waste/pesticide collection events.

*Actions:*

- Compile list of auto shops that are within the GWMA and partner with Lane County Pollution Prevention Coalition's (Lane P2C's) EcoBiz program to contact auto shop owners, conduct site visits, and form a network for auto shops to share information.
- Partner with Lane P2C to recognize outstanding auto shops in various media and advertising outlets.
- Work with partners to coordinate and implement monitoring and collection events.

**Goal 3: Supplement existing employee training programs and provide GWMA-specific information to trainers. Seek out technical assistance opportunities related to drinking water protection.**

**Objectives**

- Contact the high and medium risk businesses within the 5-year time of travel zones about the GWMA. Encourage those businesses to change at least one practice that will better protect groundwater.
- Increase the number of high and medium risk businesses in the 5-year time of travel that have drinking water protection information included in training.

**Strategy 3.1** DEQ works with existing land management, watershed management, and pollution prevention groups to increase awareness about groundwater contamination in the GWMA and promote practices to reduce risk.

*Actions:*

- Present GWMA information to Lane County Pollution Prevention Coalition and statewide pollution prevention group in Portland.
- Brainstorm project ideas with partners to increase residents' adoption of best practices
- Gain support and research funding for development of regional pollution prevention team to address issues in GWMA and prepare supporting documents.
- Obtain support from jurisdictions for expanded pollution prevention efforts in the

region through presentations and staff contacts, secure funding and in-kind support.

- Invite staff and professionals to be involved in pollution prevention actions.

**Strategy 3.2** Provide forums designed to make technical assistance and training opportunities available to water systems, local government officials, and planning staff to reduce contamination risks within established drinking water source areas.

*Actions:*

- OHA and DEQ Drinking Water staff continue to work with public water systems to deliver training sessions for area planners and community leaders (sponsored by water system).
- OHA and DEQ organize an annual meeting of public water systems within the GWMA to update them on Action Plan accomplishments and engage them in next steps.
- OHA and DEQ Drinking Water staff will partner with public water systems to provide drinking water protection materials for local businesses to use in employee training programs.

**Strategy 3.3** Continue to partner with agricultural organizations to promote on-farm technical assistance to landowners regarding risks to public water supplies within the GWMA's Drinking Water Source Areas.

*Actions:*

- OHA and DEQ Drinking Water staff meet with County SWCDs, ODA, NRCS staff, and OSU Extension staff working within GWMA to develop project proposal, including scope of work and funding source(s).
- Partners with agriculture interests (such as ODA, NRCS, etc.), with support from OHA and DEQ Drinking Water staff, advertise opportunity for farmers to participate in on-farm assistance.
- Partners provide assistance and maintain relationship with participating farmers to monitor results.

**Strategy 3.4** Establish a mentoring program with large businesses helping smaller, less regulated businesses in drinking water source areas within the GWMA.

To whom should this responsibility fall (GWMA Committee, the Public Water Suppliers, Businesses or a special workgroup)?

*Actions:*

- Research successful mentoring programs and develop appropriate materials.

- Deliver presentation on mentoring program to business coalitions/Chamber of Commerce to gain support.
- Develop plan for conducting outreach to businesses to encourage participation in mentoring effort.
- Share spill response resources with businesses and sponsor joint employee training workshops.

**Goal 4: Encourage land use planning and public health procedures that prevent or minimize groundwater contamination**

**Objective**

- DEQ and OHA will partner with GWMA staff to inform all local jurisdictions in the GWMA about possible zoning/health ordinance changes and provide examples.

**Strategy 4.1** Upon request, DEQ and OHA work with local jurisdiction(s) to establish drinking water protection overlays in the 5-year time of travel zones of the Community and Non-Transient, Non-Community water systems in the GWMA.

*Actions:*

- Public Water Systems, with assistance from DEQ and OHA, establish a contact list of planning staff and elected officials in the GWMA and meet with city and county planners to present examples of drinking water protection overlays.
- Upon request, DEQ and OHA provide public water systems maps and guidance with example overlay zones.
- Upon request, DEQ and OHA assist local and county government staff in proposing overlay zone to planning commissions and elected officials.

**Strategy 4.2** Provide information to staff and local officials about model ordinances available to governing bodies to implement drinking water protection measures.

*Actions:*

- Compile information about the costs of drinking water contamination, examples of ordinances other than overlay zones, and information detailing examples of communities that had to address contaminated drinking water.
- Contact public officials and staff and arrange a time to discuss potential drinking water protection measures.
- Meet with cities and counties to identify barriers to implementation and propose solutions to address these issues.

