DEQ Water Quality Division

First Four-Year Evaluation of Action Plan Success And 2001 Annual Progress Report For the Lower Umatilla Basin Groundwater Management Area

November 2002

State of Oregon
Department of
Environmental
Quality

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Department of Environmental Quality

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1.0 INTRODUCTION

This report describes the progress made towards implementation of the Lower Umatilla Basin Groundwater Management Area Action Plan during the year 2001. In addition, because four years have elapsed since adoption of the Action Plan, Section VIII, item B.2 of the Action Plan requires a review and evaluation of the effectiveness of the Plan be conducted as a joint effort between DEQ, ODA, the Committee, and the local lead organizations and local governments. To that end, a discussion of some activities conducted in 1998 through 2000 is also included. As part of this review and evaluation, an assessment of the success of the Action Plan to date has been made.

This report was prepared by the Oregon Department of Environmental Quality (DEQ) using information provided by the affected and interested parties involved in the Lower Umatilla Basin Groundwater Management Area. It should be noted that many of the parties contributing to this document are also doing other activities that are protective of groundwater both within and outside the GWMA. However, these "other activities" are not mentioned in this document because they are not directly applicable to implementation of the Action Plan.

This section of the report provides information on the establishment of the Lower Umatilla Basin Groundwater Management Area, the purpose of this report, important facts about nitrate, the goals of the Action Plan, and ways to measure success of the Action Plan.

1.1 Establishment of Lower Umatilla Basin Groundwater Management Area

Oregon's Groundwater Protection Act of 1989 requires the DEQ to declare a Groundwater Management Area (GWMA) if area-wide groundwater contamination, caused primarily by nonpoint source pollution, exceeds certain trigger levels.

Nonpoint source pollution of groundwater results from contaminants coming from diffuse land use practices, rather than from discrete sources such as a pipe or ditch. The contaminants of nonpoint source pollution can be the same as from point source pollution, and can include sediment, nutrients, pesticides, metals, and petroleum products. The sources of nonpoint source pollution can include construction sites, agricultural areas, forests, stream banks, roads, and residential areas.

The Groundwater Protection Act also requires the establishment of a local Groundwater Management Area Committee comprised of affected and interested parties. The committee works with and advises the state agencies that are required to develop an action plan that will reduce groundwater contamination in the area.

The Lower Umatilla Basin GWMA was declared in 1990 after nitrate contamination was identified in a 352,000-acre area in the northern portions of Umatilla and Morrow Counties. Groundwater samples from private wells identified nitrate contamination above the federal safe drinking water standard in many samples collected from the area. A four-year comprehensive study of the area was conducted in the early 1990s by the DEQ, the Oregon Water Resources Department, and the Oregon Health Division (now known as the Department of Human Services). The 1995 report titled "Hydrogeology, Groundwater Chemistry, & Land Use in the Lower Umatilla Basin Groundwater Management Area" identified five potential sources of nitrate loading to groundwater:

1. Irrigated Agriculture
2. Land Application of Food Processing Water
3. Septic Systems (rural residential areas)
4. Confined Animal Feeding Operations, and
5. The Umatilla Chemical Depot Washout Lagoons

The Lower Umatilla Basin Groundwater Management Area Action Plan was finalized in December 1997. The Action Plan details the activities to be conducted by the various agencies and organizations involved. The Umatilla and Morrow County Soil and Water Conservation Districts are the local agencies leading implementation of the Action Plan. The ODEQ and ODA have oversight responsibility. Local governments,

private industry, and the US Army are also involved in implementation of the Action Plan. The Action Plan recommends general activities and specific tasks to be conducted by involved agencies and groups representing the five sources of nitrate loading. The Action Plan also identifies methods and a schedule for evaluation of the Action Plan progress. It was decided to implement the Action Plan on a voluntary basis recognizing that individuals, businesses, organizations, and governments will, if given adequate information and encouragement, take positive actions and adopt or modify practices and activities to reduce contaminant loading to groundwater. The ODEQ samples a network of 38 wells every other month for analysis of nitrate. Approximately once a year, these wells are sampled for a larger list of analytes including major ions, metals, and additional pesticides. These data are being used to evaluate changes in groundwater quality over time in response to adoption of BMPs. Progress is being made at land surface, but it may take years or even decades for groundwater quality to return to natural background levels.

1.2 Purpose Of This Report

In accordance with Section VII, Item B.1 of the Action Plan, the purpose of this report is to outline the activities undertaken by the various interested parties related to implementation of the Action Plan during the year 2001. In addition, this report gauges the success of Action Plan implementation during the first four years of implementation (i.e., 1998 through 2001) and provides an update to Section VII of the Action Plan. Finally, groundwater quality information collected from the bi-monthly monitoring well network is presented.

1.3 Important Facts About Nitrate

The following information is, in large part, from the June 2001 Oregon Health Division's Technical Bulletin - Nitrate Health Effects Information. Edits have been made to the "What is Nitrate and What Are Its Uses" section of the Technical Bulletin and a few comments on of blue baby syndrome have been included. This background information is provided to educate the reader and provide a context for the remainder of the report.

Nitrate Synonyms

There are no synonyms for nitrate but there are a number of nitrogen compounds that are important in nitrate effects including nitrites, amines and nitrosamines. All may be present along with nitrates in the environment and in the human body.

What Is Nitrate And What Are Its Uses

Nitrate is a naturally occurring oxide of nitrogen. Nitrogen is always present in the air and it reacts with oxygen and ozone to produce several nitrogen oxides of which nitrate is one. Nitrogen oxidation also occurs in aerobic growing and decomposing biological systems such as soils. Nitrogen is an essential component of living things and is a major component of animal manure, human sewage waste and many commercial fertilizers. Nitrogen in the environment occurs in organic and inorganic forms. There are two dominant inorganic forms: nitrate and ammonia. Most organic and inorganic nitrogen fertilizer sources are ammonia or organic based, not nitrate. Organic nitrogen converts to ammonia which gets oxidized to nitrate by the soil's microbiological system. Most plants take up nitrogen in the nitrate form. Nitrate must be present in the soil for adequate nitrogen uptake by plants. Nitrate has been used for centuries as fertilizers, in explosives and as a food preservative.

How Can I Be Exposed To Nitrates

Everyone is exposed regularly to nitrates because of their presence in foods, in water and because they are formed during digestion and metabolism in our bodies. Nitrates are not harmful unless our exposure to them is excessive. Very young infants, persons taking nitrogen-containing medications, persons who work with nitrates occupationally, and persons with genetic susceptibility to nitrates are harmed at lower exposure levels than others; but high nitrate exposures above the current MCL may be harmful to everyone.

Occurrence And Sources Of Nitrate In Water Supplies

Naturally occurring levels of nitrate in surface and groundwater do not generally exceed 2 milligrams per liter (mg/l). Sources of nitrate in water include fertilizers, septic systems, animal feedlots, industrial wastes, and food processing waste. It can also be naturally occurring in certain geological settings, and can result from decaying

organic matter. Elevated levels of nitrate found in well water usually indicate improper well construction or location, overuse of chemical fertilizers or improper disposal of human and animal waste in the vicinity of the well. Water with less than 10 mg/l nitrate as nitrogen (NO_3-N) is generally safe for all household activities including use in foods and beverages.

Health Effects Of Drinking Nitrate Contaminated Water

The United States Environmental Protection Agency (USEPA) has set a maximum contaminant level (MCL) of 10 mg/l for nitrate (NO_3-N) in public water supplies. Nitrate levels above 10 mg/l may present a serious health concern for infants and pregnant or nursing women. Adults receive more nitrate exposure from food than from water. Infants, however, receive the greatest exposure from drinking water because most of their food is in liquid form. Nitrate can interfere with the ability of the blood to carry oxygen to vital tissues of the body in infants of six months old or younger. The resulting illness is called methemoglobinemia, or "blue baby syndrome".

Pregnant women may be less able to tolerate nitrate, and nitrate in the milk of nursing mothers may affect infants directly. These persons should not consume water containing more than 10 mg/l nitrate directly, added to food products, or beverages (especially in baby formula). Other domestic uses of affected water such as irrigation, washing and bathing do not result in nitrate absorption. The 10 mg/l standard for NO_3-N in public drinking water supplies has been devised to protect a select group of sensitive persons (infants, and pregnant and nursing women).

It has been suggested in human studies that nitrate ingestion may be linked to gastric or bladder cancer. This link, however, has not been firmly established and current exposure levels do not appear to put the population at risk. There is also some evidence that areas having elevated nitrate in drinking water may have increased incidence of spontaneous abortion.

It should be noted that some members of the LUB GWMA Committee believe that blue baby syndrome has not been shown to be a problem in the LUB GWMA. Their belief is based on the lack of reported cases of the illness in the area. Other members of the LUB GWMA Committee counter that argument by noting that the medical community is not required to report cases of blue baby syndrome. Regardless of the extent of the blue baby syndrome in the area, the LUB GWMA Committee is committed to reducing the level of nitrate contamination in groundwater.

Removing Nitrate From Drinking Water

Heating or boiling water containing nitrate will not remove the nitrate, the loss of water actually concentrates it. Options to consider if the water supply is contaminated with nitrate above the 10 mg/l level include using bottled water for drinking, and for food and beverage preparation, or installing a home water treatment unit. Mechanical filters or chemical disinfection, such as chlorination, do not remove nitrate from water. Nitrate may successfully be removed from water using treatment processes such as ion exchange, distillation, and reverse osmosis. These treatment techniques require careful maintenance and sampling to achieve and confirm effective operation. If a treatment system is to be used, one with National Sanitation Foundation (NSF) certification should be selected. For additional information on these options, contact the Drinking Water Section of the Department of Human Services at (503) 731-4010.

1.4 Action Plan Goal

The ultimate goal of the Action Plan is to seek solutions to protect the area's groundwater. Recommended solutions should, within a reasonable time, bring the level of nitrate-nitrogen in the groundwater back below the 7 mg/l level triggering the declaration of a GWMA.

1.5 Action Plan Implementation

The Action Plan recommends general activities and specific tasks to be conducted by involved agencies and groups representing the five sources of nitrate loading. The Action Plan identifies methods and a schedule for evaluation of the Action Plan progress. The Action Plan is also voluntary. It was decided to implement the Action

Plan on a voluntary basis recognizing that individuals, businesses, organizations, and governments will, if given adequate information and encouragement, take positive actions and adopt or modify practices and activities to reduce contaminant loading to groundwater.

1.6 Measures of Action Plan Success

The Action Plan includes specific ways to gauge success that are focused on each sector. Assessments are primarily conducted on four-year cycles. The specific parties to conduct the assessment are also identified. For each of the five sectors, some benchmark information was to be obtained within 2 years. Other measurable goals for each sector are at 4, 8, 12, etc. years after Action Plan adoption.

2.0 EDUCATION / OUTREACH ASPECTS OF ACTION PLAN IMPLEMENTATION

This section of the report includes information on the educational / outreach activities conducted as part of the Action Plan implementation, general cataloging of information, printed material available, information sources, and future needs in education / outreach.

2.1 Educational / Outreach Activities Conducted

General Information

The Umatilla County SWCD has performed educational and outreach activities focused on the irrigated agriculture and rural residential sectors of the LUB. The Umatilla County SWCD also assists and supports educational meetings held by county extension agents.

The Umatilla County SWCD developed a "Lower Umatilla Basin Groundwater Management Area Education and Outreach Plan" dated December 23, 1997. The plan set forth two goals: 1) Emphasize through education and outreach, the economic importance of groundwater to the citizens of the Lower Umatilla Basin; and 2) Develop steps or measures that increase awareness of groundwater problems and the need for protecting and improving the quality of the resource.

Examples of specific Umatilla County policies to address the educational aspect of the Action Plan implementation include:

1. Umatilla County will maintain a library of materials and contacts regarding BMPs to prevent water contamination.
2. Umatilla County may require video viewing or training regarding septic system maintenance as a condition of development approval.
3. Umatilla County may require video viewing or training regarding proper well placement, construction, and maintenance as a condition of development approval.
4. Umatilla County shall coordinate with other concerned entities to develop an outreach program regarding proper well and septic system maintenance, livestock containment, and lawn fertilization and irrigation.
5. Umatilla County will coordinate with the LUB GWMA committee in establishing an educational program regarding water contamination within the western portion of the County.

The Morrow County Planning Department regularly distributes written materials about groundwater quality, OSU Home-A-Syst information, etc. to landowners. The distribution of this groundwater quality information is made a condition of approval of many land use permits, including subdivisions and partitions in residential zones. In addition, a general disclaimer about the impact a proposed development may have on groundwater quality is included in almost every "Finding of Fact" report for land use actions.

Examples of specific Morrow County policies to address the educational aspect of the Action Plan implementation include:

1. Morrow County maintains a library of materials regarding BMPs to prevent water contamination.
2. Morrow County coordinates with the LUB GWMA committee in establishing an educational program regarding water contamination.

Wellness Seminar

Dr. Peter Weyer, of the University of Iowa, spoke at Good Shepherd Hospital, in Hermiston, regarding his research connecting increased bladder cancer risk from nitrate contaminated groundwater. Invitations were sent out by Umatilla County SWCD staff and Good Shepherd staff to area physicians, medical agencies and within Umatilla County. A seminar was held on October 24, 2001 at Good Shepherd Hospital and attended by five medical doctors and 10 other agency staff. Dr. Weyer made a second presentation to ODEQ water quality staff in Portland on October 25, 2001. Approximately 20 DEQ staff attended his presentation.

Public Schools and Civic Groups

The City of Boardman has had an active interest in groundwater education since the early 1990s. The City offers public education in a variety of subjects, including groundwater, to public schools of the area and interested civic groups. Classes have been taught to grades 2 through 12 in the public schools. The City has a groundwater model that is used in several of the classes to show how contamination in groundwater can affect this area. This activity has garnered press coverage in previous years, which further spread the information to the public.

The City of Boardman has developed and distributed flyers and handouts on the Wellhead Protection Area to schools, at civic functions, and other opportunities.

DEQ personnel periodically visit local schools to demonstrate ways to prevent pollution of groundwater and surface water by using a groundwater model and an Enviroscape® model.

OSU Extension staff in Hermiston have discussed recommended practices to reduce nitrogen loading to the groundwater at Hermiston High School and to local Cub Scout troops.

Umatilla County Fair

The Umatilla County SWCD manned a booth at the Umatilla County Fair in 2001. The subject of the booth focused on health risks associated with contaminated groundwater (nitrate) and the Umatilla River Subbasin Agricultural Water Quality Management Area Plan. Staff conducted an informational survey asking respondents about their knowledge of the groundwater management area and methods to improve groundwater quality. 46 fair attendees completed the survey over the week. Nitrate detection test strips were available to take home for well water testing. The SWCD has the survey report available at the office.

WINME Program

The USDA grant program known as Sustainable Agriculture Research and Education (SARE) sponsored an $87,000 grant for a nutrient management education program known as Western Integrated Nutrient Management Education (WINME). This grant was particularly targeted for NRCS staff that have the new-found duties of being responsible for nutrient management plans for both fertilizer and organics such as manure. A training session was held in Prosser in 2001.

Farm Fair

The ODA Basin Planner spoke at the 2001 Hermiston Farm Fair AG Issues Forum on the topic "The 1010 Rule, TMDL & Other Regulations". The presentations covered SB1010 and TMDL information usually associated with surface water issues. The Agricultural Water Quality Management Program (SB1010) authorizes ODA to "develop and implement any program or rules that directly regulate farming practices…that are for the purpose of protecting water quality…including but not limited to rules related to protection of the quality of surface or groundwater." (ORS 561.191) Until we have a better understanding of groundwater movement and interconnection with surface water in the LUB GWMA, we will expect that the BMPs recommended for surface water protection will also be effective for groundwater protection. The proper management of irrigation water and nutrient application will prevent and control both runoff into surface water and leaching into groundwater.

The Umatilla County SWCD Program Manager made a presentation at the Farm Fair titled "Programs to Assist with New Regulations and Environmental Concern". Approximately 40 people attended the session held

November 29, 2001. Nutrient and irrigation management issues are also discussed with growers on an individual basis.

In addition, there was also a general session on crop management for improving grower BMPs.

Water Wells

On a daily basis, Oregon Water Resources Department (WRD) staff answers questions from the public and well contractors on well construction issues. When a new or recently constructed well is found to be commingling water, the well is repaired or abandoned. When people contact the WRD staff with water quality problems, well construction and well placement are investigated as the possible cause of the problem. WRD staff educates the public on how poor well construction can lead to poor water quality.

On the second Monday of every quarter, the WRD gives its test for new water well drillers. A week prior to this test, a four hour class is offered to individuals wishing to take the test. In this class the State well construction rules and statutes are discussed. Heavy focus is placed on well location, sealing depth, areas of known nitrate contamination, alternative well construction methods, under reamer systems, and telescoping casing methods of construction. In addition to the new driller education, WRD staff works with SWCD and other agencies on workshops for realtors and other interested public. Some of the topics covered in these workshops include basic well construction, sand point wells, well location, well abandonment, and water rights.

The 2001 legislature passed continuing education requirements for drillers to renew their licenses under ORS 537.747(5).

Confined Animal Feeding Operations (CAFOs)

In cases where non-permitted CAFOs land-apply wastes, ODA offers educational reviews designed to assist operators in identifying potential pollution pathways associated with waste application. The CAFO program encourages, and has required in several instances, development of an Agricultural Waste Management Plan. Through this process, appropriate BMPs are identified that are protective of waters of the state.

LUB Citizens Advisory Committee Meeting

The LUB Citizens Advisory Committee met on October 3, 2001. The meeting focused on finalizing the 2000 Annual Progress Report. The Committee approved the final draft with changes. Fourteen members attended the meeting.

DEQ / Food Processor Workshop

On August 29, 2001, a DEQ / Food Processor Workshop was held at DEQ to discuss land application issues. Attendees included members of the food processor community and DEQ. Topics of conversation included:

- Improving the guidance for Operation, Maintenance, and Monitoring (OM&M) Plan preparation,
- Nitrogen and hydraulic loading rates,
- Nitrogen and hydraulic balance,
- Groundwater Reporting and Data Analysis, and
- Improving communications and sharing information.

Re-use Water Consortium Meeting

On September 27, 2001 the first annual re-use water consortium meeting was held at the Port of Morrow to discuss land application issues. Attendees included members of the food processor community and DEQ. Topics of conversation included:

- Pivot water management and measuring water flow,
- The value of re-use materials,
- Soil moisture monitoring,
- Importance of our agriculture to the world's food supply and environment,
- The nitrogen cycle,

- Total dissolved solids analysis including organic vs. inorganic solids, volatile vs. non-volatile solids, ways to monitor TDS, and crop removal.

Re-use Water Consortium Meeting Follow-up Meeting

On September 28, 2001 a follow up meeting to the first annual re-use water consortium meeting was held at the Oregon State University Agricultural Experiment Station in Hermiston. Attendees included members of the food processor community and DEQ. Topics of conversation focused on the previous day's topics.

2.2 Residential Survey

The Umatilla County SWCD submitted an EPA/DEQ 319 grant application to conduct a survey that follows up on a May 1999 survey. The grant was funded in October 2002. Results of the survey will be discussed in the 2002 Annual Progress Report.

The May 1999 survey, conducted in conjunction with the Blue Mountain Community College, involved a telephone survey of 100 LUB residents to gauge their knowledge of water quality issues in the basin, including high nitrate levels in the groundwater. Results of the survey were presented in a June 30, 1999 final report. According to Jim Loiland, the Umatilla County SWCD Water Quality Coordinator at the time, "the survey results indicate we need to continue to remind residents of nitrate levels and other groundwater issues".

2.3 General Cataloging of Information

A bibliography of groundwater information is maintained at the Umatilla County SWCD office. The bibliography includes a wide range of information on topics related to groundwater issues.

The Umatilla County SWCD has a list of information and people knowledgeable in groundwater protection management for different sectors. The list is available at the Umatilla County SWCD office.

The City of Boardman maintains an information library which includes the Lower Umatilla Basin Study, the LUB Action Plan, the Wellhead Protection Study, inventories of all well logs filed with the Water Resources Department in Township 4N / Range 25E, numerous materials on groundwater protection strategies for construction, storm water management and others. This information is available to the staff, decision-makers in the community, and the general public for review or research.

Umatilla County recognizes groundwater quality and quantity as a concern. Under the State-mandated Periodic Review process, Umatilla County included groundwater quality and quantity in its Periodic Review Work Program. Umatilla County staff has made an inventory of groundwater studies conducted in Umatilla County by various agencies. Specific areas having groundwater quality and quantity problems for the entire County were identified based on the studies inventoried. DEQ, SWCD, EPA, and OWRD are working with the County to address these concerns in response to DLCD's remand of the County's Periodic Review.

2.4 Printed Material

Newspaper Articles

Several articles have appeared in local newspapers discussing the groundwater nitrate problem as well as other water quality concerns in the area. Examples include:

- "Lesson Makes Splash – DEQ program teaches value of clean water", East Oregonian, June 6, 2001

BMP Handbook

The Umatilla County SWCD staff has a Best Management Practices Handbook describing BMPs for air, surface water, and groundwater in one user-friendly document. The handbook was created to make available to the farmer the BMPs for soil erosion and water quality protection (both groundwater and surface water) in the Umatilla Basin in an easy to use and practical format. The document is available at the Umatilla County SWCD office.

A Consumer's Guide to Water Well Construction, Maintenance, and Abandonment

The Oregon Water Resources Department updated the Consumer's Guide to Water Well Construction, Maintenance, and Abandonment in 2001. The document includes information on common well construction questions such as proper set back requirements, well abandonment, drilling your own well, and other well topics. This pamphlet is handed out to anyone inquiring about wells. This pamphlet is also made available to other agencies for their uses in dealing with the public. Individuals with Internet access can obtain a copy at www.wrd.state.or.us under the publication link.

Spanish Version of Nitrate Technical Bulletin

One of the recommendations made in the 2000 Annual Progress Report was to get educational materials produced in Spanish and make them available to the Spanish-speaking population within the GWMA. To that end, the DEQ contacted the Oregon Health Division and asked if they had a Spanish version of their Nitrate Technical Bulletin. They said they did not currently have one, but would get it translated. They produced a Spanish version of their technical bulletin discussing the following topics related to nitrates:

- what is nitrate and what are its uses,
- how can I be exposed to nitrates,
- occurrence and sources of nitrate in water supplies,
- health effects of drinking nitrate contaminated water, and
- removing nitrate from drinking water.

The Spanish version of the technical bulletin was transmitted to:

- Oregon Health Division Drinking Water Program in Pendleton
- Oregon Health Division Drinking Water Program in Springfield
- Umatilla County Planning Department
- Morrow County Planning Department
- Umatilla County Soil & Water Conservation District
- Umatilla County Health Department
- Morrow County Health Office
- Columbia Basin Board of Realtors (through Miller Realty)
- Oregon Dpt of Human Resources in Pendleton (staff working with infants and nursing mothers)
- Oregon Dpt of Human Resources in Hermiston (staff working with infants and nursing mothers)
- DEQ Headquarters

Other Educational Printed Material

The following educational materials are available at the Umatilla County SWCD:
Tips on Land & Water Management for Small Acreages in Oregon
Blue Thumb Pamphlet, Water Conservation Tips
Basic Guide for Lawn Maintenance (Pendleton Public Works Pamphlet)
Home*A*Syst pamphlet and worksheets 1-11
Farm*A*Syst overview booklet titled "Twelve simple things you can do to protect well water"
Home*A*Syst pamphlet titled "Why do septic systems fail?"
Groundwater: Pollute or Preserve? It's Your Choice (OSU Extension Circular 1343)
LUB Groundwater Action Plan
Oregon Groundwater Community Involvement Program
"I Love Water" pamphlet

2.5 Information Sources

The following table contains contact information for various topics related to the GWMA.

Topic	Contact	Organization	Telephone #
Irrigated Agriculture BMP Implementation	Ray Denny Janet Greenup Don Horneck Bob Adelman	Umatilla County SWCD Morrow County SWCD OSU Extension NRCS	(541) 276-8170 (541) 676-5452 (541) 567-8321 (541) 278-8049
Health effects of nitrate and/or how to remove nitrate from your drinking water	Drinking Water Section	Oregon Health Division	(503) 731-4010
Protecting groundwater quality while developing property	Tamra Mabbott Patty Perry	Morrow Co. Planning Umatilla Co. Planning	(541) 922-4624 (541) 278-6252
Groundwater quality protection guidelines related to lawn and garden maintenance	Ray Denny Don Horneck	Umatilla County SWCD OSU Extension	(541) 276-8170 (541) 567-8321
Groundwater quality protection guidelines related to well construction and maintenance	Brian Mayer	Oregon Water Resources Department	(541) 278-5456
Groundwater quality protection guidelines related to animal density	Eric Moeggenberg	Oregon Department of Agriculture	(541) 475-7155
DEQ's bi-monthly monitoring well network	Phil Richerson	Oregon Department of Environmental Quality	(541) 278-4604
Properly siting, installing, and maintaining a septic system	Bernie Duffy or Bob Marshall	Oregon Department of Environmental Quality	(541) 276-4063

2.6 Future Needs in Education / Outreach

The following items have been identified that would assist in the education and outreach aspects of Action Plan implementation:

- Complete the follow up survey to the 1999 Rural Residential Survey
- Translate additional educational materials into Spanish and make them available to the Spanish-speaking population within the GWMA.
- Completion of the follow up survey to the baseline rural residential survey conducted in 1999

3.0 DETERMINATION AND IMPLEMENTATION OF BMPS

This section of the report includes discussions of various research projects for determining BMPs relevant to the Lower Umatilla Basin. Examples of specific BMPs implemented are also discussed.

3.1 Research into BMP Determination

Research into BMPs has occurred on several levels since declaration of the GWMA. Specific activities related to BMP determination for irrigated agriculture and rural residential development are discussed below.

Irrigated Agriculture

Most agri-chemicals, including nitrogen fertilizers, currently used in the LUB are applied through, or at least under, center pivot irrigation systems. If nutrients and irrigation water are not properly managed, nitrate can leach through the root zone and contaminate groundwater. The primary BMPs to minimize nitrate leaching, cited throughout the scientific literature, are proper irrigation management and the metering of fertilizer throughout the season.

Proper irrigation management involves the careful monitoring of the soil moisture in the root zone and scheduling irrigation to maintain soil moisture near field capacity. The goal of irrigation management is to prevent over-irrigation and under-irrigation.

Proper nutrient management involves knowing the type, amount, and timing of fertilizer application so that no more nutrients are applied than the crop needs so that excess nitrate is not available for leaching. As with soil moisture, knowing the amount of each nutrient in the soil and how much the crop needs allows the application of just the right amount of fertilizer. With the development of chemigation techniques, such metered applications of fertilizer are possible through center pivot and drip irrigation systems.

Some of the past research into determining BMPs for irrigated agriculture in the LUB has revolved around quantifying what constitutes proper irrigation and nutrient management for the local crops, soils, and climate. By quantifying nitrogen present below the root zone, a grower is able to adjust nutrient management practices by adjusting application timing and rates and/or elect to plant an appropriate deep-rooted crop to capture excessive levels of deep nitrogen thus averting nitrate leaching to groundwater. The primary goal of a series of projects partially funded through DEQ's Nonpoint Source Management Program (also known as the 319 program) and involving landowners, IRZ Consulting, and OSU Extension service, was to demonstrate to growers the direct benefits of using deep soil sampling and irrigation water analysis as part of their fertilizer and water management program.

OSU Experiment Station staff in Hermiston continue studying nitrogen uptake in potatoes and onions. The potato data is available in a WSU nutrient management guide and the onion information is available in a PNW onion publication. Kentucky bluegrass is currently being researched for nitrogen utilization and optimum fertilizer practices. The bluegrass work is in initial stages. The data has not yet been linked to the Northwest Irrigation Network.

Rural Residential Development

Umatilla County has incorporated groundwater quality concerns in their Comprehensive Plan Policies. Examples of Umatilla County's policies to address groundwater quality issues in the rural residential setting include:

1. Umatilla County recognizes that the development of performance standards will assist in protecting the quality of groundwater.
2. Umatilla County recognizes the Lower Umatilla Basin Groundwater Management Area and will take the actions requested within the Groundwater Management Area Action Plan.
3. Umatilla County will work in cooperation with DEQ and EPA to determine standards to lower nitrate concentrations in groundwater.

4. Umatilla County will work with DEQ and EPA to develop performance standards for land use development to maintain water quality at a sustainable level both within and outside of designated Critical Groundwater Areas.
5. Umatilla County shall work with DEQ to determine the effectiveness of alternative on-site septic systems in removing nitrates.
6. Umatilla County will consider several factors when creating solutions to the groundwater quality limitations on development. These solutions may include but are not limited to performance standards, alternative septic system technologies, transferable development credits, and sewer systems within cluster development sites.
7. Umatilla County will remain informed about the Source Water Assessments of public water systems and will take necessary steps to limit determined sources of contamination to public water systems.
8. Umatilla County shall encourage and assist managers of all public or community water systems to implement a well head protection program for their wells.

The City of Boardman is in the process of Comprehensive Plan Review and a review of the zoning and development ordinances to assess the need for changes. Incorporation of the Wellhead Protection Area into the Comprehensive Plan is part of the required work items under review. Additionally, groundwater protection in general is being looked at within this review. This process is expected to take until 2003 to complete; however, implementation of some of the concepts already identified is currently taking place. The Planning Commission and Boardman City Council have supported these efforts and expect them to be part of the Comprehensive Plan and the Ordinances when they are completed.

No research regarding BMP determination for septic systems in rural residential development, CAFOs or the land application of food processing process water was conducted in the LUB GWMA in 2001.

3.2 BMP Implementation

BMP implementation has occurred on several levels since declaration of the LUB GWMA. Specific examples of BMP implementation are discussed below.

Irrigated Agriculture

The Umatilla County SWCD Water Quality Coordinator created a "Nutrient Management Worksheet" for use by NRCS planning staff working in the Lower Umatilla Basin.

Irrigation Management – Companies like IRZ Consulting and Simplot Soilbuilders play an important role in implementing irrigation management in the LUB.

IRZ's irrigation management service includes soil moisture monitoring, an on-line source of daily crop water use and evapotranspiration reports, the use of aerial infrared photography, the development of comprehensive water conservation plans, and irrigation scheduling software.

Simplot Soilbuilder's irrigation scheduling and crop water management services utilize crop ET rates, plant water uptake within the root zone and moisture movement through the soil profile.

Giddings Probe - OSU Extension Service provides maintenance and one-on-one training for a Giddings Probe used for deep soil sampling. In 2001, a new truck was installed on the probe. It was checked out for 94 days for sampling in Umatilla and Morrow Counties.

The Giddings Probe is used for deep soil sampling. This is of particular value following high nitrogen use, shallow rooted crops. Sampling after crops such as potatoes and onions to depths beyond two feet is difficult with hand probes. The Giddings probe was acquired to allow deeper sampling: to four feet, six feet, or even deeper (samples have been collected from nine feet where soil depth allows). The concept is to measure the amount of residual nitrogen, particularly in the three to five feet zone that might still be pulled back up and utilized by a "sponge crop" such as cereal, grass seed, or sudan grass. Although alfalfa leaves some residual nitrogen itself,

this is generally deposited in the surface two feet and its deeper rooting habit (even to depths of six to seven feet) can be an effective way to move nitrogen back to the surface where it can then be removed with the harvested crop. This concept was very successfully used by a local grower when they were utilizing high nitrogen hog waste from their lagoon and is now being used by another grower utilizing municipal sludge. It could be appropriate for the incoming dairy waste utilization. An area-wide deep sampling study conducted by an OSU Master's student identified additional "hot spots" of nitrogen deposition such as swales.

Implementation of Recommended Management Practices – In addition to the specific goals specified for 2001 (discussed in Section 5.0), the Action Plan also lists several recommended practices for the irrigated agriculture community (Section VI, items A.2.c.1.a through p). Those recommended practices are reiterated below and followed by a statement of activities implemented. The statement of activities implemented is based on the Base Line Survey of Irrigated Agriculture conducted by IRZ Consulting, LLC in 1998.

Recommended Practice 1.a
Encourage growers to develop crop management strategies and plans to address irrigation and nutrient management.

Activities Implemented
On going educational activities by private consultants, OSU Extension, Natural Resource Conservation Service and the Soil & Water Conservation District promote systems that will not contribute to the groundwater problem.

Recommended Practice 1.b
Increase grower awareness of the nitrate problem and provide education and information to assist growers in making informed choices on how best to address concerns on their farms. Additionally, method(s) are needed for determining whether the information and education efforts are changing people's practices to better protect the groundwater resource.

Activities Implemented
The Natural Resource Conservation Service has developed Resource Management System (RMS) plans on 15,465 acres in the GWMA. RMS plans address all resource concerns for soil, water, air, plant and animals for the entire operation. General awareness of nitrate problems and solutions among growers is also increased through interaction at events such as the annual Farm Fair and County Fair.

Recommended Practice 1.c
Irrigation scheduling – Balance irrigation applications with crop needs and soil characteristics throughout the irrigation season. Irrigation scheduling should become the norm for all growers, all forms of irrigation, for small parcels and for major commercial growers. Irrigation districts should encourage irrigation water conservation and the correct timing and placement of water to prevent nitrate leaching beyond the root zone.

Activities Implemented
According to 1998 survey, 100% of respondents practice scheduling to prevent over irrigation. Scheduling information is provided by an irrigation service (100%), landowner predictive system (93.6%), by published charts or tables (39.3%), and other means (5.5%).

Irrigation monitoring is practiced by 99.5 % of the respondents. 68.9% use the soil "feel method" using probe or shovel, 83.1 % use rain gauges, 2.2 % use a tensiometer, 62.3% use neutron probe moisture monitoring, 33.1% use aerial photography. 79.4% utilize a professional service for monitoring.