**Strategy 4.3** Public Water Systems request that all county and city planning departments in the GWMA notify water systems of proposed development actions in the 5-year time of travel zones or provide operators with web-site information where they can access development information.

*Actions:*

- Public Water Systems compile contact information of all county and city planning staff and create detailed maps of the 5-year time of travel zones within each jurisdiction.
- Obtain support from water system operators and public works directors and provide information to planning staff.
- Monitor development actions within the 5-year time of travel zones

**Goal 5: Work with state agencies to provide prioritized, focused, and customized pollution reduction efforts for regulated and permitted activities within the five-year time of travel zone in drinking water source areas in the GWMA.**

**Objective**

- Maintain the efforts of state agencies such as the Water Resources Department (WRD), DEQ, OHA, ODA, and the Department of Geology and Mining Industries (DOGAMI) to prioritize work within the GWMA.

**Strategy 5.1** Partner with the WRD to better understand the location and concentration of temporarily and permanently abandoned wells in the five-year time of travel drinking water source areas. Help the WRD to prioritize efforts to address temporary and permanent well decommissioning.

*Actions:*

- Contact the WRD to discuss ways to collaborate on identifying wells that should be permanently and properly decommissioned.
- Establish a method to prioritize 'higher risk' wells.

**Strategy 5.2** Public water systems and agency partners will alert DEQ to the presence of confirmed leaking underground storage tanks and underground storage tanks of unknown status within public water system five-year time of travel zones in drinking water source areas.

*Actions:*

- Public water systems contact responsible party at regional DEQ office about the known leaking underground storage tanks.
- Invite DEQ personnel to working group and GWMA Committee meetings to talk about the Underground Storage Tank program.
- DEQ enforces clean-up of leaking underground storage tanks.

**Strategy 5.3** OHA and DEQ continue to notify DOGAMI of all sand and gravel mining operations within Drinking Water Source Areas in the GWMA and work with DOGAMI to provide sand and gravel mining operators information on best management practices to reduce risks to groundwater contamination.

*Actions:*

- Compile up-to-date groundwater protection mining BMP information, contact DOGAMI and provide them with maps and information about high priority operations.
- Partner with DOGAMI to focus efforts on operations within drinking water source areas.
- Ensure OHA drinking water staff continue to be formal reviewers on mining permit applications.

**Strategy 5.4** DEQ will continue to: 1) provide ODA updated maps and GIS layers of the drinking water source areas and the CAFO sites within the 5-year time of travel zones in the GWMA to help ensure compliance with permits; 2) provide updated information to ODA about the GWMA that can be shared with CAFO operators during site visits.

*Actions:*

- Update CAFO BMP information, contact ODA, give them an updated map of PWS and 5-year time of travel and information about high priority operations and recent water quality concerns.
- Work with ODA to encourage regular, routine site visits to these CAFOs and inform operators of their location within drinking water source areas in the GWMA.

**Strategy 5.5** DEQ in collaboration with OHA drinking water staff evaluates the factors influencing nitrate risks in the GWMA for the public water supply wells not already examined and included in the 2011 report, *“Factors Influencing Nitrate Risks at Oregon Public Water Systems”*.

*Actions:*

- Using the methodology in the DEQ 2011 report, evaluate the soil sensitivity (a combination of the soil's leaching potential and sorption potential) and produce soil sensitivity maps for each public water system in the GWMA.
- Determine the percent of the total area in each soil sensitivity category.
- Analyze the nitrate-N data to determine the influence of aquifer vulnerability (a combined rating of aquifer confinement and well construction), aquifer confinement, well construction in confined aquifers, and soil sensitivity on the median and 90th percentile nitrate-N values for each well.
- Analyze the Nitrate-N values (median and 90th percentile for each public supply well) in unconfined and semi-confined aquifers against the percentage of the Time-of-Travel (TOT) zones' total area that has soil sensitivity greater than Low (i.e. % area in Moderate, High, and Very High categories).
- Using soil sensitivity maps, aquifer and hydrogeology characteristics, or models such as NLEAP, prioritize the most vulnerable locations for management changes.