Recommended Practice 1.d
Plant tissue and soil testing – Determine fertilizer needs based upon crop needs determined by plant tissue and soil testing. Apply only the amount of fertilizer necessary to maintain crop vitality, quality and yields based upon most recent test analyses.

Activities Implemented
Monitoring soil and plant fertility is practiced by 78.3% of the respondents. 68.5% soil sample at least monthly, 37.2% tissue sample at least weekly. 66.6% chart and monitor fertilizer applications.

Recommended Practice 1.e
Nutrient Management - Time nutrient inputs to coincide with crop uptake requirements. Spread fertilizer application over the growing season rather than applying one or two times a year. Minimize the amount of pre-plant nitrogen and maximize amount of water-run seasonal applications. Scheduled fertilization should provide nutrients when a crop is able to use them and should reduce the amount of nitrate readily available for leaching from the soil profile.

Activities Implemented
51.5% respondents attempt to use official OSU/WSU fertilizer guide recommended rates and timing for nitrogen applications (+/- 20%). Of the 51.5% using guide sheets, 41.9% use fertilizer guides and 48.6% use professional services.

Recommended Practice 1.f
Water testing - Test irrigation water for the amount of nutrients in the water before applying fertilizer. Knowing the amount of nutrients a crop receives from irrigation water would help growers avoid over applying nutrients to a crop. Accounting for nutrients in irrigation water would both reduce the amount of excess fertilizer being applied to a crop and the amount of excess nitrate in the soil available to leach to groundwater. This practice will also have the beneficial effect of actively cleaning up and reducing the nitrate in the groundwater by using it for the beneficial purpose of growing a crop.

Activities Implemented
33.6% of respondents monitor irrigation for nitrate concentration.

Recommended Practice 1.g
Deep soil testing – Many growers now utilize shallow soil testing to determine fertilizer rates for high value crops. Growers need to combine shallow soil sampling with deep soil sampling below the root zone (ideally for each foot down to 4 or 6 feet). Deep soil sampling will help growers determine whether nutrients are getting past the root zone of their crops. Knowing the nutrient content of their soil will allow a grower to adjust the water and fertilizer applied to keep them within their crop root zone.

Activities Implemented
Of the 78.3% of respondents that indicated they monitor for soil and plant fertility, 0.5% stated they pre-season or post-season deep soil sample deeper than 3 feet.

Recommended Practice 1.h
Precision farming - Balance fertilizer and irrigation applications to crop requirements according to variations within a field.

Activities Implemented
32.9% responded they use “Precision Farming” methods: 32.3% grid sample, 32.3% use GPS for location, 32.9% use variable rate fertilizer applicators and 28% use variable rate irrigation system. 49.4% of respondents replied they use cropping or tillage systems for wind and water erosion or nitrogen recovery. 67.5% of the respondents who use precision farming indicated they compare pre-season and post-season soil nitrogen profiles, compare nitrogen application to crop uptake, and assess appropriate modifications to future fertilizer inputs.

Recommended Practice 1.i
Minimize water and soil erosion - Avoid the movement of soils and water to low lying areas by controlling run-off and wind-blown erosion. Allowing water and soil to collect in swales or pond on the surface provides an ideal condition for leaching of nitrate to groundwater. Ponded water provides a hydraulic head for pushing water through the soil column while leaching out what nitrate is available in the soil as well as what is already in the water. (Recommended practices would include use of cover crops, dammer-dikes, ripping, etc.)

Activities Implemented
53.0% of respondents utilize winter cover crops to reduce wind and water erosion. 40.7% use dammer-dikes to control wind-blown erosion during row crop rotations. 66.4% use center pivot irrigation, of those 57.4% use low pressure and 49.2% use drop down tubes to effectively target water to crops. 30.8% use drip irrigation targeting water to the root zone.

Recommended Practice 1.j
Manage inputs for lower value crops – Encourage growers to apply practices that reduce nitrate leaching for the entire crop rotational cycle rather than applying them to high value crops only. Low value crops may be causing more of a leaching problem than other crops because they receive less attention. It is recommended that management activities and strategies identified here are applied to all crops grown in the basin, not just high value crops.

Activities Implemented
The four "low-value" crops actively included in cropping rotations consist of alfalfa, hard red spring wheat, soft white wheat and field corn. In the past three years, alfalfa has become the most popular due to market demand. Very little nitrogen is typically used on alfalfa so it does not make a significant addition to the nitrogen load in the groundwater.

Producers growing hard red spring wheat must meet a preset protein content for the crop to be accepted by flour mills. Producers collect tissue samples to track the vigor of the plant so nitrogen inputs are managed.

Lastly, nitrogen inputs for soft white wheat and field corn rely on recommended rates by OSU field guides, certified crop advisors, desired yield and the cost of fertilizer. Nitrogen inputs will vary based on the crop need and expected yield. More education directed to growers regarding nutrient management would help reduce over-fertilization.

Recommended Practice 1.k
Schedule deep rooting crops into a rotation – Deep rooted crops should be included in a rotational cycle to salvage nitrates that moved past the root zones of shallower rooted crops. Utilizing this deeper nitrate makes it unavailable for leaching to groundwater

Activities Implemented
5.9% of respondents indicated they attempt to include a deep-rooted crop in the rotation.

Recommended Practice 1.l
Planting deep rooted trees such as hybrid poplar as a crop or downgradient of a field would provide a crop to absorb nitrate from the soil and possibly from shallow groundwater in some areas.

Activities Implemented
Documentation of this practice cannot be confirmed, however 30,000 acres of former cropland now grows hybrid poplar trees. These trees are grown under drip irrigation in which the water and nutrients needed by the crop are supplied on a metered basis so the plant does not need to extend roots to search out water and nutrients. The trees

do use a lot of water but the water applied to these trees comes from the Columbia River. It is unlikely that these trees have a significant positive or negative impact on the quality or quantity of alluvial aquifer water.

Recommended Practice 1.m
Nutrient value of manure – Account for the nutrient value of any manure spread on a field before adding additional fertilizer. If the manure has not been taken into account over fertilization becomes more likely allowing excess nutrients to leach to groundwater.

Activities Implemented
Application of manure is determined through a waste management plan that is a condition of the ODA permit issued to CAFOs that collect, store and apply manure. The application records are examined during yearly inspections.

Recommended Practice 1.n
Encourage the conversion to more efficient irrigation systems and practices with a lower potential to leach excess water to groundwater. More efficient systems and practices are especially important on highly fertilized crops.

Activities Implemented
A large portion of the commercial irrigated agriculture has converted from flooding and sprinklers to center pivots and drip irrigation. The 1998 survey conducted by IRZ Consulting yielded the following results: 2.3% use flood irrigation, 1.4% use sprinklers, 66.4% use center pivot irrigation, and 30.8% use drip irrigation. Pivot systems have become more efficient with advances in flow control and delivery systems that are more efficient. Continued technological advances in drip system design have allowed many of the vegetable growers to convert from pivot to drip concentrating nutrients at the roots. Extensive use of drip systems outside of orchards, vegetable, melons, and other row crops is not yet practical. The Malheur Experiment Station is conducting research and promoting subsurface irrigation in onions, alfalfa and other crops but the high cost of installing such systems is limiting the adoption.

In addition to improvements in the delivery system, the level of irrigation management has improved with professional irrigation monitoring. According to the survey, 100% of the respondents practice irrigation scheduling to prevent over-irrigation. 99.6% stated they practice irrigation monitoring with 79.4% reporting they use a professional service.

Recommended Practice 1.o
Continue to develop and refine irrigation scheduling for wheel and set systems. Shorter “sets” or the use of nozzles that restrict flow rate should be encouraged to help reduce the over-application of irrigation water which leaches nitrogen out of the soil profile.

Activities Implemented
Much of the irrigated cropland has converted to drip or pivot system. The remaining wheel and set systems exist on irrigated pastures and hay fields. Field labor is one big limiting factor in improving efficiency in wheel and permanent sets. However, a need exists for some general education to growers using these systems on maintenance and management.

Recommended Practice 1.p
Maintain irrigation equipment – Develop operation and maintenance schedules for irrigation equipment to ensure water is applied at correct rates.

Activities Implemented
Since most of the larger producers with center pivots utilize a professional monitoring service, problems are identified and repaired quickly. In addition, many larger growers are replacing center pivots with new pivots that will be fitted with new nozzles.

CAFOs

Educational reviews were (and still are) offered by ODA to assist operators in identifying potential pollution pathways associated with waste application. The CAFO operator identifies and adopts BMPs through the Animal Waste Management Planning process. ODA reviews Animal Waste Management Plans (AWMPs) that are submitted as part of a CAFO's Water Pollution Control Facility (WPCF) permit. ODA offers courtesy reviews of AWMPs written for non-permitted operations.

Letters were written in an attempt to gain involvement from the non-permitted CAFOs in the LUB. A meeting was held between ODA, Extension, and the WQC. The ODA and the Umatilla County SWCD set up a demonstration of confined feeding areas (winter holding pastures) upstream on Butter Creek in 1999. A report documenting this demonstration project is on file at the Umatilla County SWCD.

Rural Residential

The City of Boardman includes groundwater protection and wellhead protection as integral parts of staff reports developed for land use decisions within the jurisdictional boundaries of the City, the Urban Growth Boundary, and the delineated Wellhead Protection Area. Although there is not a Wellhead Protection Ordinance, review of potential impacts of any development is accomplished through a process of staff review, Site Team review (bringing in other utilities and agencies for review), and Planning Commission approval (when use is not outright). These reviews allow for the assessment of groundwater and other environmental impacts to be addressed or mitigated prior to development. The City of Boardman does not allow new septic systems within the City limits.

The City of Boardman has developed a Municipal Sewer System Plan that includes a requirement for developers to extend sewers to new developments within City limits, and that prohibits new septic systems within 300 feet of the municipal sewer system.

Morrow County was actively involved in Periodic Review until 1997 when the Oregon Legislature exempted counties with a population less than 15,000 (which included Morrow County) from the process. The one unresolved work program item was to study and develop policies with regard to development inside the critical groundwater and groundwater contaminated areas. Despite being exempt from the Periodic Review process, Morrow County continued working on the issue and concluded that rural residential development was the topic where the County may want to consider regulatory measures for development. The main concern related to groundwater contamination was septic tank density. A study conducted by EPA for the GWMA (including both Morrow and Umatilla Counties) concluded a large minimum lot size would be required to ensure attainment of the 7 mg/l goal for the GWMA. The Planning Commission and County Court reviewed the study and concluded the recommendations were much too onerous and the County did not change the minimum lot size. The Oregon Land Conservation & Development Commission (LCDC), however, revised Oregon Administrative Rules for Goal 14 and, effective October 3, 2000, essentially imposed a 2-acre minimum lot size for existing residentially zoned lands outside of urban growth boundaries. This eliminated Morrow County's one-acre residential zone, and effectively reduced the potential future impact of nitrate contamination from on-site septic systems in rural areas. Another effect of the LCDC rule change was to limit the minimum lot size for newly zoned residential lands to ten acres. So, any zone changes to allow farm or other ground to be taken out of exclusive farm use and put into a residential zone would not allow two acre or four acre parcels; the minimum lot size would be ten acres. This change greatly limits the potential for widespread groundwater contamination from rural septic systems.

Food Processor Process Water

Each of the food processors that land-apply water have a permit and an Operation, Monitoring, & Maintenance Plan (OM&M Plan) on file with DEQ. These documents detail various BMPs regarding nutrient management and water management, specific to their facility. An example of nutrient management that some facilities perform is post-harvest soil sampling (to help compare the amount of nitrogen applied to the amount of nitrogen removed). An example of water management that some facilities perform is soil moisture monitoring (to allow the control of deep percolation of process water).

3.3 Future Needs Regarding BMP Determination and Implementation

From July 30, 2001 to August 2, 2001, a field visit of the Lower Umatilla Basin Ground Water Management Area (LUB GWMA) was conducted to identify research needs related to nitrate pollution of the GWMA.

The field visit was conducted by Tom Straughan (ODA water quality planner), Ray Denny (program manager for Umatilla SWCD), Phil Richerson (DEQ nonpoint source hydrogeologist), and Erick Burns (ODA hydrogeologist). Sites visited include many of the monitoring well locations, permitted confined animal feeding operation (CAFOs), and the Hermiston Agricultural Research and Extension Center. Don Horneck and George Clough represented OSU Extension for a half-day meeting designed to identify research needs.

Those research needs identified fell into two broad categories: 1) hydrogeologic character of the GWMA, and 2) BMP implementation. The first category encompasses those research topics that will allow interpretation of nitrate trend data. This is critical since there currently are severe limitations to the ability to predict when and how observed nitrate data relate to improvement of water quality within the GWMA. The hydrogeologic research needs are discussed in Section 6.0. The second category is an important aspect of action plan implementation and will allow spatial analysis of management factors as they relate to water quality. The BMP research needs are discussed below.

In accordance with the Action Plan, implementation of BMPs will be tracked to ensure that BMP implementation occurs. Currently this is not occurring in an organized fashion that will allow spatial analysis of BMP implementation relative to monitoring well nitrate concentrations. Tracking of BMP implementation in both time and space will allow evaluation of BMP effectiveness, and it will also allow success stories to be documented in a scientifically defensible manner.

Continued BMP development and implementation is also an important part of GWMA management. Since groundwater quality will change very slowly, performance of new and already existing BMPs should continue to be evaluated. Most BMPs have not been rigorously tested in a manner that ensures the target nitrate levels for groundwater will be achieved.

1. *BMP Implementation*

    a. *Document BMP implementation on the GWMA scale in a system that allows spatial analysis (e.g., GIS).*

    It would be beneficial to track BMP implementation both temporally and spatially. This will allow quantification and documentation that action plan goals are being achieved and will also allow analysis of monitoring well water quality relative to BMP implementation. This provides the positive link between landowner activities and resultant water quality. It is anticipated that this is likely a very controversial and time-consuming task. Since privacy issues and perception of government priorities will be large drivers, those entities with higher credibility with the landowners will need to accomplish the work, and great pains will need to be taken to preserve landowner anonymity while still preserving scientific value. A very detailed work plan would be required for this item, but the results would be very valuable. [Primary candidates for work are OSU Ext, Umatilla SWCD, and OSU Geography (or other department with interest and GIS skill).]

b. Field scale BMP performance evaluations.

In some cases, it would be beneficial to perform evaluations of BMPs (both existing and experimental) at the field scale. Since the GWMA is highly variable, this process will provide case studies that show the viability of practices for production as well as environmental protection. Effectively, these studies will be demonstration projects and should have a strong outreach component. Proposed projects should have very well developed monitoring plans capable of documenting BMP performance. [Primary candidates for work are OSU Ext, Umatilla SWCD, OSU Bioresource Engineering, and OSU Soil Sciences.]

c. Revise some of the fertilizer guides and recommended BMPs.

Deficiencies were noted with various fertilizer guides. Several guides are approximately 20 years old, and they recommend rates and practices that are not consistent with present practices. On a case-by-case basis, fertilizer guides and BMP guidance documents should be revised. Plans to revise fertilizer guides should provide basic information that describes the deficiencies of the current document and the number of acres that will be affected by the revisions. Review and revision should also evaluate the environmental aspects of the document. Consideration should be given to adding a section giving environmental pointers (e.g., "To account for mineralization of nitrogen from organic sources, a mineralization N test can be used.", "Over-irrigation may result in leaching of nitrate.", etc.). [Primary candidates for work are OSU Ext and OSU Soil Sciences.]

d. Mineralization N test.

One particular BMP that should be evaluated is a mineralization N test. This test requires a digestion period (therefore, more lead time by the operator), but it provides information to the operator about how much nitrogen will become available to the plant during the growing season. A comparison of this test with other commonly used tests may encourage operators to use this test when applicable. This test may allow more accurate budgeting of nitrogen. [Primary candidates for work are OSU Ext and OSU Soil Sciences.]

e. Groundwater workshop for growers and certified crop advisors.

Reportedly, it is relatively difficult for certified crop advisors to satisfy their groundwater points requirement due to a general low number of workshops that qualify. For this reason, groundwater workshops in both GWMAs should be well attended. Sponsoring these workshops allows DEQ and ODA to ensure that the content is consistent with the intent of the action plans and with groundwater protection in general. [Primary candidates for work are OSU Ext, DEQ and the SWCDs.]

f. Develop outreach material/strategy for small acreage growers and/or lawn and garden care.

Small acreage growers and homeowners occupy a relatively small percentage of the GWMA. In those areas with higher density of residences, the effect of their practices on groundwater may be appreciable. Historically, these people have been very difficult to communicate with in an effective and efficient manner. Grants designed to effectively communicate environmentally protective practices to this demographic should be encouraged. Innovative approaches may be necessary to draw in these portions of the LUB Community. [Primary candidates for work are OSU Ext and the Umatilla SWCD.]

4.0 GROUNDWATER QUALITY MONITORING

Following is a discussion of the results of DEQ's ongoing bi-monthly sampling, the water quality evaluation at food processor process water land application sites, the ongoing groundwater cleanup at the US Army Umatilla Chemical Depot Washout Lagoons, and a preliminary evaluation of high nitrate wells.

4.1 Results of DEQ's Bi-Monthly Monitoring

As indicated in Section 1.1, the ODEQ samples a network of 38 wells every other month for analysis of nitrate. The results of this monitoring are presented in Table 1. In addition to the 24 sampling events conducted since adoption of the Action Plan, results from two additional events are included in Table 1. These additional events include the first bimonthly event (October 1991) and the synoptic event (July 1992) conducted during the investigation phase of the project. It is important to note that the water quality discussion in this report is an informal evaluation of the four years of data collected since adoption of the Action Plan. The first formal trend analysis of the bi-monthly monitoring well network data is scheduled for 2009, and will include 12 years of data.

The maximum nitrate value observed between January 1998 and November 2001 at each well is identified in Table 1 with shading. The scattered distribution of the shaded cells indicates maximum nitrate values over the past four years occurred at different times at different locations. This suggests some wells may have increasing nitrate trends while other wells may have decreasing nitrate trends.

The maximum nitrate value observed at each sampling event is identified in Table 1 with large bold numbers. The large bold numbers indicate the maximum nitrate values during the past four years. The maximum values in alluvial aquifer wells have most often been at well UMA085 (19 of 24 events) but have also occurred at well UMA096 (3 of 24 events), UMA156 (1 of 24 events), and UMA198 (1 of 24 events). The average nitrate concentration at well UMA085 is 32.9 ppm.

The large bold numbers also indicate the maximum nitrate value during the past four years in the basalt aquifer wells has always been at well UMA029, if this well was sampled. Well UMA028 exhibited the highest nitrate concentration during the two events well UMA029 was not sampled. The average nitrate concentration at well UMA029 is 44 mg/l. The average nitrate concentration at well UMA028 is 9.4 mg/l.

It was noted in the 2000 Annual Progress Report that concentrations at well UMA029 seemed anomalously high. Testing of irrigation water by landowners and irrigation consultants from numerous basalt wells throughout the LUB suggests nitrate concentrations in the basalt aquifer are generally less than 10 ppm. A preliminary evaluation of wells exhibiting high nitrate concentrations was conducted in 2001. This evaluation is discussed in Section 4.4.

Figure 1 is a graph of average and median nitrate concentrations in the Alluvial Aquifer and Basalt Aquifer during the three years since the Action Plan was adopted (1998 through 2000). Each data point represents either the average or median nitrate concentration of the wells sampled during that particular sampling event. The purpose of graphing the average and median nitrate concentrations is to provide an indication of area-wide nitrate concentrations. It is important to note that these values represent the "middle" portion of the data set. Individual wells exhibit significantly higher and lower concentrations. The LOWESS lines[1] in Figure 1 suggest:

- the average concentration in the Alluvial Aquifer wells fluctuated slightly but remained fairly constant at about 10 ppm,
- the median concentration in the Alluvial Aquifer wells started at about 7 ppm and may be slightly declining,
- the average concentration in the Basalt Aquifer wells decreased slightly during 1998, then increased through 1999, then flattened back out at about 12.5 ppm in 2000, and
- the median concentration in the Basalt Aquifer wells started at about 3.5 ppm and increased about 1 ppm.

[1] LOWESS stands for LOcally WEighted Scatterplot Smoothing and is a data smoothing technique used to illustrate the underlying structure of a data set. LOWESS is similar to a moving average.

The larger difference between average and median values in Basalt Aquifer wells than in the Alluvial Aquifer wells reflects the high values observed in the Basalt Aquifer well UMA029. Average values are influenced by every data point while median values reflect only the "middle" value. This difference is evident in the dip in average values of January and March 2001, when well UMA029 was not sampled. The LOWESS lines in Figure 1 provide an indication of how the average water quality data is changing through time but does not constitute a trend analysis. The first formal trend analysis of the well network data is scheduled for 2009.

The cyclic nature of the average nitrate values in the Alluvial Aquifer wells (e.g., the spikes at March of each year) suggests seasonality may be an important factor in water quality changes. The cyclic nature of the average nitrate values in the Basalt Aquifer wells is less obvious.

Table 1
Comparison of Nitrate Values (in ppm) from Selected Sampling Events
Lower Umatilla Basin Groundwater Management Area

Alluvial Aquifer

Well ID	Oct-91 (1st bimonthly event)	Jul-92 (synoptic event)	Jan-98 (1st event after Action Plan adoption)	Mar-98	May-98	Jul-98	Sep-98	Nov-98	Jan-99	Mar-99	May-99	Jul-99	Sep-99	Nov-99	Jan-00	Mar-00	May-00	Jul-00	Sep-00	Nov-00	Jan-01	Mar-00	May-01	Jul-01	Sep-01	Nov-01	Minimum value per well; 1998 thru 2001	Maximum value per well; 1998 thru 2001	Median value per well; 1998 thru 2001	Average per well; 1998 thru 2001
UMA033	10	7.6	6.6	7.1	6.5	7.2	6.9	7	7.1	7.51	6.63	7.03	7.28	6.98	7.03	6.97	6.47	6.56	6.83	6.72	6.8	6.82	6.73	6.84	6.88	6.98	6.47	7.51	6.89	6.89
UMA034	2.5	2	5	6.8	3.5	6.3	5.5	4.6	4.9	7.32	7.37	4.1	3.64	3.46	3.72	5.16	4.83	3.94	3.32	3.01	3.76	5.04	3.47	3.39	2.95	2.82	2.82	7.37	4.02	4.50
UMA038	1.6	3	3.9	4.2	4.4	4.9	4.6	3	3	2.74	4.09	3.19	3.75	3.00	2.08	2.04	2.51	1.28	2.24	1.09	2.38	3.51	1.69	0.983	2.96	4.23	0.983	4.9	3.00	2.99
UMA039	2.1	1.3	3.5	2.4	3.1	ns	3.6	4	4.3	2.92	2.06	3.92	4.11	4.19	4.62	4.15	4.05	4.12	4.4	4.45	4.14	3.31	3.34	4.12	4.15	4.38	2.06	4.62	4.11	3.80
UMA046	1.4	0.47	0.56	1.2	0.49	0.5	0.67	0.54	0.51	0.912	0.507	0.83	0.872	0.406	0.459	0.782	0.474	0.533	0.776	0.473	0.485	0.512	0.473	0.429	0.61	0.512	0.406	1.2	0.51	0.60
UMA048	1.8	1.2	1.8	1.8	1.7	1.9	1.8	1.9	1.7	1.78	1.72	1.69	2.02	2.12	2.15	1.96	1.83	1.8	1.99	2.14	2.03	1.69	1.9	1.72	2.09	2.13	1.69	2.15	1.87	1.89
UMA056	6.4	6.6	6.8	6.9	6.8	6.5	6.5	6.5	6.8	7.32	6.75	6.73	6.86	6.69	6.46	7.02	4.56	6.76	6.41	6.33	6.31	6.22	5.74	3.87	5.18	6.55	3.87	7.32	6.53	6.36
UMA058	13	23	16	21	15	11	19	17	11	18.1	11.1	10.2	15.2	11.2	10.5	15.5	11	12.1	12.1	9.7	8.03	7.38	7.76	9.01	9.43	7.24	7.24	21	11.05	12.31
UMA066	4.8	6.5	8.5	8.3	8.8	8.4	8.6	8.8	8.8	9.38	9.07	7.6	6.75	8.05	8.76	9.1	8.18	6.7	7.5	8.07	8.55	8.63	9.21	8.82	8.01	8.48	6.7	9.38	8.53	8.38
UMA084	14	10	14	9.5	12	16	15	14	13	6.66	6.21	7.4	11.8	10.9	7.72	4.18	6.59	10.2	15.5	11.4	8.32	5.23	6.19	10.8	12.5	9.16	4.18	16	10.50	10.18
UMA085	20	22	**29**	29	29	28	**31**	**31**	**31**	31.5	**33.3**	**31.0**	**33.4**	**33.0**	**33.6**	**34.4**	**33.7**	**34.5**	**35.1**	35.0	**34.4**	**34**	**35.1**	**36.6**	**36.3**	**36.9**	28	36.9	33.50	32.91
UMA088	11	12	14	14	14	15	17	15	15	14.7	15.4	16.3	16.5	16.4	15.8	16.1	15.1	17.5	17.6	16.3	15.2	14.9	14.9	16.4	17.9	16.3	14	17.9	15.60	15.72
UMA094	13	10	11	9.3	8.5	8.1	9.5	8.4	8.4	8.17	7.41	7.44	7.59	7.14	7.15	6.99	6.49	6.56	7.42	7.04	6.57	6.17	6.32	6.78	7.09	6.98	6.17	11	7.28	7.60
UMA096	**25**	**31**	28	**32**	**31**	**31**	29	27	30	31.5	32.4	29.1	25.5	22.5	27.9	31.5	29.5	29.8	27.5	19.2	28.4	30.5	33.2	30.2	18.8	26.6	18.8	33.2	29.30	28.42
UMA103	17	21	20	18	18	18	18	16	18	18.4	18.8	17.4	18.2	17.0	20.8	21.7	20.9	22.4	22.5	20.7	21.6	20.5	19.3	19.4	18.7	20.1	16	22.5	19.05	19.35
UMA109	2.5	1.9	4.7	5.6	5.4	4.8	3.9	2.8	3.9	5.62	4.51	3.49	3.31	3.53	4.04	5.11	5.56	4.45	3.75	4.21	4.6	4.86	6.43	5.80	5.33	4.96	2.8	6.43	4.65	4.61
UMA110	6.8	5.9	5.7	3.8	8.4	9.3	9.3	6.8	5	3.93	5.69	7.51	8.34	4.72	3.81	4.39	6.13	7.26	8.27	5.69	5.72	5.27	3.22	4.45	5.5	3.48	3.22	9.3	5.69	5.90
UMA112	5	4.6	2.7	6.9	2.8	3.1	3.3	2.9	3.2	3.77	3.35	3.67	3.73	3.98	4.19	4.26	4.23	4.49	4.56	4.84	4.49	4.44	4.19	4.68	4.63	4.78	2.7	6.9	4.19	4.05
UMA116	3.1	3	4.3	4	4	4.2	4.3	4.3	4.5	4.57	4.27	4.26	4.49	4.92	5.08	4.98	4.25	4.3	4.85	4.89	4.38	3.99	4.56	4.49	4.26	4.18	3.99	5.08	4.30	4.43
UMA119	6.6	6.8	15	18	11	8.5	3.5	9.6	15	20.5	17.9	8.28	7.66	14.3	19	22.4	13.8	10.8	4.68	11.2	8.27	21.2	19.9	11.4	5.58	12.4	3.5	22.4	11.90	12.91
UMA122	8.1	9.7	14	22	26	21	15	13	17	24.4	31.3	21.6	11.9	14	19.4	17.8	20.9	34.4	24.4	22.2	25.9	25.2	30.8	32.2	23.5	26.1	11.9	34.4	22.10	22.25
UMA133	21	17	29	32	30	29	28	29	30	29.6	26	18.1	15.8	25.4	27.7	26.7	19.5	18.6	11.9	21.7	22.9	21.7	15.8	17.3	16.1	19.0	11.9	32	24.15	23.37
UMA144	2.9	4.9	18	20	13	12	12	17	19	19.7	17.4	4.33	1.46	11.2	15	17.6	12.4	10.5	9.69	10.5	13.6	16.2	11.6	10.0	9.36	9.88	1.46	20	12.20	12.98
UMA156	13	10	24	24	19	16	16	23	28	**32**	8	17.8	19.8	21.5	23.4	28.7	22.5	28.5	25.7	25.7	26.4	26.0	17.8	14.4	10	22.0	8	32	22.75	21.68
UMA160	0.06	0.02	0.02	0.02	0.02	0.4	0.67	6	<0.02	<0.004	0.0062	0.0063	3.03	0.0052	<0.0050	0.0054	0.006	<0.0050	2.61	0.0071	<0.0050	<0.0050	0.0063	0.0077	0.151	9.67	0.0052	9.67	0.02	1.26
UMA168	4.7	3.6	3.6	3.1	2.8	2.2	2.1	3.1	3.4	3.02	2.75	2.17	2.34	3.45	3.6	1.81	2.47	2.39	2.4	3.45	3.44	2.94	3	2.92	2.99	3.45	1.81	3.6	2.97	2.87
UMA180	0.14	0.7	1.3	1.7	1.6	2.2	2.7	ns	ns	3.99	4.12	5.00	5.41	ns	ns	ns	5.18	5.07	4.5	3.29	3.19	3.36	5.53	8.56	7.32	4.37	1.3	8.56	4.12	4.13
UMA185	0.13	0.11	0.14	0.13	0.15	0.15	0.15	0.12	0.14	0.135	0.138	0.139	0.143	0.143	0.149	0.139	0.143	0.148	0.149	0.147	ns	0.140	ns	0.149	ns	0.149	0.12	0.150	0.14	0.14
UMA187	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.004	<0.004	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	ns	<0.0050	0.0202	<0.0050	<0.0050	0.0059	<0.004	<0.02	<0.0050	<0.02
UMA190	0.89	0.55	2.7	1.4	1.7	1.1	2.5	3.8	2.4	2.99	1.39	0.612	0.827	3.68	3.38	1.43	0.811	0.848	3.71	4.1	3.31	6.23	2.03	1.17	1.77	7.80	0.612	7.8	2.22	2.57
UMA191	0.37	0.87	0.9	1.4	1.2	1	1.2	0.73	0.87	1.22	1.14	0.909	1.15	0.793	0.679	0.958	2.22	1.7	1.13	1.14	1.1	1.27	3.14	1.37	0.954	1.00	0.679	3.14	1.14	1.22
UMA198	5.8	7.9	14	16	16	16	13	14	17	15.9	12	9.4	7.49	16.6	17.8	18.5	19.9	ns	ns	**41**	21	20.4	19	15.8	24.1	16.9	7.49	41	16.30	17.35
UMA201	12	11	17	17	18	20	19	21	21	20.4	21.4	20.7	19.4	23.7	25.01	24.3	22.4	23.4	25.1	29.4	24.8	23.8	21.7	24.5	23.2	21.2	17	29.4	21.55	21.98
Maximum per sampling event	**25**	**31**	**29**	**32**	**31**	**31**	**31**	**31**	**31**	**32**	**33.3**	**31.0**	**33.4**	**33.0**	**33.6**	**34.4**	**33.7**	**34.5**	**35.1**	**41**	**34.4**	**34**	**35.1**	**36.6**	**36.3**	**36.9**				
Median per sampling event	5.0	6.2	6.7	7.0	7.6	8.1	6.7	7.0	7.8	7.3	6.7	6.9	6.8	7.0	7.1	7.0	6.3	6.6	6.4	6.5	6.7	6.2	6.3	6.8	6.9	7.0				
Average per samping event	7.2	7.7	10.2	10.9	10.1	10.1	9.8	10.4	11.1	11.6	10.1	8.8	8.7	9.8	11.0	11.2	10.0	10.7	10.0	10.78	11.0	11.0	10.1	10.0	9.6	10.02				

Basalt Aquifer

Well ID	Oct-91 (1st bimonthly event)	Jul-92 (synoptic event)	Jan-98 (1st event after Action Plan adoption)	Mar-98	May-98	Jul-98	Sep-98	Nov-98	Jan-99	Mar-99	May-99	Jul-99	Sep-99	Nov-99	Jan-00	Mar-00	May-00	Jul-00	Sep-00	Nov-00	Jan-01	Mar-00	May-01	Jul-01	Sep-01	Nov-01	Minimum value per well; 1998 thru 2001	Maximum value per well; 1998 thru 2001	Median value per well; 1998 thru 2001	Average per well; 1998 thru 2001
UMA028	2.2	2.2	5.3	5.1	6.3	6.7	7.7	7.8	7.8	8.36	8.87	9.23	9.01	9.56	10.9	10.4	9.49	10	10.4	12.5	**13.0**	**12.7**	12.3	10.3	9.38	11.7	5.1	13	9.44	9.37
UMA029	**37.0**	**31.0**	**49.0**	**43.0**	**51.0**	**36.0**	**41.0**	**39.0**	**41.0**	**43.3**	**42.4**	**47.0**	**46.5**	**46.3**	**47.8**	**46.7**	**44.1**	**43.4**	**46.1**	**46.2**	ns	ns	**45.2**	**46.6**	**33.7**	**45.7**	33.7	51.0	45.45	44.14
UMA047	2.5	2.6	3	3	3.2	3.1	3.1	3.0	3.0	3.16	3.07	3.1	3.17	3.06	3.17	3.29	3.05	3.17	3.25	3.18	3.08	2.99	3.07	3.24	3.22	3.24	2.99	3.29	3.10	3.12
UMA106	0.8	0.75	0.52	0.47	0.8	0.94	0.9	1.2	0.66	0.792	0.834	0.644	0.938	1.51	0.584	0.601	0.747	0.67	0.837	1.13	0.489	1.40	0.759	0.83	0.861	1.49	0.47	1.51	0.82	0.86
UMA164	2.8	2.9	3.6	3.6	3.8	3.8	ns	3.9	3.7	2.04	4.42	4.25	4.27	4.09	4.35	ns	4.55	4.53	4.56	4.37	4.27	ns	4.56	4.56	na	ns	2.04	4.56	4.27	4.06
Maximum per sampling event	**37.0**	**31.0**	**49.0**	**43.0**	**51.0**	**36.0**	**41.0**	**39.0**	**41.0**	**43.3**	**42.4**	**47.0**	**46.5**	**46.3**	**47.8**	**46.7**	**44.1**	**43.4**	**46.1**	**46.2**	**13.0**	**12.7**	**45.2**	**46.6**	**33.7**	**45.7**				
Median per sampling event	2.5	2.6	3.6	3.6	3.8	3.8	5.4	3.9	3.7	3.2	4.4	4.3	4.3	4.1	4.4	6.8	4.6	4.5	4.6	4.37	3.7	3.0	4.6	4.6	6.3	7.47				
Average per samping event	9.1	7.9	12.3	11.0	13.0	10.1	13.2	11.0	11.2	11.5	11.9	12.8	12.8	12.9	13.4	15.2	12.4	12.4	13.0	13.5	5.2	5.7	13.2	13.1	11.8	15.5				