**Appendix 9 and Appendix 10**

**Updates to Chapter Four**

Long Term Monitoring Program

Measuring Success and Rescinding the GWMA Through Performance Indicators

## Long-Term Groundwater Monitoring Program

After years of designing, developing and refining, the Long-Term Monitoring Program was finalized in 2015. This process began with agreements from DEQ Western Region to fund the installation of approximately 25 monitoring wells and from the DEQ Lab to commit to monitoring the groundwater network four times a year, until another frequency is determined for this project.

In collaboration with Lane Council of Governments and informed by recent research conducted by an OSU Graduate Student (Jeffrey Glenn Mutti: *Temporal and Spatial Variability of Groundwater Nitrate in the Southern Willamette Valley of Oregon*), DEQ determined that approximately 40 monitoring locations would provide an adequate network to assess the overall groundwater health, and would be a manageable workload for the DEQ Lab.

It was necessary to accomplish a quasi-random approach of monitoring groundwater while still achieving geographic coverage. To realize this, Lane Council of Governments developed a map of the GWMA; breaking the study area into 40 approximately equal 'chunks' (see below Monitoring Grid map.) Then, using a random number generator, a targeted section was chosen for each of those 'chunks'. Each targeted section was reviewed in the office and in the field to determine if a domestic drinking water well was available for the monitoring program, or if there was a suitable right-of-way location to install a monitoring well.

Once acceptable monitoring well locations were identified, Right of Way permits and Water Resource Department start cards were filed by Licensed Well Constructors. Once all approvals were in place, licensed DEQ staff used a GeoProbe Direct Push Drill rig to install 26 small diameter wells averaging 20-25 feet deep. In addition to those monitoring wells, 17 domestic well owners also agreed to participate in this study. The monitoring program of 2006 started in August, and the below map identifies the locations of each monitoring point. (note: Domestic wells on this map and all future maps are always located as approximate locations, to protect the privacy of the owners. In addition, DW-17 was brought into the program after the map was developed, and is located near GW-20.)

For over two years all wells were sampled every three months (quarterly) for nitrate and semi-annually for sulfate. Occasionally, other parameters were included in the sampling program. In order to capture seasonal variations in nitrate levels, background groundwater quality was calculated after completing of 9 quarterly sample events. This background concentration is the nitrate concentration level assigned to each monitoring location to evaluate the long term changes in nitrate.

Several wells were eliminated from the original monitoring program. One monitoring well (GW-14) was physically removed as part of a gravel extraction in 2007. Two domestic wells (DW-1 and DW-4) were removed from the monitoring in 2008 after an evaluation of their associated groundwater data lead to the conclusion these wells did not monitor the shallow Willamette Aquifer. Over time, 3 additional domestic wells (DW-1524, DW-1525 and DW-1544) and one groundwater well (GW-27) were added to the groundwater monitoring program.

EPA has provided stable hydrogen and oxygen isotope analyses for all monitoring locations beginning in May of 2012. These data are invaluable, and have helped determine where and when the Willamette River affects the groundwater quality of some wells. Isotopic information can also help classify some of the groundwater recharge sources. More detailed isotopic information can be found on the GWMA website:

[http://gwma.oregonstate.edu/sites/default/files/brooks\\_gwma\\_slides\\_9-25-14.pdf](http://gwma.oregonstate.edu/sites/default/files/brooks_gwma_slides_9-25-14.pdf)

In 2015, after more than 9 years of groundwater monitoring, the GWMA Committee accepted a modified monitoring approach that included:

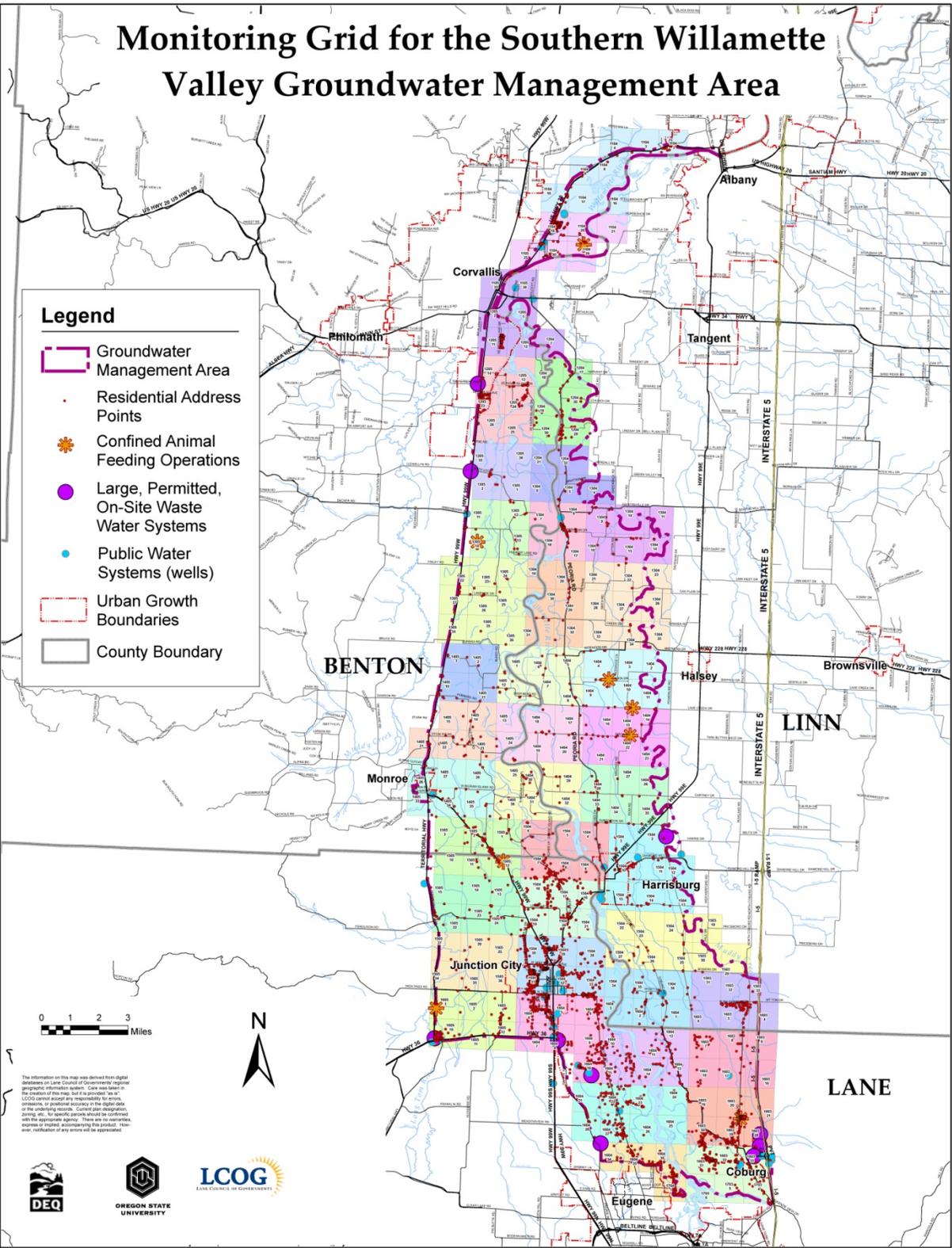
- 25 wells tested quarterly;
- 9 wells tested semiannually in May and November: and
- 5 wells tested annually in May.