Notes:
na = not analyzed
ns = not sampled

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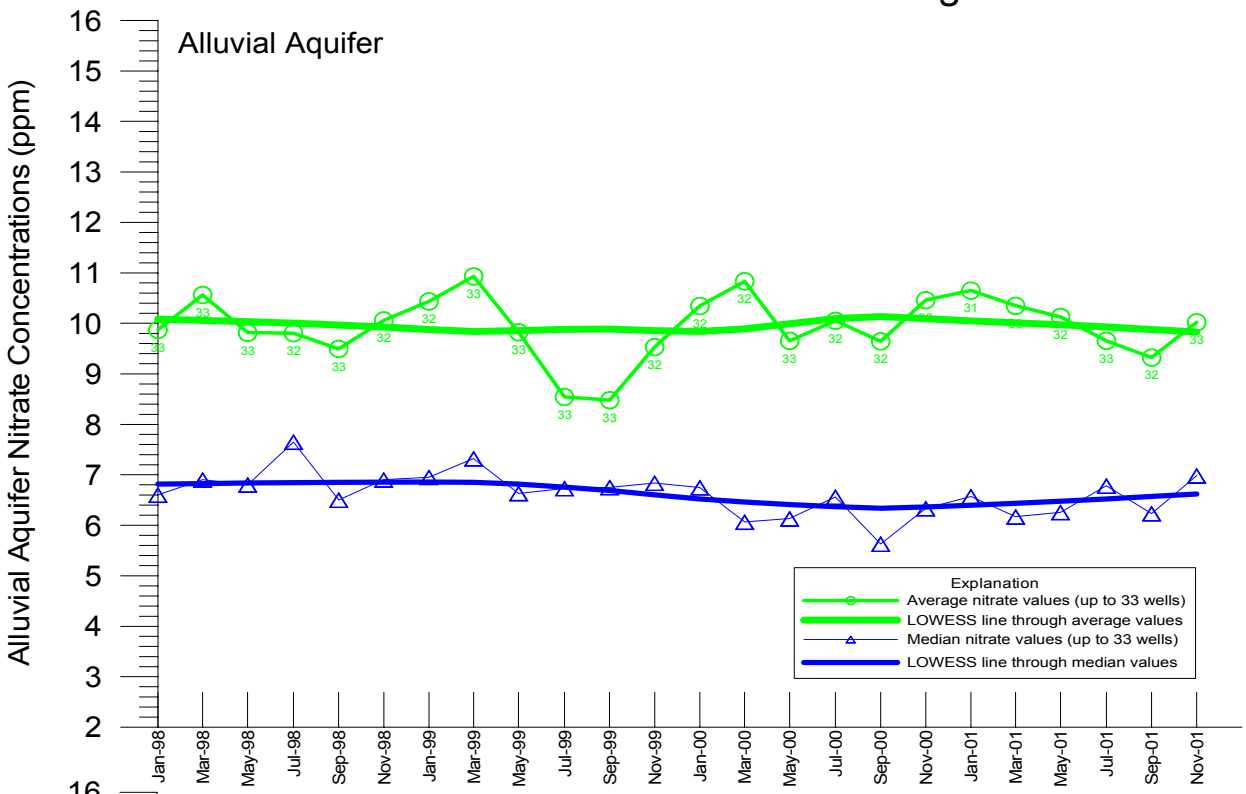
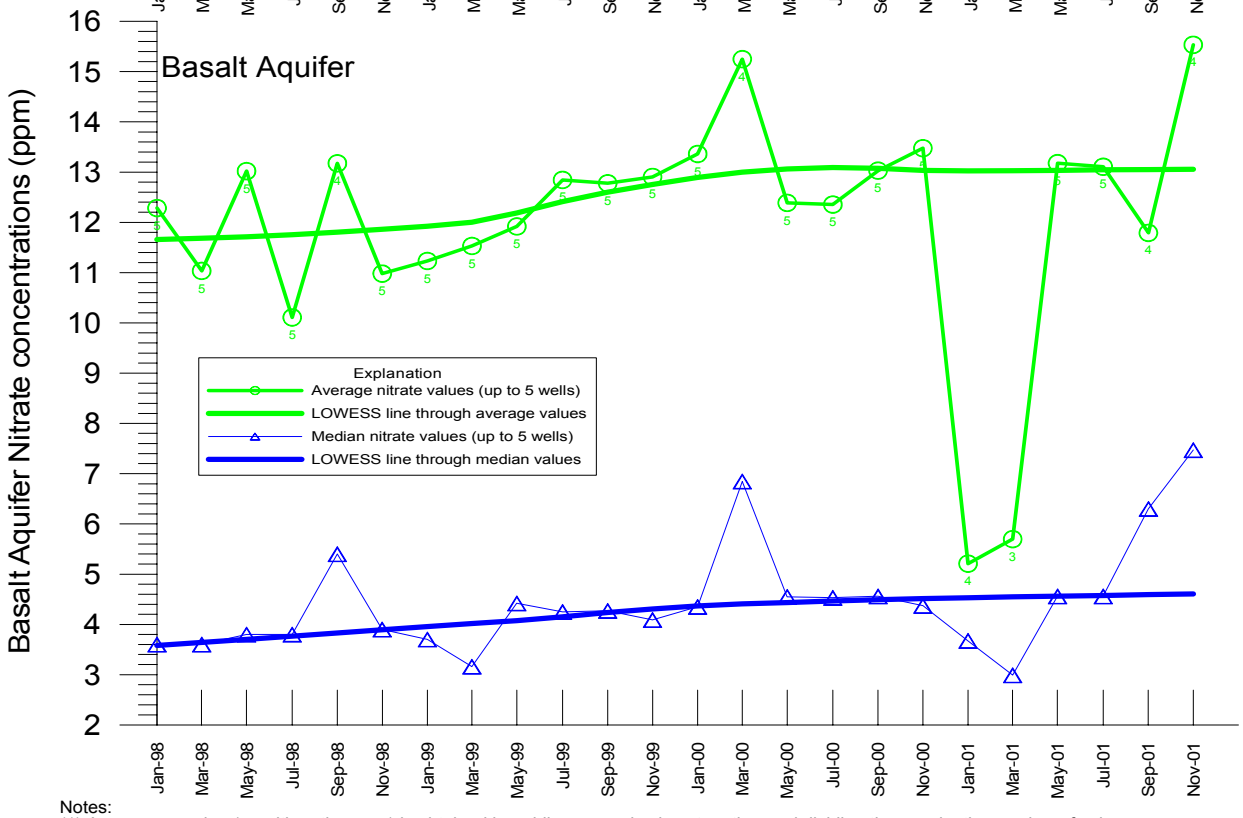
Figure 1
Summary of Nitrate Concentrations
Lower Umatilla Basin Groundwater Management Area





Notes:
(1) An average value (or arithmetic mean) is obtained by adding several values together and dividing the sum by the number of values.
(2) A median value is the middle number in a sequence of ranked values, or the average of the two middle numbers when a sequence has an even number of values.
(3) LOWESS is a data smoothing technique used to illustrate the general structure of a data set.
(4) The number of wells sampled is indicated beneath each circle symbol.

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4.2 Monitoring at Food Processor Process Water Land Application Sites

The Action Plan requires that a trend analysis of groundwater monitoring data from food processor wastewater land application sites be conducted. Specifically, the goal of Section VII, Item G.3.b is that by December 2001, "monitoring data shows improving groundwater quality trends for nitrate" and that permitees are "meeting permit conditions and objectives". It should also be noted that Section VIII, Item A.3 states "since it is not anticipated that quantitative reductions in nitrate levels will take place early in the implementation phases of the plan, qualitative measures will also be established to evaluate the progress and success of the Action Plan."

There are six facilities (consisting of 10 sites) within the LUB GWMA that land apply food processing water and are thus targeted by this goal. The nitrate trends at 113 wells located at the 10 sites have been evaluated. The hydrogeology at these sites is currently being evaluated so that detailed comparisons can be made between upgradient and downgradient wells. Of the 113 wells evaluated, approximately 64% have increasing trends, 8% have decreasing trends, 3% have flat trends, and 26% have statistically insignificant trends. It should be noted that these wells are located upgradient, downgradient, cross gradient, and within these land application sites. A preliminary evaluation of upgradient versus downgradient wells suggest nitrate concentrations increase across some sites but decrease across other sites. A report is being prepared which discusses, in detail, the trend analysis and draws conclusions regarding upgradient and downgradient concentrations and trends.

4.3 Monitoring at the US Army Umatilla Chemical Depot Washout Lagoons

The following information appears in the "Annual Monitoring Report 08/11/00 – 08/10/01 Contaminated Groundwater Remediation Treatment System, Umatilla Chemical Depot, Hermiston, Oregon" by Remtech, Inc.

- Groundwater samples from extraction wells and selected monitoring wells are analyzed quarterly. Semi-annual water quality samples are collected at the effluent sample port. The samples are analyzed for explosives[2], metals, anions, alkalinity, and TDS.
- During the July quarterly sampling event, three monitoring wells were selected for nitrate analysis.
- Since the groundwater remediation plant began operation in December 1996, contaminant concentrations show a general decline over time at most of the wells.
- The explosive chemistry at several wells varies with seasonal water levels.
- Concentrations of explosives are declining at each of the three extraction wells.
- The areas covered by the TNB, TNT, and 2,4-DNT plumes appear to be well inside the capture zone of the treatment system. However, the eastern-most edge of the RDX plume extends beyond the capture zone.
- Two new wells installed to evaluate the eastern extent of the RDX plume indicate concentrations are above the targeted cleanup level at these locations. Further monitoring is required.
- During the soil flushing phase, some RDX from the main plume was pushed eastward beyond the capture zone. Since the soil flushing phase has been completed, no new additional source for RDX should contribute to this eastern extension of the plume.

4.4 Evaluation of High Nitrate Wells in DEQ Well Network

As indicated in Section 4.2, the nitrate concentration at well UMA029 appears anomalously high when compared to other basalt wells. This anomalously high nitrate concentration prompted a preliminary evaluation of several wells with high nitrate concentrations.

The evaluation consisted of examining well logs to confirm adequate well construction followed by a site visit to evaluate potential contaminant sources and pathways, as well as identify research needs for the GWMA. The evaluation of well logs was performed in July 2001 by Phil Richerson (DEQ hydrogeologist). No flaws in well construction were identified by examining the well logs. From July 30, 2001 to August 2, 2001, a field visit of the GWMA was conducted by Tom Straughan (ODA water quality planner), Ray Denny (program manager for Umatilla SWCD), Phil Richerson, and Erick Burns (ODA hydrogeologist). Sites visited include many of the

[2] Explosives include 1,3,5-Trinitrobenzene (TNB), 2,4,6-Trinitrotoluene (TNT), 2,4-Dinitrotoluene (2,4-DNT), and hyxahydro-1,3,5-trinitro-1,3,5-triazine (RDX).

monitoring well locations (including those with the highest nitrate concentrations), permitted confined animal feeding operation (CAFOs), and the Hermiston Agricultural Research and Extension Center. No obvious sources of localized nitrate contamination were identified during the site visits. However, the evaluation did lead to the identification of several research needs including the need to further investigate a few wells by sending a camera down the borehole to ensure there is no cross-connection of aquifers. These research needs are discussed in Section 6.0.

5.0 DECEMBER 2001 GOALS

Section VIII.C.1 of the Action Plan states that after the first four years of implementation, the success of the Action Plan will be based on whether strategies and plans have been developed as outlined under the Implementation Tasks (Section VII). The evaluation will include documentation of information gathered and organized, whether the appropriate institutions have been put into place to promote the Action Plan recommendations and documentation of what activities, practices, and alternates have been adopted that reduce nitrate loading to groundwater. Five goals were identified in the Action Plan as having December 2001 deadlines. These five goals relate to the five contributors of nitrate, and are discussed below.

5.1 Irrigated Agriculture

Goal

By December of 2001, 75% of the irrigated acreage is implementing an accepted system of BMPs or are covered by an implementation plan and the recommendations are in place and being used. Responsible parties – SWCDs, NRCS, OSU Extension, and private agricultural service providers.

Accomplishments

Based on results of the Base Line Survey of Irrigated Agriculture conducted by IRZ Consulting, LLC in 1998, and the general understanding that BMP implementation has not decreased since 1998, it is expected that this goal has been met. At the time of the study, BMPs believed to be protective of groundwater quality were being implemented on more than 75% of the irrigated acreage. However, it is difficult to define one "acceptable system of BMPs". The collection of BMPs that are effective at one place and time would not necessarily be effective at another place or time. It is recognized that a future need is to either define an "acceptable system of BMPs" for irrigated agriculture or redefine the 2005 irrigated agriculture goal.

The 1998 survey was distributed to the operators (approximately 45) utilizing the services of the Northwest Irrigation Network (NIN)[3]. These 45 operators represented over 160,000 acres. 14 of the operators responded to the survey. These operators represent a fairly typical cross section of the area operators and farmed over 48,000 acres. Respondents indicated 66.4 % used pivot irrigation, 100% used some form of irrigation scheduling, 99.5% monitored soil moisture, 51.5% use OSU/WSU fertility guides, 78.3 % monitored soil fertility, and 49.4 % used cropping and/or tillage systems designed for wind/water erosion or nitrogen recovery. Many of the survey respondents are still under the management of the NIN. However, some respondents have gone out of business while others have been consolidated into larger operations. Since the baseline study, the number of acres managed by NIN has increased from 160,000 in 1998 to 165,000 in 1999, and 167,000 in 2000. Based on both the 1997 estimate (180,000 irrigated acres in the GWMA) and the 2001 estimate (200,000 irrigated acres in the GWMA), more than 75% of the irrigated acreage is implementing an accepted system of BMPs or covered by an implementation plan and the recommendations are in place and being used.

In addition to the acres in traditional cropland systems, 30,000 acres have been converted to poplar tree plantations. The plantations utilize drip irrigation systems, nutrient management, water monitoring, weather monitoring among other irrigation practices.

Probably the most effective incentive for water efficiency in irrigated agriculture is power rates. The cost of pumping continues to increase, with increases of up to 40% expected. By itself, the cost of power will cause growers to reduce pumping time through higher efficiency or reduce other inputs, such as reducing nitrogen amounts.

[3] The Northwest Irrigation Network (http://www.irz.com/NIN/) is a service sponsored by the Umatilla Electric Co-op and maintained by IRZ Consulting that utilizes data from 19 weather stations in eastern Oregon and Washington to provide daily crop water use information for more than 20 crops, recommended hours of operation per week for center pivots, hand lines and wheel lines, and historical and current weather data.

5.2 Rural Residential

Goal

By December of 2001, through a random survey, 50% of area residents are aware of the groundwater nitrate problem and know of at least one activity or practice that contributes to the problem. Responsible parties – SWCD and OSU Extension.

Accomplishments

This goal has not been met, as described below. The survey has not yet been conducted due to lack of funding, staff time and resources to conduct the survey. An EPA/DEQ 319 grant application was submitted by the Umatilla County SWCD for funding. The grant was funded in October 2002. The survey will be completed by the end of 2002. Results of the survey will be provided in the 2002 Annual Report.

Goal

By December of 2001, procedures and methods to reduce the impact of septic system nitrate loading to the groundwater have been investigated and presented to all local area governments. Responsible parties – local governments and DEQ.

Accomplishments

This goal has been met, as described below. The following methods and procedures, which fall into five broad categories, have been identified through discussions with DEQ and Umatilla and Morrow County Planning staff. It should be noted that not all of these methods and procedures are voluntary (e.g., a geographic rule). In accordance with the Action Plan, mandatory efforts can be required only after evidence shows voluntary measures are not working. The methods and procedures include:

(1) Eliminate the Discharge

- Work with local governments to encourage flexibility in extending sewer lines into Urban Growth Areas.
- Enforce existing connection requirements (e.g., a single-family dwelling must connect if the nearest connection point is within 300 feet from the property to be served).
- Utilize a holding tank and periodically transfer the waste to a wastewater treatment facility.
- Utilize composting toilets.

(2) Make the Discharge More Diffuse in Rural Residential Areas

- Through Zoning Changes using the following steps:
  1. Identify build out potential for areas zoned Rural Residential.
  2. Based on the Rural Residential build out potential, determine if a change in lot size might be an effective tool to reduce nitrate loading to groundwater.
  3. If a change in lot size is believed to be an effective tool, estimate the appropriate lot size for a standard septic system.
  4. Change zoning codes as necessary to adopt an appropriate lot size.
- Use a "geographic area rule" (under the Groundwater Quality Protection Rules) to specify siting criteria that will make septic system impacts more diffuse.

(3) Obtain Better Treatment of Discharge

- Through education and outreach, encourage the public to properly maintain on-site septic systems.
- Once identified, promote the use of alternative septic systems that perform better than standard systems.
- Use a "geographic area rule" (under the Groundwater Quality Protection Rules) to require better treatment of septic system discharge.

(4) Quantify and Limit the Total Nitrate Loading Allowed

- Use a "geographic area rule" to quantify and limit the amount of nitrate-nitrogen added per acre to the groundwater by septic systems each year. This loading limit could be met by a combination of items 1, 2, and 3 listed above.

(5) Passively Remediate the Groundwater

- Phytoremediation (i.e., the use of plants to clean contaminated air, soil or water) can, under certain circumstances, be used to remove nitrate from groundwater.

Goal

By December of 2001, evaluate the ability of the state to consider the cumulative impact of septic systems when issuing permits. Responsible party – DEQ

Accomplishments

This goal has been met as described below. DEQ's on-site permitting process typically evaluates each site individually. However, it is possible to create a "Geographic Area Rule" under the Groundwater Quality Protection Rules {OAR 340-40-0020(10)} that limits the cumulative impact of septic systems in a specific area by:

- Quantifying the amount of nitrate added per acre to the groundwater by septic systems each year,
- Requiring specific construction and siting criteria, and/or
- Requiring "aquifer reserve areas" be set aside for future water supply development

The process of drafting a geographic rule regarding septic systems in the LUB is expected to take at least 8 months and require the following:

(1) *An Action Plan Amendment which requests such a rule*. The request is necessary because the Action Plan is voluntary and requiring alternative septic systems is not voluntary. The amendment must be prepared and endorsed by the Citizens Advisory Committee with sufficient opportunity for public involvement.

(2) *Proven Alternatives* – Proven alternatives would need scientific evidence that some system(s) works better than the standard system. It would not necessarily have to be cheaper than a standard system. The LaPine study and/or other 319 projects might identify such a system.

(3) *Writing the rule* – the rule would likely be written by DEQ staff, and after internal review, go out for public notice and hearing. After public comments are incorporated, the EQC must review and approve the rule. Legislature approval may or may not be required.

It is also possible to make a new statewide rule requiring a higher degree of treatment for all onsite systems. It is unlikely that the data required to rationalize such a rule exists. The political viability of such a rule would likely depend on the cost differential between the standard system and the proposed system.

5.3 Food Processor Process Water

Goal

By December of 2001, monitoring data shows improving groundwater quality trends for nitrate and meeting permit conditions and objectives. Responsible parties – DEQ and food processor permitees.

Accomplishments

This goal has been partially met as discussed below.

Improving Nitrate Trends

Monitoring data do not yet show improving groundwater quality trends at all food processor land application sites. Due to the multiple sources of nitrate in the GWMA, the slow movement of groundwater, and historical practices that included over-application of nitrogen, it is not surprising that groundwater quality at these sites has not yet improved. In fact, this idea was acknowledged by Section VIII, item A.2 of the Action Plan which states "since it is not anticipated that quantitative reductions in nitrate levels will take place in the early implementation phases of the plan, qualitative measures will also be established to evaluate the progress and success of the action plan.

As indicated in Section 4.2, there are six facilities (consisting of 10 sites) within the LUB GWMA that land apply food processing water and are thus targeted by this goal. The nitrate trends at 113 wells located at the 10 sites have been evaluated. It should be noted that these wells are located upgradient, downgradient, cross gradient, and within these land application sites. The hydrogeology at these sites is currently being evaluated so that detailed comparisons can be made between upgradient and downgradient wells.

Of the 113 wells evaluated, approximately 64% have increasing trends, 8% have decreasing trends, 3% have flat trends, and 26% have statistically insignificant trends. The average nitrate concentration at these wells is approximately 15 mg/l. The high percentage of increasing trends and elevated average concentration confirms the regional nitrate problem.

A preliminary evaluation of upgradient versus downgradient wells suggest nitrate concentrations increase across some sites but decrease across other sites. A report is being prepared which discusses, in detail, the trend analysis and draws conclusions regarding upgradient and downgradient concentrations and trends.

Meeting Permit Conditions and Objectives

Due to limited resources, DEQ conducts a thorough review of information submitted by food processor facilities only when the facility's permit is up for renewal (once every five years). A preliminary review of each document is conducted when it its submitted which may, or may not, result in a response to the facility. Therefore, it is not yet possible to determine how each of the food processor facilities in the LUB GWMA has done towards meeting their permit conditions and objectives during the 1998 through 2001 time frame. DEQ has thoroughly reviewed the files of two of the six facilities and identified instances of noncompliance. Some of these instances were unforeseeable and uncontrollable accidents while other instances were preventable. While the food processor facilities are ultimately responsible for complying with their permits, DEQ bears some of the responsibility because submitted documents have not always been reviewed and responded to in a timely manner. It should be noted that when permit violations were identified, the food processor facilities have taken a proactive approach to finding solutions.

It is recommended that DEQ do a better job at reviewing submitted documents and providing comments that will assist the food processor facilities meet their permit conditions and objectives. This recommendation will not be easy to implement in light of the current budget problems facing all state agencies that are forcing each agency to find more efficient ways to conduct business, prioritize work, and potentially leave some work undone. It is also recommended that the food processor facilities continue to strive to meet permit conditions and objectives.

5.4 CAFOs

Goal

By December of 2001, 50% of CAFOs are implementing an accepted system of BMPs or are covered by an implementation plan. Responsible parties – ODA, SWCDs, NRCS, OSU Extension, and private agricultural service providers.

Accomplishments

It is currently unknown if this goal has been met. An EPA/DEQ 319 grant agreement has been signed that funds an evaluation of the fulfillment of this goal. The evaluation will be conducted by ODA and the Umatilla County SWCD. Results of the ODA/SWCD evaluation will be provided in the 2002 Annual Progress Report.

The difficulty in evaluating the fulfillment of this goal is, in large part, defining what "an accepted system of BMPs" is. The ODA/SWCD evaluation will include a determination of "an accepted system of BMPs" on a case-by-case basis and will include specific BMPs relevant to each site.

In cases where permitted CAFOs land-apply wastes, ODA offers educational reviews designed to assist operators in identifying potential pollution pathways associated with waste application. The CAFO program encourages, and has required in several instances, development of an Agricultural Waste Management Plan. Through this process, appropriate BMPs are identified that are protective of waters of the state. Because all of the permitted CAFOs within the GWMA have been inspected within the last year and are implementing or developing an Animal Waste Management Plan consistent with ODA expectations, it is expected that these facilities will be found to be implementing "an accepted system of BMPs".

Groundwater assessments are being conducted for facilities recently or currently being built (Sixmile Dairy, Willow Creek Dairy, Columbia River Dairy, and Stage Gulch Dairy). These new facilities, all permitted since declaration of the GWMA, have significant engineered upgrades and monitoring sufficient to allow assessment of groundwater protection.

Non-permitted CAFOs, however, are not routinely inspected except in response to a citizen's complaint. Approximately twelve non-permitted CAFOs have been inspected since adoption of the Action Plan. Because no formal tracking mechanism (i.e., a permit) exists for these facilities, the exact number of non-permitted CAFOs within the GWMA is not known. Locating and assessing these additional feeding operations will be a significant portion of the ODA/SWCD evaluation.

It should also be noted that the State of Oregon adopted Animal Feeding Operation and Confined Animal Feeding Operation definitions consistent with federal definitions in January 2002.

5.5 Umatilla Chemical Depot Washout Lagoon

Goal

By December of 2001, monitoring data should show that the treatment system is working as expected and that reinjection water is not migrating beyond the capture zone of the treatment system. Responsible parties – US Army and DEQ.

Accomplishments

This goal has been partially met, as described below. Based on review of the Annual Monitoring Report for the treatment system, contaminant concentrations have generally shown a decline over time at most wells since the groundwater remediation plant began operation in December 1996. However, the RDX plume has migrated beyond the capture zone to the east, presumably due to "soil washing" during the early stages of remediation. More specific information regarding the groundwater quality at the site is provided in Section 4.3 of this report.

6.0 RESEARCH NEEDS FOR HYDROGEOLOGIC CHARACTERIZATION

From July 30, 2001 to August 2, 2001, a field visit of the Lower Umatilla Basin Ground Water Management Area (LUB GWMA) was conducted to identify research needs related to nitrate pollution of the GWMA.

The field visit was conducted by Tom Straughan (ODA water quality planner), Ray Denny (program manager for Umatilla SWCD), Phil Richerson (DEQ nonpoint source hydrogeologist), and Erick Burns (ODA hydrogeologist). Sites visited include many of the monitoring well locations, permitted confined animal feeding operation (CAFOs), and the Hermiston Agricultural Research and Extension Center. Don Horneck and George Clough represented OSU Extension for a half-day meeting designed to identify research needs.

Those research needs identified fell into two broad categories: 1) hydrogeologic character of the GWMA, and 2) BMP implementation. The first category encompasses those research topics that will allow interpretation of nitrate trend data. This is critical since there currently are severe limitations to the ability to predict when and how observed nitrate data relate to improvement of water quality within the GWMA. The hydrogeologic research needs are discussed below. The second category is an important aspect of action plan implementation and will allow spatial analysis of management factors as they relate to water quality. The BMP research needs are discussed in Section 3.3. The research topics listed below may be used as an overall research plan. Each item will improve the utility of the other items, and in only rare instances will the research efforts be redundant at all. It is recommended that most of the items be accomplished, followed by re-assessment of the research plan.

A primary concern of both landowners and regulators was premature interpretation of BMP implementation effect on water quality change. In order to understand when, where, and how to look for water quality improvements, an adequate understanding of travel time through the groundwater system is necessary. Such information is currently not available for the GWMA.

This research topic focuses on hydrogeologic characterization of the groundwater management area. Travel time and geochemical character of the hydrogeologic system are critical pieces of information for making assessment of when water quality improvements are expected.

a. *Analyze current monitoring well network for additional analytes that will improve our understanding of the hydrogeologic system and potential nitrate sources (e.g., isotopic analysis, redox potential, etc.).*

   An increasing number of studies are utilizing geochemical indicators to evaluate travel time of groundwater. These indicators should be analyzed for potential usefulness in the current monitoring network. Since these wells are already sampled regularly, costs should be nominal (i.e., only for analyses).

   Isotopic analysis of various chemical constituents may allow estimation of groundwater age or of likely nitrate source (e.g., septic tanks, manure, and commercial fertilizer). An understanding of the age of the groundwater in various parts of the basin will allow estimates of time until BMP implementation will be detected at each well. Evaluation of likely sources of pollution will allow BMPs to be focused where they will do the most good.

   Other geochemical indicators may also prove useful (e.g., redox potential, Cl/N ratios, etc.) for detecting water quality improvements (resulting from BMP implementation) or for understanding why some wells are consistently lower in nitrate concentration. While nitrate is very mobile in groundwater, in some geochemical environments, it is likely not conservative. [Primary candidates for work are DEQ, OSU Ext, OSU Bioresource Engineering, OSU Forest Engineering, or other departments or universities exhibiting sufficient expertise.]

b. *Re-sample the 200+ wells sampled during the synoptic sampling round in 1992.*

   2002 will be the tenth year since the synoptic round of well sampling across the entire GWMA. Re-sampling of these wells in 2002 will allow a comparison of a large number of data points ten years later. The large number of data points will allow statistics to be applied to give an indication of whether the GWMA nitrate concentrations are generally higher or lower than they were ten years ago.

If additional analytes will prove beneficial (see *a.* above), then these should be added to the synoptic sampling round. For this reason, it may be beneficial to accomplish *a.* (above) first (i.e., it would minimize cost to know which additional analytes are most likely to succeed). [Primary candidate for work is DEQ.]

c. Vadose zone sampling.

Vadose zone sampling was accomplished early during the action plan implementation. Additional vadose zone sampling may prove beneficial, but research objectives need to be clearly identified. Reductions in amounts of applied irrigation and fertilizer have a synergistic effect that may provide misleading results. Also, vadose sampling will be expensive if the goal is to provide statistically relevant results to be applied at the basin scale. [Primary candidates for work are DEQ, OSU Ext, OSU Bioresource Engineering, and OSU Soil Sciences.]

d. Hydraulic aquifer testing (i.e., hydraulic conductivity determination).

Pump and slug testing are standard tools used in hydrogeology. Estimates of hydraulic conductivity would prove very beneficial in formulation of conceptual models of the flow in the GWMA. Further, this data can be used at future dates for development of numerical models. Unfortunately, there are a number of technical challenges associated with use of the existing monitoring network, and aquifer testing is relatively expensive (especially if the goal is to characterize the entire GWMA). [Primary candidates for work are DEQ or a contracted consultant.]

e. Development of new statistical tools for analysis of trend data.

Preliminary statistical analysis of Northern Malheur County GWMA data indicated that more advanced statistical tools need to be developed to assign numeric values to pollutant trends in the GWMAs. Confidence that current tools will allow evaluation of probable final nitrate concentrations in groundwater is very low.

If proper statistics can be developed, analysis of the Malheur nitrate and dacthal data together may provide some method of estimating system response time to BMP implementation. If this proves to be the case, it may be beneficial to attempt to identify some chemical in the LUB GWMA that may also provide a temporal signature that coincides with BMP implementation. [Primary candidates for work are DEQ and OSU Mathematics (or others).]

f. Case-by-case evaluation of anomalously high nitrate concentrations.

A few wells were noted to have anomalously high nitrate levels (e.g., there is a basalt well that would normally be assumed to have high protection against agricultural or septic tank pollution). These wells might benefit from a more detailed inspection to ensure that there are no well construction or siting problems that invalidate their use as a GWMA monitoring well. It is anticipated that these additional inspection items will be low cost actions (e.g., sending a camera down the borehole to ensure there is no cross-connection of aquifers). Anomalous high pollutant levels may have large impacts on trend analyses depending on the types of statistics that are employed. [Primary candidate for work is DEQ.]

g. Spatial analysis of other vulnerability factors (e.g., soil type, septic density, distance from irrigation canals, etc.).

Site visits to wells indicated that many of the possible confounding factors for aquifer vulnerability were not easy to assess. In order to evaluate these factors, it may be desirable to be able to perform spatial analysis between high concentration wells and factors that may affect aquifer vulnerability. This item might best be accomplished following geochemical analysis of monitoring wells and documentation of BMP implementation. This will ensure the analysis of the other vulnerability factors occurs in the proper context. [Primary candidates for work are DEQ, OSU Ext, OSU Bioresource Engineering, and OSU Soil Sciences.]

h. Evaluation of groundwater / surface water interaction.

Although not identified during the field visit discussed above, an evaluation of the interaction of groundwater and surface water could be very useful. An increased knowledge of groundwater surface water interaction (throughout the basin as a whole and at specific locations) could shed light on issues where surface water issues and groundwater issues intersect (e.g., Total Maximum Daily Loads for surface water bodies versus GWMA needs, BMPs protective of surface water quality but detrimental to groundwater quality). A comprehensive groundwater study that will characterize the groundwater system (including surface water interaction) for the entire Umatilla River basin is desired. Funding partners are being pursued to allow this project to proceed. [OWRD and USGS are the agencies that will lead this investigation.]

7.0 EVALUATION OF SUCCESS

Item C.1 in Section VIII of the Action Plan requires the success of the Action Plan be evaluated after the first four years of implementation (i.e., 1998 through 2001). The criteria for evaluating success are described as "whether strategies and plans have been developed as outlined under the Implementation Tasks Section VII". Section 7.1 includes an evaluation of the success of each item listed in the 1997 version of Section VII of the Action Plan. Section 7.2 includes conclusions regarding the overall success of Action Plan Implementation.

In addition to the evaluation of overall success, item A.4 in Section VII of the Action Plan requires the Implementation Tasks section of the Action Plan (Section VII) be updated after each four year evaluation period. The updated Section VII is provided in Attachment 1.

7.1 Evaluation of Implementation of Individual Action Plan Tasks

Table 2 summarizes each item listed in the 1997 version of Section VII of the Action Plan and the progress made towards implementing each item.