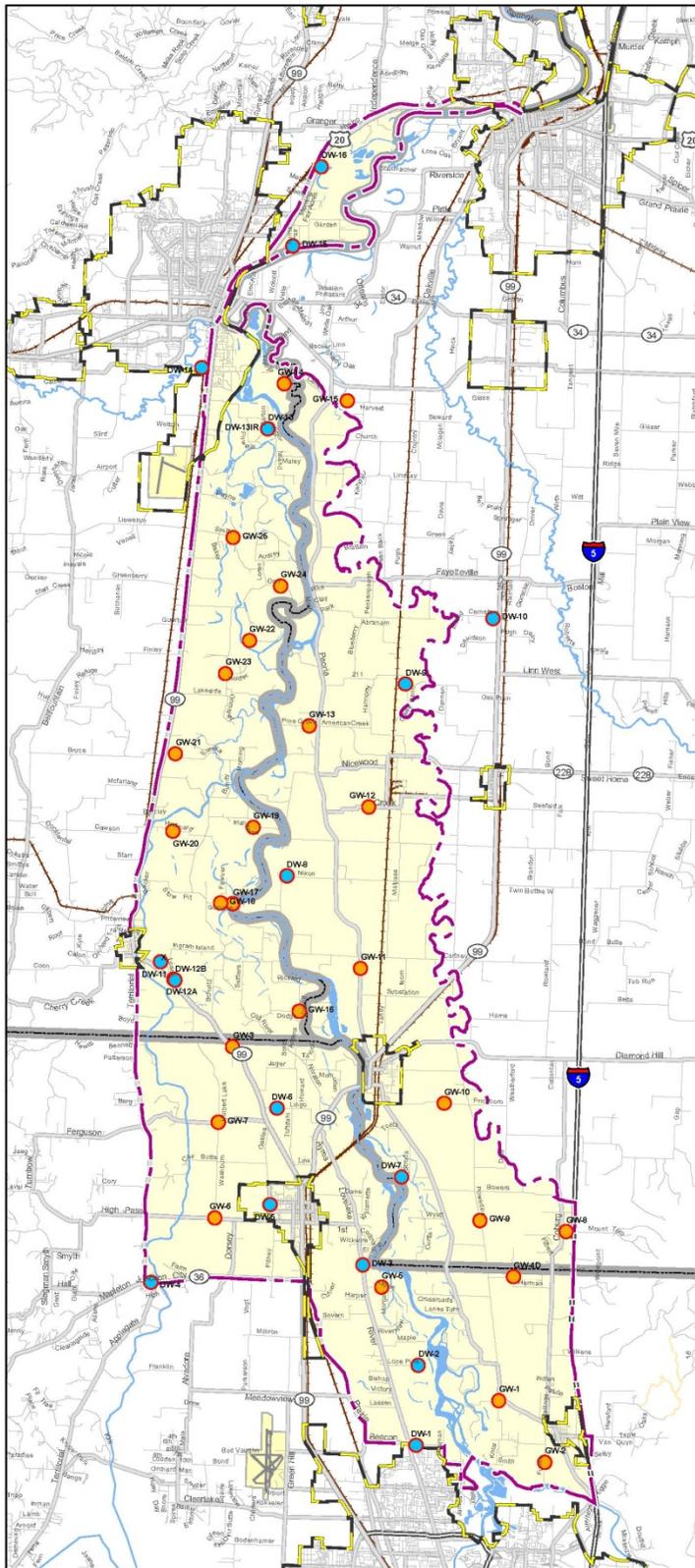
Based on the 2014 and 2015 Data Assessments, it has been agreed that we will use twenty-four wells for the formal Long-Term Monitoring Network. These 24 wells will be used to gauge future changes in water quality in the GWMA. Other wells have been included in DEQ's monitoring because they provide important information for the project; but those wells will not be used to determine how nitrate trends are faring year to year. In addition, 3 monitoring wells (GW-2, GW-23 and GW-25) and 2 domestic wells (DW-2 and DW-12a) were also permanently removed from the analytical program, although groundwater elevations may still be collected from those monitoring wells. The monitoring strategy can be seen on the below map entitled *Long Term Monitoring Sites: Well Status and Monitoring Frequency*.

The 2013-2014 Groundwater Nitrate Evaluation found the following nitrate concentration trends for those 24 Long Term Monitoring Network Wells as: increasing for 9 wells; decreasing for 10 wells; and remaining steady for 5 wells. Many other groundwater evaluations have been conducted since 2006. Those assessments can be found in the Meetings sections of GWMA Webpage:

<http://gwma.oregonstate.edu/meetings>

# Monitoring Grid for the Southern Willamette Valley Groundwater Management Area



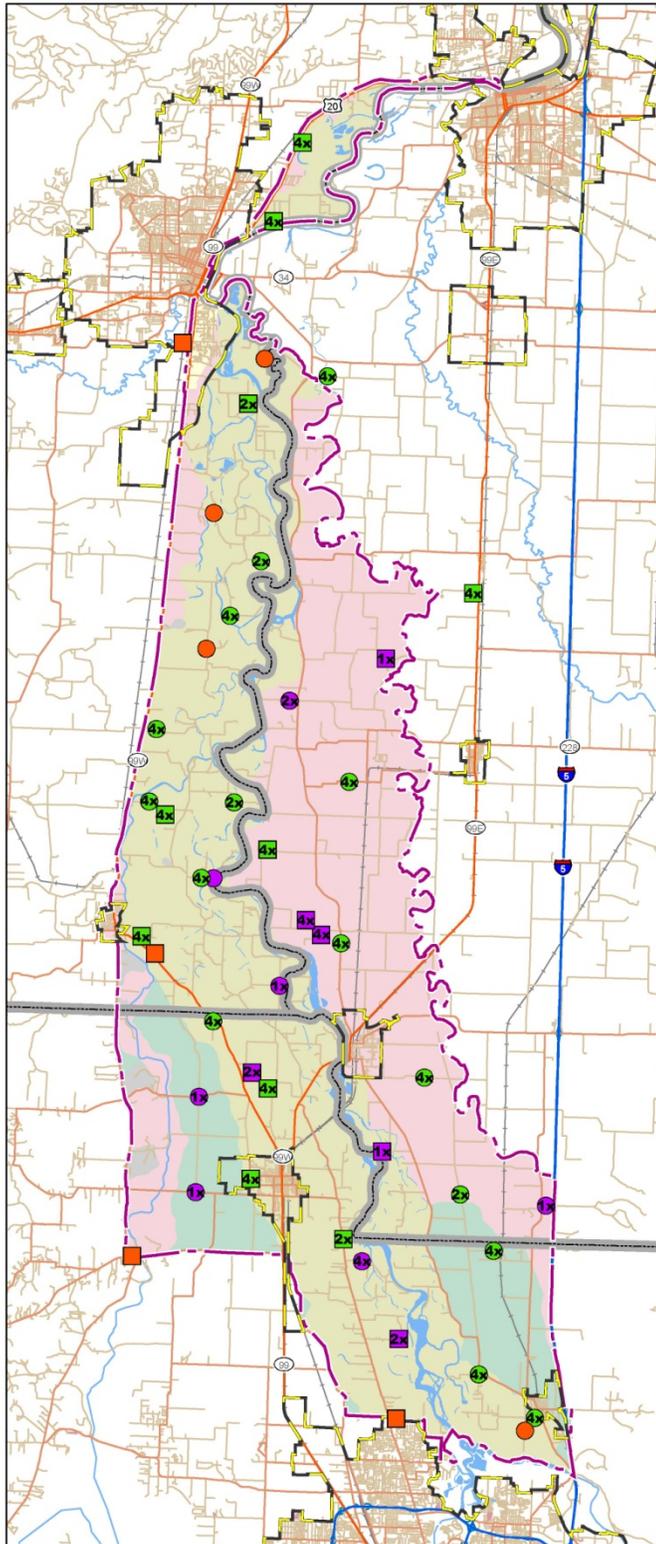


2006 Monitoring Locations in the SWV GWMA

- Domestic Well
- Monitoring Well

MAP PRODUCED BY  
**LCOG**  
 Map Document: (G:\projects\EPA\_S01\Map\Audrey\_071105.mxd)  
 1/16/2007 - 9:18:36 AM

# Southern Willamette Valley Groundwater Management Area



## Long-Term Monitoring Sites Well Status & Monitoring Frequency

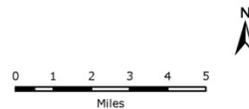
### Legend

- Groundwater Management Area
- Urban Growth Boundaries
- County Boundary

### Well Type & Monitoring Status

- Drinking Water Wells**
  - DW, Long Term Assessment
  - DW, Removed
  - DW, Special
- Ground Water Wells**
  - GW, Long Term Assessment
  - GW, Removed
  - GW, Special

#x is the monitoring frequency per year.



G:\projects\DEQ\GWMA\_10\gwma\_wel\_Metadata\_150218.mxd Results.mxd  
Tuesday, February 24, 2015

## Proposed Process to Rescind the Southern Willamette Valley GWMA

Oregon law is pretty vague on how a GWMA is rescinded<sup>1</sup>. We could look at the process used when this GWMA was declared (briefly discussed in Chapter 2 of the Action Plan) to infer that a similar process would be applicable for the repeal.

Any process for rescinding a GWMA should address nitrate contamination in both regional groundwater quality and public/private well water quality. It must also recognize that once groundwater is contaminated, remediation takes a long time. Any process to repeal a GWMA must consider this.

DEQ does test a number of wells that are part of the SWV GWMA monitoring network; but water quality within public and private groundwater supplies may not always reflect water quality within the regional groundwater system (i.e., there may be nearby point source activities that are local contributing factors but remain regionally insignificant.) The wells used for long-term monitoring of the SWV GWMA can be good first indicators of groundwater quality changes; however, additional testing would need to substantiate a recommendation to rescinding the GWMA Declaration.

The *Indications of Improving and Worsening Water Quality* and the *Indications of Awareness and Engagement Conditions* charts are excellent tools to evaluate quantitative and qualitative trends. Multiple successive assessments coupled with some water quality within the regional groundwater system reaching a point where it is not considered to be *significantly impaired* for a *sufficient period of time* (i.e., modeling that demonstrates groundwater quality appears to be “less than 7.0 mg/L nitrate-N” for 2 years) would trigger a reassessment of the water quality within the regional groundwater system to ensure similar conditions.