Table 2
Summary of Action Plan Implementation

Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.A.5.a.1	General – Education and Public Awareness	Develop Public Information and Education plans which emphasize groundwater quality protection in the LUB GWMA. Then, as resources allow, implement components of the plan.	SWCD and OSU Extension	
VII.A.5.a.2	General – Education and Public Awareness	Design presentations or workshops which could be used to present groundwater protection concepts to a variety of target audiences. Attempt to include groundwater protection presentations into various forums attended by targeted audiences.	SWCD, NRCS, and OSU Extension	Some efforts have been completed and others are ongoing
VII.A.5.a.3	General – Education and Public Awareness	Prepare and/or encourage the development of articles addressing different aspects of groundwater quality protection. Attempt to have the articles printed in local publications and/or as a Groundwater Quality Newsletter.	SWCD and OSU Extension	Some efforts have been completed and others are ongoing
VII.A.5.b.1	General – Cataloging of Information	Maintain and update a groundwater quality management practices library and index. Organize and update the information and make the material available at appropriate locations.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	The Umatilla County SWCD and the City of Boardman maintain groundwater quality libraries
VII.A.5.b.2	General – Cataloging of Information	Keep an index of the location of pertinent information and people knowledgeable in groundwater protection management practices for the different sectors.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	The Umatilla County SWCD maintains such an index

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Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.A.5.c.1	General – Implementing Strategy	Identify accepted systems of BMPs or implementation plans which would be useful for those in the identified sectors to use for protection of groundwater quality. Encourage the development and adoption of strategic plans by individuals, business organizations, and governments to protect the groundwater quality	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	Some efforts have been completed and others are ongoing
VII.A.5.c.2	General – Implementing Strategy	Gather, organize, and make available existing relevant information pertaining to practices and strategies which will protect groundwater from contamination.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	This information is part of the library maintained by the Umatilla County SWCD
VII.A.5.c.3	General – Implementing Strategy	Develop and implement specific plans which highlight the groundwater concerns to be addressed and the practices which will be promoted and encouraged to address those concerns.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	Some efforts have been completed and others are ongoing
VII.A.5.c.4	General – Implementing Strategy	Identify gaps in knowledge and develop plans for obtaining the information or research needed to fill those gaps.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	
VII.A.5.d.1	General – Documentation of Results	Develop a plan to document how well activities, practices and alternative practices recommended in the Action Plan are being adopted. Include specifics on types of practices, aerial extent, location, time of adoption, continued use of recommendations and other factors relevant to document progress in implementing the action plan. This plan will be used to address the evaluation criteria in Section VIII.	SWCD, NRCS, and OSU Extension are the lead agencies but local governments and agencies, individuals, businesses, and organizations are encouraged to participate	
VIII.C.2	Irrigated Agriculture	To familiarize the agricultural sector in the reasoning and use of the recommended management practices, appropriate articles should be developed for publication in local media outlets. Additionally, presentations on groundwater quality protection should be developed and presented at local forums.	SWCD, NRCS, and OSU Extension	Some efforts have been completed and others are ongoing
VII.C.3	Irrigated Agriculture	Survey local growers as to what practices they are now using to determine baseline practices. This can also be used as an educational tool to highlight what practices the GWMA Committee is recommending for use in the basin.	SWCD, NRCS, and OSU Extension	Completed

Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.C.4	Irrigated Agriculture	Develop inventories of reference materials, guidance documents and articles which recommend management practices and strategies to reduce nitrate loading for targeted crops and conditions in the LUB. Develop and maintain a bibliography of literature on BMPs.	SWCD with assistance from OSU Extension and private agricultural service sector companies	The Umatilla County SWCD maintains such an inventory and bibliography
VII.C.5	Irrigated Agriculture	Target grant applications and other assistance funds to implementing recommended management practices and strategies and developing practices which address reducing nitrate contamination of the groundwater.	None specified	Some efforts have been completed and others are ongoing
VII.C.6.a	Irrigated Agriculture	Coordinate and assist the agricultural community in identifying practices that reduce or eliminate nitrate loading to the groundwater.	All agencies	Some efforts have been completed and others are ongoing
VII.C.6.b	Irrigated Agriculture	Support funding activities to develop, compile information, or demonstrate the use of BMPs and strategies for protection of the basin's groundwater quality resources.	None specified	Some efforts have been completed and others are ongoing
VII.C.6.c	Irrigated Agriculture	Investigate and research which production practices are most appropriate for use in reducing the loading of nitrate to the groundwater. Determine whether the recommended practices are being used and applied correctly and at the proper time.	None specified	Some efforts have been completed and others are ongoing
VII.C.6.d	Irrigated Agriculture	Determine what the relationship is between various irrigation scheduling methods and nitrate losses for different crops and practices within the basin.	None specified	
VII.C.6.e	Irrigated Agriculture	Determine the level of soil and tissue sampling to provide optimal information for the cost involved for the different crops grown in the basin.	None specified	
VII.C.6.f	Irrigated Agriculture	Determine the levels and variances of nitrate at depth in the soil profile under agricultural fields in the area. Recommend appropriate methods and sample size for growers to use to account for variations in their fields. Promote an increased understanding of the variation in practices and nutrient requirements across agricultural fields.	None specified	
VII.C.6.g	Irrigated Agriculture	Identify what are the sources and sinks of nitrogen in the soil profile and the transformation rates of nitrogen in the soil. Evaluate whether there are certain times of year when nutrients leach out of the soil profile. Develop a strategy which would account for and capture a majority of nitrate in the soil profile.	None specified	
VII.C.6.h	Irrigated Agriculture	Determine the nutrient requirements for each life stage of the major crops being grown in the basin and recommend optimum fertilizer rates. Add a "growth stage nitrogen component" for crops on the Northwest Irrigation Network.	None specified	

Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.C.6.i	Irrigated Agriculture	Determine the specific nutrient requirements for a given yield on different crops grown in the area. Then develop recommendations and review and modify fertilizer guides, if needed, based on high yield requirements.	None specified	
VII.C.6.j	Irrigated Agriculture	Further study nitrogen uptake in potatoes to better develop an understanding of nitrogen requirements. Utilize Dr. Hodges work. This information would also help with the Northwest Irrigation Network project. Compile existing data on nitrogen-irrigation-variety work on potatoes in the basin to update and expanded "Fertilizer Guide".	None specified	Some efforts have been completed and others are ongoing
VII.C.6.k	Irrigated Agriculture	Determine fertilization needs of onions in the basin. This would help with the Northwest Irrigation Network project.	None specified	Some efforts have been completed and others are ongoing
VII.C.6.l	Irrigated Agriculture	Determine which plants would be most beneficial in reaching and utilizing nitrates deep in the soil profile. Develop recommendations for the use of deep rooted crops.	None specified	
VII.D.1.a	Rural Residential – General	Develop appropriate articles and newsletters for local publication and media outlets. Emphasize and encourage the adoption of recommended practices to reduce nitrogen loading to the groundwater. Submit a monthly press release to local newspapers, publish a biannual newsletter and submit articles to the Ruralite magazine (written by various agency personnel and active citizens)	SWCD and OSU Extension	Some efforts have been completed and others are ongoing
VII.D.1.b	Rural Residential – General	Develop and establish an educational / outreach program and material to provide the rural residential community with information and alternatives on how to develop property while protecting groundwater quality. Encourage local area libraries to house information for public checkout.	SWCD and OSU Extension	
VII.D.1.c	Rural Residential - General	Integrate a groundwater quality component into the local area watershed curriculum initiative and other educational forums such as 4H, FFA, and Scouts.	SWCD and OSU Extension	Some efforts have been completed and others are ongoing
VII.D.1.d	Rural Residential – General	Conduct surveys of local residents to determine their awareness of the groundwater quality concerns and problems in the area. Do surveys at local community events or in conjunction with a free nitrate testing program.	SWCD and OSU Extension	1999, 2001, 2005, and 2009 goals
VII.D.1.e	Rural Residential – General	Offer workshops for realtors on groundwater quality concerns and provide continuing education credits.	SWCD and OSU Extension	Workshops conducted in 1998 and 1999
VII.D.1.f	Rural Residential – General	Develop bilingual outreach material for Hispanic community. Consider applying for an Environmental Justice grant to address this need.	None Specified	Spanish version of nitrate fact sheet completed

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Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.D.2.a	Rural Residential – Septic Systems	Develop options and alternatives for county and city governments to use to address the cumulative impacts of septic systems	DEQ and County Planning Depts.	Completed
VII.D.2.b	Rural Residential – Septic Systems	Determine where in the basin septic system waste water loading could create a groundwater quality problem based on current development, hydrogeology and potential future development	DEQ and County Planning Depts.	2005 goal
VII.D.2.c	Rural Residential – Septic Systems	Once an understanding of where groundwater degradation from septic systems may occur, develop options and alternatives to assist county planning commissions, departments and the development community in addressing the groundwater quality impacts of development.	DEQ and County Planning Depts.	2009 goal
VII.D.2.d	Rural Residential – Septic Systems	Review Land Use Plans and Codes to determine how to incorporate groundwater concerns and incorporate groundwater quality as a criterion in land use review of development proposals. Develop a long term municipal sewer system plan. Where and when possible, connect residences to the municipal system	DEQ and City and County Governments and Planning Depts.	Some efforts have been completed and others are ongoing
VII.D.2.e	Rural Residential – Septic Systems	Encourage routine maintenance of septic systems to extend the useful life of systems and minimize groundwater quality impacts.	DEQ, Counties, OSU Extension, and SWCD	Ongoing
VII.D.2.f	Rural Residential – Septic Systems	Encourage periodic inspections and replacement or upgrading of septic systems to meet current standards	DEQ, Counties, OSU Extension, and SWCD	Ongoing
VII.D.2.g.1	Rural Residential – Septic Systems	Investigate possible methods for determining where in the basin high densities of septic systems are likely to have an adverse impact on groundwater quality	None specified	Some efforts have been completed and others are ongoing
VII.D.2.g.2	Rural Residential – Septic Systems	Develop recommendations of methods for County Planning Commissions and planning departments to use in addressing present and future development issues with regards to groundwater contamination	None specified	Some efforts have been completed and others are ongoing
VII.D.3.a	Rural Residential – Landscape, Lawn, and Garden	Organize information and develop an educational/outreach program on methods and alternatives to properly maintain landscaping, lawns, and gardens to prevent leaching nutrients to the groundwater.	SWCD and OSU Extension	
VII.D.4.a	Rural Residential - Wells	Develop and distribute information to well drillers about groundwater contamination concerns in the area.	SWCD and OSU Extension	
VII.D.4.b	Rural Residential – Wells	Outline the need to construct and repair wells to prevent possible contamination from the surface and the concern about the use of sand points.	SWCD and WRD	
VII.D.4.c	Rural Residential – Wells	Highlight the need to repair wells which are commingling alluvial and basalt aquifers so contamination in one aquifer does not contaminate another	SWCD and WRD	
VII.D.4.d	Rural Residential – Wells	Educate well drillers on the concerns of placement of wells too close to septic systems.	SWCD and WRD	Ongoing

Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.D.5.a	Rural Residential – Animal Pastures	Develop comprehensive plan policies that encourage the implementation of guidelines establishing the number of animals allotted per acre as determined to be appropriate to prevent groundwater contamination.	County Planning Depts., ODA, NRCS, and OSU Extension	
VII.D.5.b	Rural Residential – Animal Pastures	Better enforce existing zoning code restrictions on allowable animal densities. Document and map if possible.	County Governments	
VII.E.1	Food Processor Process Water	Strive to address the intent of the laws and regulations established for environmental protection. Continue to follow permit conditions and requirements and meet or exceed all requirements. Continue the use of the Operation, Monitoring and Management (OMM) Strategy.	DEQ and food processors	Ongoing
VII.F.1	CAFOS	Develop informational materials introducing BMPs for groundwater protection to CAFO operators	SWCD, NRCS and ODA	Completed by ODA
VII.F.2	CAFOS	Develop and maintain a bibliography of literature on CAFO BMPs	SWCD, NRCS and ODA	In ODA Library
VII.F.3	CAFOS	Develop and maintain a list of individuals and agencies with technical expertise in design, construction, and operation of CAFO BMPs	SWCD, NRCS and ODA	Ongoing; Partial list available from ODA
VII.F.4	CAFOS	Provide individual farm evaluations of CAFOs upon request to assess the adequacy of groundwater protection measures.	SWCD, NRCS and ODA	
VII.F.5	CAFOS	Develop a database characterizing CAFOs to support information / education efforts and to measure implementation of the action plan.	SWCD, NRCS and ODA	Ongoing effort by ODA
VII.F.6	CAFOS	Develop a prioritized list of information, research and demonstration needs relating to CAFO management and groundwater protection	SWCD, NRCS and ODA	
VII.F.7.a	CAFOS	Perform further analysis on different types of manure (i.e., fresh, dried, composted) to develop nutrient guidelines for the use of manure on crops.	None specified	
VII.F.7.b	CAFOS	Review scientific literature and studies regarding groundwater quality management of CAFO operations	None specified	Completed by ODA
VII.F.7.c	CAFOS	Review research and identify BMPs that will address waste management problems within CAFOs	None specified	Ongoing effort by ODA
VII.F.7.d	CAFOS	Develop educational materials which recommend BMPs for use by CAFO operators	None specified	
VII.F.7.e	CAFOS	Develop a plan for educating the public which will clarify the science in regards to groundwater quality and the management of CAFOs	None specified	
VII.F.7.f	CAFOS	Develop a forum for providing and disseminating information developed through this plan	None specified	
VII.F.7.g	CAFOS	Develop and implement a strategy to effectively deliver information and education to CAFO operators on BMPs for groundwater protection	None specified	

Action Plan Reference	Topic	Annual Progress Report Item	Lead Organizations	Progress Made Towards Implementation
VII.G.1	US Army Umatilla Chemical Depot Washout Lagoons	Operation of the treatment system and continued monitoring of groundwater quality around the treatment system with the intent being to assure that nitrate contaminated water is not migrating away from the treatment system and into other parts of the aquifer.	DEQ and US Army	Ongoing

7.2 Evaluation of Overall Success of Action Plan Implementation

As shown in Table 2, progress has been made towards implementing many items. Several Action Plan items have been completed in full. Many Action Plan items have some aspects that have been completed while others are ongoing. Other Action Plan items have yet to be implemented. Some of these items could, and should, be implemented as soon as possible while others are scheduled for future implementation. As indicated in Section 5.0 of the 2000 Annual Report and Section 5.0 of this report, most of the December 1999 and December 2001 goals have been, or soon will be, met.

Because measurable progress has been made towards the Action Plan goal using the criteria set forth in the Action Plan, it is concluded that sufficient progress has been made to continue the voluntary nature of the Action Plan. This is not to say that there is no room for improvement. There is always room for improvement. Specific recommendations for the future are included in Section 8.1.

8.0 RECOMMENDATIONS

This section of the report contains recommendations for the future and recommended changes to the Action Plan.

8.1 Recommendations for the Future

- Develop a plan to document how well activities, practices and alternative practices recommended in the Action Plan are being adopted. Include specifics on types of practices, aerial extent, location, time of adoption, continued use of recommendations and other factors relevant to document progress in implementing the action plan.
- All interested and affected parties should work towards accomplishing the December 2005 goals.
- Explore the possibility of performing deep soil sampling at locations where high nitrates have been detected.
- DEQ and others should further investigate the anomalously high nitrate values at several monitoring well network wells.
- DEQ and others should pursue funding for the research needs identified for BMP determination and implementation as well as the hydrogeologic characterization of the GWMA.
- Completion of a Memorandum of Agreement between the SWCDs, ODA and DEQ along with a work plan for activities associated with this action plans implementation (Section VII, item A.3).
- DEQ should work towards implementing an economical alternative septic system demonstration project.
- DEQ should get additional educational materials produced in Spanish and make them available to the Spanish-speaking population within the GWMA.
- Completion of the follow up survey to the baseline rural residential survey conducted in 1999 (Section VIII, item G.2.b)
- Consider a more proactive approach to education efforts such as a door-to-door information campaign, direct mailing, and/or meetings specific to the Spanish-speaking population.
- Develop Public Information and Education plans which emphasize groundwater quality protection in the LUB GWMA.
- Begin efforts to encourage routine maintenance of septic systems and to encourage periodic inspections and replacement or upgrading of septic systems.
- Begin efforts to address rural residential animal pastures per items VII.D.5a & b.
- DEQ should do a better job at reviewing documents submitted by food processor facilities in a timely manner and providing comments that will assist the food processor facilities meet their permit conditions and objectives.
- Food processor facilities continue to strive to meet permit conditions and objectives.
- Direct more education to growers regarding nutrient management to help reduce over-fertilization.
- Direct more general education on maintenance and management of wheel and permanent set irrigation systems.
- Either define an “acceptable system of BMPs” for irrigated agriculture or redefine the 2005 irrigated agriculture goal.
- Develop an inventory of CAFOs in the LUB GWMA.