This reassessment would include the same type of evaluations that were used as a basis for declaring a GWMA. The question to be asked is: Would the current data collected during this reassessment support declaring a GWMA? Those assessments could include (but not limited

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<sup>1</sup> **468B.188 Repeal of declaration of ground water management area.** (1) If, after implementation of the action plan developed by affected agencies under ORS 468B.184 to 468B.187, the ground water improves so that the levels of contaminants no longer exceed the levels established under ORS 468B.180, the Department of Environmental Quality shall determine whether to repeal the ground water management area declaration and to establish an area of ground water concern.

(2) Before the declaration of a ground water management area is repealed under subsection (1) of this section, the Department of Environmental Quality must find that, according to the best information available, a new or revised local action plan exists that will continue to improve the ground water in the area and that the Department of Environmental Quality finds can be implemented at the local level without the necessity of state enforcement authority.

(3) Before the Department of Environmental Quality terminates any mandatory controls imposed under the action plan created under ORS 468B.184 to 468B.187, the ground water management committee must produce a local action plan that includes provisions necessary to improve ground water in the area and that the department finds can be implemented at the local level without the necessity of state enforcement authority. [Formerly 536.169]

to): a synoptic monitoring event (up to 250 locations in addition to the current long-term monitoring); an assessment of the recent Real Estate Transfer data; and an evaluation of the Public Water Supply data.

If a GWMA would not be declared solely on the assessment of current data, a *sufficient amount of time* should pass (timeframe to be recommended by the GWMA Committee – perhaps another 2 years) before a confirmation evaluation would occur. If the confirmation evaluation (could be similar to the first reassessment or could reflect a subset of that approach) also concludes that a GWMA would not be declared based on current data, the GWMA could be down-graded to a “GWMA watch” status<sup>2</sup>. The length of time for this watch status to be in place should be decided by the GWMA Committee.

For the time period between the triggered GWMA reassessment and the GWMA confirmation evaluation, the focus of the GWMA Committee and agency staff could be directed towards screening wells with nitrate concentrations above 7 mg/L to determine if they are impacted by local point source activities, with the intent of offering technical assistance to landowners in the vicinity of locally impacted wells.

If nitrate concentrations within the regional groundwater system were then observed to show an increasing trend over what the GWMA Committee deems to be a significant amount of time, it would trigger another GWMA evaluation event that could push the GWMA back to an “active” status. However, the GWMA Committee would be able to use the data of *no notable increasing trends over a significant period* of time, they could recommend to Oregon DEQ a complete repeal of the GWMA.

### **The Proposed Process**

- 1) Successive nitrate groundwater quality assessments (monitoring network plus some regional groundwater data) do not conclude the groundwater to be significantly impaired.
- 2) Conduct a reassessment based on similar evaluations used to declaring the GWMA.
- 3) If a GWMA would be declared solely on the assessment of current data, the return to GWMA monitoring status and continue with implementation of Action Plan.
- 4) If a GWMA would not be declared solely on the assessment of current data, conduct a confirmation evaluation after a sufficient amount of time passes.
- 5) GWMA down-graded to a “GWMA watch” status.
- 6) Continue monitoring of the GWMA network, however the GWMA Committee and agency staff directed towards technical assistance to landowners in the vicinity of locally impacted wells.
- 7) If nitrate concentrations within the regional groundwater system are observed to show an increasing trend, that could push the GWMA back to an “active” status.
- 8) If nitrate trends during the GWMA Watch continues to show *no notable increasing trends over a significant period*, recommend to Oregon DEQ a complete repeal of the GWMA.

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<sup>2</sup> Note: the status of “GWMA Watch” is a new concept and would need DEQ concurrence.

Indications of Improving and Worsening Water Quality  
Southern Willamette Valley GWMA – Two Year Assessment

Variable	Indications of Improving Water Quality	Indications of Worsening Water Quality
Overall area-wide nitrate trend	Changed from flat to decreasing	Changed from flat to increasing
Trends at individual locations	Overall, there are more decreasing trends than increasing trends; Each year exhibits predominantly decreasing trends; Decreasing trends are steeper than increasing trends	Overall, there are more increasing trends than decreasing trends; Each year exhibits predominantly increasing trends; Increasing trends are steeper than decreasing trends
LOWESS line through all data	Changed from flat (using all data) to slightly declining	Changed from flat (using all data) to slightly increasing
Public Water Supply data (all GWMA systems)	10% fewer nitrate values above 7.00 mg/L than in the previous 2 years	10% more nitrate values above 7.00 mg/L than in the previous 2 years
Average slope of all trends	Decreased	Increased
New minimum concentrations	≥15% of monitoring stations exhibited new minimum concentrations	
New maximum concentrations		≥15% of monitoring stations exhibited new maximums
Mean concentrations	More than 1/3 of monitoring stations exhibited lower mean concentrations	More than 1/3 of monitoring stations exhibited higher mean concentrations
	Area-wide mean concentration was lower	Area-wide mean concentration was higher

## Indications of Awareness and Engagement Conditions Southern Willamette Valley GWMA – Two Year Assessment

Variable	Indications of Improving Conditions	Indications of Worsening Conditions
Level of awareness and activity (residents)	<ul style="list-style-type: none"> <li>• Surveys document Increased recognition of the GWMA</li> <li>• Surveys document increased recognition of logo and tagline.</li> <li>• Increased number of water tests being conducted</li> <li>• Increased number of hits on the GWMA website</li> <li>• Increased number of times that the GWMA is referenced in media outlets</li> <li>• Increased number of community events at which outreach materials are displayed</li> </ul>	<ul style="list-style-type: none"> <li>• Surveys document less recognition of the GWMA and/or groundwater conditions</li> <li>• Surveys document less recognition of GWMA logo and tagline.</li> <li>• Decreased number of water tests being conducted.</li> <li>• Decreased number of hits on the GWMA website.</li> <li>• Decreased number of times that the GWMA is referenced in media outlets.</li> <li>• Decreased number of community events at which outreach materials are display.</li> </ul>
Level of awareness and activity (farmers)	<ul style="list-style-type: none"> <li>• Increased implementation of BMPs that protect groundwater.</li> <li>• Increased discussions about groundwater protection with field reps.</li> <li>• Increased discussion of the GWMA at Water Quality Management planning meetings (Basin Plans).</li> <li>• Increased presentations at agriculture related venues (such as the Grass Seed Growers conference)</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased implementation of BMPs that protect groundwater.</li> <li>• Decreased discussions about groundwater protection with field reps.</li> <li>• Decreased discussion of the GWMA at Water Quality Management planning meetings (Basin Plans).</li> <li>• Decreased presentations at agriculture related venues (such as the Grass Seed Growers conference).</li> </ul>
Stakeholder engagement/interest	<ul style="list-style-type: none"> <li>• Stakeholders are involved and providing input.</li> <li>• Consistent and/or increasing number of stakeholders attending Committee meetings.</li> <li>• Increasing number of stakeholders viewing “poster session” displays at events.</li> </ul>	<ul style="list-style-type: none"> <li>• Stakeholders are less involved and not providing input.</li> <li>• Decreasing number of stakeholders attending Committee meetings.</li> <li>• Decreasing number of stakeholders viewing “poster session” displays at events.</li> </ul>
Partner agency staff engagement/interest	<ul style="list-style-type: none"> <li>• Partner agency staff are involved and initiating GWMA projects.</li> <li>• Partner agency staff are attending GWMA “all staff” meetings.</li> <li>• Partner Agencies are inviting GWMA representatives to their discussions</li> <li>• Partner Agencies continue to attend GWMA Committee meetings at the same level of participation.</li> </ul>	<ul style="list-style-type: none"> <li>• Partner agency staff have limited (if any) involvement in GWMA projects.</li> <li>• Partner agency staff are not attending GWMA “all staff” meetings.</li> <li>• Partner Agencies are not extending invitations to GWMA Staff to participate in their discussions.</li> <li>• Partner Agency attendance at GWMA Committee meetings drops significantly.</li> </ul>
Strategies implemented in the Action Plan	<ul style="list-style-type: none"> <li>• More than 20% of the strategies remaining in the Action (compared to the previous 2 years) have been actively addressed and progress is reportable.</li> </ul>	<ul style="list-style-type: none"> <li>• Less than 20% of the strategies remaining in the Action Plan (compared to the previous 2 years) have been actively addressed.</li> </ul>
		<ul style="list-style-type: none"> <li>•</li> </ul>