8.2 Recommendations for Changes to the Action Plan

Recommended changes to the Action Plan at this time include:

- Incorporation of the updated Section VII “Implementation Tasks” (included as Attachment 1) into the final version of the Action Plan

9.0 ACTION PLAN SUPPORT AND APPROVAL

Section VIII, item C.5 of the Lower Umatilla Basin Groundwater Management Area Action Plan states it is the responsibility of the Lower Umatilla Basin Groundwater Management Area Committee, ODA, and DEQ to determine whether the Action Plan is addressing the groundwater contamination concerns adequately or whether modifications need to be made to the Action Plan to better enable it to succeed. The following statements address the adequacy of the Action Plan, and its success to date.

9.1 Statement by Committee Chair

On behalf of the Committee, I commend the efforts of those who have strived to implement the Action Plan over the past four years. It is through the efforts of these affected parties, with support from local natural resource agencies, that progress has been made in education, outreach, best management practice development and implementation toward the goal of seeking solutions to protect the area's groundwater and, ultimately, reduce the nitrate-nitrogen concentration in the groundwater to below the 7 mg/l level that triggered the declaration of the Groundwater Management Area.

Because measurable progress has been made towards the Action Plan goal using the criteria set forth in the Action Plan, I conclude that sufficient progress has been made to continue the voluntary nature of the Action Plan.

Furthermore, the Committee is dedicated to continued efforts to implement the Action Plan and any future amendments until the goal has been reached. A similar statement regarding Action Plan success will be prepared following the next four year evaluation period ending in 2005.

Ron Rackman, Committee Chair

11/07/02
Date

9.2 Statement by ODA Director

I concur with the statement by the Committee Chair, acknowledge the progress of Action Plan implementation to date, and recognize the importance of ODA's support towards attaining the Action Plan goal.

Phil Ward, Director
Oregon Department of Agriculture

1/6/03
Date

9.3 Statement by DEQ Director

I concur with the statement by the Committee Chair, acknowledge the progress of Action Plan implementation to date, and recognize the importance of DEQ's support towards attaining the Action Plan goal.

for
Stephanie Hallock, Director
Oregon Department of Environmental Quality

12/2/02
Date

Attachment 1

2001 Update to Section VII "Implementation Tasks" of the 1997 Lower Umatilla Basin Groundwater Management Area Action Plan

Section VII Implementation Tasks

A. General

1. The GWMAC will act as overall coordinator for encouraging the adoption of practices which will reduce nitrate loading to the aquifers.

2. Implementation will initially rely on education, encouragement and a promotion effort, backed by an effort to gather information pertinent to practices and activities which will protect groundwater quality. The assumption is that once businesses, organizations, government and individuals are aware of the environmental consequences of certain practices they will seek alternatives to reduce the likelihood of groundwater contamination.

3. DEQ and ODA will have oversight responsibility for progress and success of this action plan. The Umatilla County Soil and Water Conservations District (SWCD) will be the local agency leading implementation of the action plan. A Memorandum of Agreement between the SWCD, ODA and DEQ will be developed along with a work plan for activities associated with this action plan's implementation.

4. Implementation Task, Section VII of this Action Plan will require updating after each 4 year evaluation period.

5. The following general activities are recommended for implementing this action plan. All local, state and federal agencies and government bodies are encouraged to coordinate their efforts to help implement the following activities.

    a) Education and Public Awareness

        1) Develop Public Information and Education plans which emphasize groundwater quality protection in the LUB GWMA. Then, as resources allow implement components of the plan. SWCD and OSU Extension will be the local agencies implementation of this component.

        2) Design presentations or workshops which could be used to present groundwater protection concepts to a variety of target audiences. Attempt to include groundwater protection presentations into various forums attended by targeted audiences. SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component.

        3) Prepare and/or encourage the development of articles addressing different aspects of groundwater quality protection. Attempt to have the articles printed in local publications and/or as a Groundwater Quality Newsletter. SWCD and OSU Extension will be the local agencies leading implementation of this component.

    b) Cataloging of Information – SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component, however, other local governments and agencies, individuals, businesses, and organizations are encouraged to participate.

        1) Maintain and update a groundwater quality management practices library and index. Organize and update the information and make the material available at appropriate locations.

        2) Keep an index of the location of pertinent information and people knowledgeable in groundwater protection management practices for the different sectors.

    c) Implementation Strategy – SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component; however other local government agencies, individuals, businesses and organizations are encouraged to participate.

        1) Identify accepted systems of BMPs or implementation plans which would be useful for those in the identified sectors to use for protection of groundwater quality. Encourage the development and adoption of strategic plans by individuals, businesses, organizations and governments to protect the groundwater quality.

2) Gather, organize, and make available existing relevant information pertaining to practices and strategies which will protect groundwater from contamination.

3) Develop and implement specific plans which highlight the groundwater concerns to be addressed and the practices which will be promoted and encouraged to address those concerns.

4) Identify gaps in knowledge and develop plans for obtaining information or research needed to fill those gaps.

d) Documentation of Results – SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component, however, other local government agencies, individuals, businesses and organizations are encouraged to participate.

1) Develop a plan to document how well activities, practices and alternative practices recommended in the Action Plan are being adopted. Include specifics on types of practices, aerial extent, location, time of adoption, continued use of recommendations and other factors relevant to document progress in implementing the action plan. This plan will be used to address the evaluation criteria in Section VIII.

B. Implementation Funding

1. No dedicated funding is available for implementing this action plan.

2. Although dedicated funds are not available, there are a number of grant funding sources available which can be applied to for addressing certain aspects of the plan. All these grant funding options have their own eligibility requirements, application procedures, and conditions for apply. Most are competitive in nature and proposed projects compete with other proposals submitted throughout the state or nation.

a) The Federal Clean Water Non-point source section 319 grant program administered by DEQ.

b) The State of Oregon Groundwater Research and Development Grants Program administered by ODA.

c) There are several programs administered by the National Resource Conservation Service (NRCS) which are directed towards agricultural activities.

d) The Oregon Watershed Enhancement Board (OWEB) grant program.

e) National Sustainable Development Challenge Grants administered through the Regional EPA offices.

f) There are also several grant and loan programs administered through the Oregon Economic Development Department.

g) DEQ also administers a State Revolving Loan Program which may be able to fund some aspects of environmental protection projects. However, this is a loan not a grant and must be repaid. Additionally, at present, loans can only be given to public organizations with a demonstrated ability to repay the loan.

h) Those wishing to pursue a project implementing some aspect of this action plan should coordinate their effort with the lead agencies and the GWMAC.

3. Ultimately, grants can only cover a small portion of the activities needed to make the necessary changes to improve the groundwater quality. In the end, much of the successful implementation of this plan will rely on individuals, organizations, businesses, and governments taking the initiative to incorporate the concepts presented here into their current practices.

4. The committee encourages all those organizations who give advice to area residents and businesses to incorporate the concepts on protecting groundwater quality into recommendations given to their clientele.

Businesses and private organizations are encouraged to support efforts to implement this action plan by: adopting the necessary activities and practices needed to protect the groundwater from contamination; funding and supporting activities outlined in the action plan; and/or using internal resources to support aspects of the activities recommended in the action plan.

C. Irrigated Agriculture

1. Implementation of this plan will be based on educational programs and demonstration projects designed to familiarize growers with the recommendations made in Section VI under Irrigated Agricultural "Recommended Management Practices" and encourage them to adopt practices which prevent the leaching of nitrate to groundwater.

2. To familiarize the agricultural sector in the reasoning and use of the recommended management practices, appropriate articles should be developed for publication in local media outlets. Additionally, presentations on groundwater quality protection should be developed and presented at appropriate local forums. SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component.

3. Survey local growers as to what practices they are now using to determine base line practices. This can also be used as an educational tool to highlight what practices the GWMA Committee is recommending for use in the basin. SWCD, NRCS and OSU Extension will be the local agencies leading implementation of this component.

4. Develop inventories of reference materials, guidance documents and articles which recommend management practices and strategies to reduce nitrate loading for targeted crops and conditions in the Lower Umatilla Basin. Develop and maintain a bibliography of literature on BMPs. Coordination will be by SWCD staff with assistance from OSU Extension and private agricultural service sector companies.

5. Target grant applications and other assistance funds to implementing recommended management practices and strategies and developing practices which address reducing nitrate contamination of the groundwater. (See Information, Research and Demonstration Project needs for recommended activities.)

6. Information, Research and Demonstration Projects needs: A number of topics have been identified which would either be useful in implementing the action plan for agricultural activities or were needed before certain practices or activities could be initiated.

    a) All agencies should coordinate and assist the agricultural community in identifying practices that reduce or eliminate nitrate loading to the groundwater.

    b) Support funding activities to develop, compile information, or demonstrate the use of Best Practical Management Practices and strategies for the protection of the basin's groundwater quality resources.

    c) Investigate and research which production practices are most appropriate for use in reducing the loading of nitrate to the groundwater. Determine whether the recommended practices are being used and applied correctly and at the proper time.

    d) Determine what the relationship is between various irrigation scheduling methods and nitrate losses for different crops and practices within the basin.

    e) Determine the level of soil and tissue sampling to provide optimal information for the cost involved for the different crops grown in the basin.

    f) Determine the levels and variances of nitrate at depth in the soil profile under agricultural fields in the area. Recommend appropriate methods and sample size for growers to use to account for variations in their fields. Promote an increased understanding of the variation in practices and nutrient requirements across agricultural fields.

    g) Identify what are the sources and sinks of nitrogen in the soil profile and the transformation rates of nitrogen in the soil. Evaluate whether there are certain times of the year when nutrients leach out of the soil profile. Develop a strategy which would account for and capture a majority of the nitrogen in the soil profile.

h) Determine the nutrient requirements for each life stage of the major crops being grown in a basin and recommend optimum fertilizer rates. Add a "growth stage nitrogen component" for crops on the Northwest Irrigation Network (NIN).

i) Determine the specific nutrient requirements for a given yield on different crops grown in the area. Then develop recommendations and review and modify fertilizer guides, if needed, based on high yield requirements.

j) Further study nitrogen uptake in potatoes to better develop an understanding of nitrogen requirements. Utilize Dr. Hodges work. This information would also help with the Northwest Irrigation Network (NIN) project. Compile existing data on nitrogen-irrigation-variety work on potatoes in the basin to update an expanded "Fertilizer Guide".

k) Determine fertilization needs of onions in basin. This would help with the NIN project.

l) Determine which plants would be most beneficial in reaching and utilizing nitrates deep in the soil profile. Develop recommendations for the use of deep rooted crops.

D. Rural Residential

1. General

a) Develop appropriate articles and newsletters for local publication and media outlets. Emphasize and encourage the adoption of recommended practices to reduce nitrogen loading to the groundwater. Submit a monthly press release to local newspapers, publish a biannual newsletter and submit articles to the Ruralite magazine (written by various agency personnel and active citizens). SWCD and OSU Extension will be the local agencies leading implementation of this component.

b) Develop and establish an educational/outreach program and material to provide the rural residential community with information and alternatives on how to develop property while protecting groundwater quality. Encourage local area libraries to house information for public check out. SWCD and OSU Extension will be the local agencies leading implementation of this component.

c) Integrate a groundwater quality component into the local area watershed curriculum initiative and other educational forums (such as 4H, FFA and Scouts). SWCD and OSU Extension will be the local agencies leading implementation of this component.

d) Conduct surveys of local residents to determine their awareness of the groundwater quality concerns and problems in the area. Do surveys at local community events or in conjunction with a free nitrate testing program. SWCD and OSU Extension will be the local agencies leading implementation of this component.

e) Offer workshops for realtors on groundwater quality concerns and provide continuing education credits. SWCD and OSU Extension will be the local agencies leading implementation of this component.

f) Information, Research and Demonstration Project needs:

1) Develop bilingual outreach material for the Hispanic community. Consider applying for an Environmental Justice grant to address this need.

2. Septic Systems

a) Develop options and alternatives for county and city governments to use to address the cumulative impacts of septic systems. DEQ and County Planning Departments will be the agencies leading implementation of this component.

b) Determine where in the basin septic system waste water loading could create a groundwater quality problem based on current development, hydrogeology and potential future development. DEQ and County Planning Departments will be the agencies leading implementation of this component.

c) Once an understanding of where groundwater degradation from septic systems may occur, develop options and alternatives to assist county planning commissions, departments and the development community in addressing the groundwater quality impacts of development. DEQ and County Planning Departments will be the agencies leading implementation of this component.

d) Review Land Use Plans and Codes to determine how to incorporate groundwater concerns and incorporate groundwater quality as a criterion in land use review of development proposals. Develop a long term municipal sewer system plan. Where and when possible, connect residences to the municipal system. DEQ and City and County Governments and Planning Departments will be the agencies leading implementation of this component.

e) Encourage routine maintenance of septic systems to extend useful life of system and minimize groundwater impacts. DEQ, Counties OSU Extension and SWCD will be the agencies leading implementation of this component.

f) Encourage periodic inspections and replacement or upgrading of septic systems to meet current standards. DEQ, Counties, OSU Extension and SWCD will be the agencies leading implementation of this component.

g) Information, Research and Demonstration Project needs:

1) Investigate possible methods for determining where in the basin high densities of septic systems are likely to have an adverse impact on groundwater quality.

2) Develop recommendations of methods for County Planning Commissions and planning departments to use in addressing present and future development issues with regards to groundwater contamination.

3. Landscape, Lawn, and Garden

a) Organize information and develop an educational/outreach program on methods and alternatives to properly maintain landscaping, lawns and gardens to prevent leaching nutrients to the groundwater. SWCD and OSU Extension will be the agencies leading implementation of this component.

b) Information, Research and Demonstration Project needs: Most information in this category already exists, no current need for additional projects.

4. Wells

a) Develop and distribute information to well drillers about the groundwater contamination concerns in the area. SWCD and OSU Extension will be the agencies leading implementation of this component.

b) Outline the need to construct and repair wells to prevent possible contamination from the surface and the concern about the use of sand points. SWCD and Water Resources Department (WRD) will be the agencies leading implementation of this component.

c) Highlight the need to repair wells which are commingling alluvial and basalt aquifers so contamination in one aquifer does not contaminate another. SWCD and WRD will be the agencies leading implementation of this component.

d) Educate well drillers on the concerns of placement of wells too close to septic systems. SWCD and WRD will be the agencies leading implementation of this component.

e) Information, Research and Demonstration Project needs: Most information in this category already exists, no current need for additional projects

5. Animal Pastures

a) The County Planning Departments will work with ODA, NRCS and OSU Extension to develop comprehensive plan policies that encourage the implementation of guidelines establishing the numbers of animals allotted per acre as determined to be appropriate to prevent groundwater contamination.

b) Counties better enforce existing zoning code restrictions on allowable animal densities. Document and map if possible. County governments will be the agencies leading implementation of this component.

c) Information, Research and Demonstration Project needs: Most information in this category already exists, no current need for additional projects.

E. Food Processor Process Water

1. Implementation of this plan will rely on the current permitting practices of DEQ with input from the food processing industry. The industry will strive to address the intent of the laws and regulations established for environmental protection. They will continue to follow their permit conditions and requirements and meet or exceed all requirements. Additionally, the industry is committed to continued use of the Operation, Monitoring and Management (OM&M) strategy developed through the permitting process. DEQ and food processors will jointly be responsible for implementation of this component.
2. Information, Research and Demonstration Project needs: Support project needs identified under Irrigated Agriculture.

F. Confined Animal Feeding Operations (Feedlots & Dairies)

1. Develop informational materials introducing BMPs for groundwater protection to CAFO operators. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

2. Develop and maintain a bibliography of literature on CAFO BMPs. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

3. Develop and maintain a list of individuals and agencies with technical expertise in design, construction, and operation of CAFO BMPs. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

4. Provide individual farm evaluations of CAFOs, upon request, to assess the adequacy of groundwater protection measures. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

5. Develop a database characterizing CAFOs, to support information/education efforts and to measure implementation of the action plan. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

6. Develop a prioritized list of information, research and demonstration needs relating to CAFO management and groundwater protection. SWCD, NRCS and ODA will be the agencies leading implementation of this component.

7. Information, Research and Demonstration Project needs:

   a) Perform further analysis on different types of manure (i.e., fresh, dried, composted) to develop nutrient guidelines for the use of manure on crops.

   b) Review scientific literature and studies regarding groundwater quality management of CAFO operations.

   c) Review, research and identify BMPs that will address waste management problems within CAFOs.

   d) Develop educational materials which recommend BMPs for use by CAFO operators.

   e) Develop a plan for educating the public which will clarify the science in regards to groundwater quality and the management of CAFOs.

   f) Develop a forum for providing and disseminating information developed through this plan.

   g) Develop and implement a strategy to effectively deliver information and education to CAFO operators on BMPs for groundwater protection.

G. U.S. Army Umatilla Chemical Depot Washout Lagoons

1. Implementation will rely on agreements reached between DEQ, the U.S. Environmental Protection Agency and the U.S. Army. These agreements include the operation of the treatment system and continued monitoring of groundwater quality around the treatment system. The intent is to assure that nitrate contaminated water is not migrating away from the treatment system and into other parts of the aquifer. DEQ and U.S. Army will be the agencies leading implementation of this comp