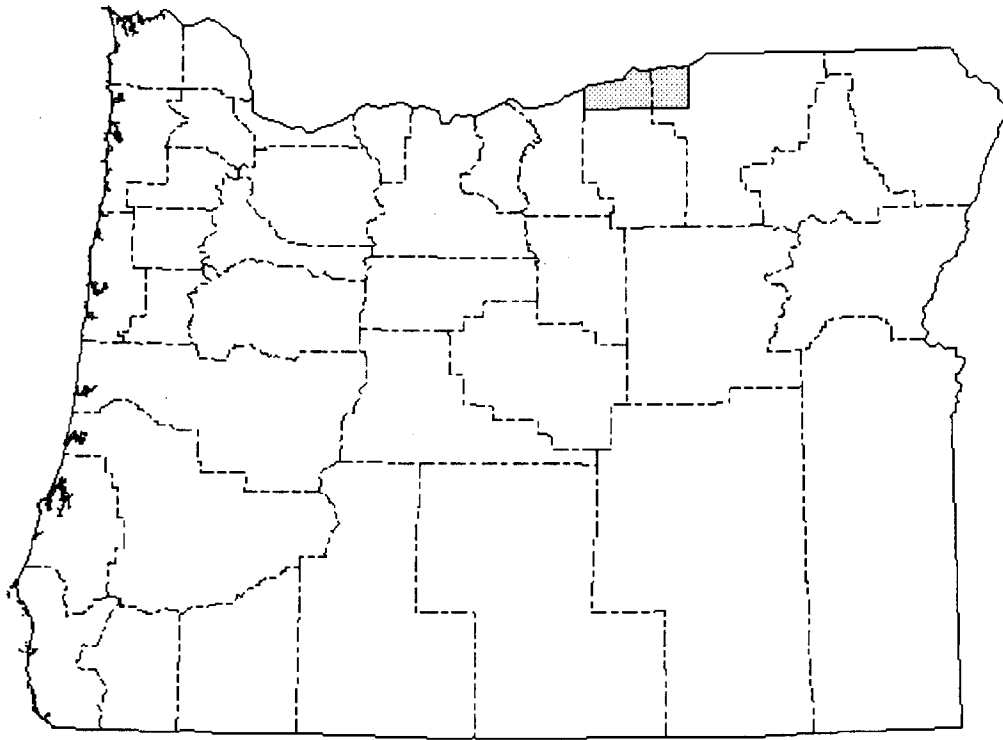


# Lower Umatilla Basin Groundwater Management Area Action Plan



December 8, 1997



## Table of Contents

<b>Section I Background</b>	<b>5</b>
A. Introduction	5
B. Authorities	5
1. Groundwater Protection Act	5
2. Groundwater Management Area Committee	6
3. Department Of Environmental Quality	6
4. The Department of Agriculture	6
<b>Section II Action Plan Approach</b>	<b>7</b>
A. Introduction	7
B. Groundwater Contamination Concerns	8
1. Irrigated Agriculture	8
2. Food Processing Water	8
3. Septic Systems (Rural Residential)	9
4. Confined Animal Feeding Operations (Feedlots and Dairies)	9
5. U.S. Army Umatilla Chemical Depot Washout Lagoons	10
<b>Section III Action Plan Goal</b>	<b>11</b>
<b>Section IV Objectives to Accomplish the Action Plan Goal</b>	<b>11</b>
<b>Section V Methods for Implementing the Action Plan</b>	<b>12</b>
<b>Section VI Implementation Activities</b>	<b>13</b>
A. Irrigated Agriculture	13
1. Irrigation Management	13
2. Nutrient Management	14
B. Rural Residential Development	18
1. Introduction	18
2. Septic Systems	18
3. Landscaping, Lawns and Gardens	19
4. Wells - Construction/location/leakage	20
5. Animal Pastures	20
C. Food Processing Water	21
D. Groundwater Recharge	23
E. Confined Animal Feeding Operations (Feedlots and Dairies)	23
1. General	23
2. Surface Water Management	24
3. Waste Water Effluent Management	24
4. Solid Manure Management	25
5. Management of Feedyard Surfaces	25
F. U.S. Army Umatilla Chemical Depot Washout Lagoons	26

1. Clean Up Activities _____	26
2. Groundwater Monitoring _____	26
3. Future use _____	27
<b>Section VII Implementation Tasks _____</b>	<b>28</b>
A. General _____	28
B. Implementation Funding _____	30
C. Irrigated Agriculture _____	31
D. Rural Residential _____	33
1. General _____	33
2. Septic Systems _____	34
3. Landscape, Lawn, and Garden _____	35
4. Wells _____	35
5. Animal Pastures _____	36
E. Food Processor Process Water _____	37
F. Confined Animal Feeding Operations (Feedlots & Dairies) _____	37
G. U.S. Army Umatilla Chemical Depot Washout Lagoons _____	38
<b>Section VIII Evaluation of Action Plan Progress and Success _____</b>	<b>39</b>
A. Introduction _____	39
B. Annual Progress Report _____	39
C. Schedule _____	39
D. Qualitative Evaluation _____	40
E. Quantitative Evaluation _____	41
F. Audience _____	42
G. Individual Sector Evaluation Criteria _____	42
1. Irrigated Agriculture _____	42
2. Rural Residential _____	43
3. Food Processor Process Water _____	45
4. Confined Animal Feeding Operations (Feedlots & Dairies) _____	45
5. U.S. Army Umatilla Chemical Depot Washout Lagoons _____	46
<b>Section IX Action Plan Support and Approval _____</b>	<b>47</b>
A. Statement by Chair _____	47
B. Concurrence with Action Plan _____	48
C. Acceptance of Action Plan _____	48

<b>Appendix A - Committee Members</b> _____	<b>A-1</b>
<b>Appendix B - Duties, Roles and Responsibilities</b> _____	<b>B-1</b>
<b>Appendix C - Resources</b> _____	<b>C-1</b>
<b>Appendix D - Bi-Monthly Groundwater Monitoring Plan</b> _____	<b>D-1</b>

# Lower Umatilla Basin Groundwater Management Area Action Plan

## Section I Background

### A. Introduction

1. The Oregon Department of Environmental Quality (DEQ) declared the Lower Umatilla Basin a Groundwater Management Area (GWMA) in 1990 because nitrate-nitrogen concentrations exceed 10 mg/l (the federal safe drinking water standard) in many area groundwater samples.
2. Under Oregon's Groundwater Protection Act (ORS 468B.180), DEQ is required to declare a GWMA if area-wide groundwater contamination is found to be caused primarily by non-point source activities. After the GWMA was declared in the Lower Umatilla Basin, DEQ and other state agencies conducted a 4 year interagency hydrogeologic investigation to determine the extent of the nitrate-nitrogen contamination problem and identify the potential sources of that contamination. (Grondin, Gerald H., Wozniak, Karl C., Nelson Dennis O., Camacho, Ivan 1995 Final Review Draft "Hydrogeology, Groundwater Chemistry and Land Uses in the Lower Umatilla Basin Groundwater Management Area")
3. The Act also requires establishing a local Groundwater Management Area Committee (GWMAC) comprised of affected and interested parties. This committee is to work with and advise the state agencies who are required to develop an action plan that will reduce groundwater contamination in the area. (for list of committee members, see Appendix A)

### B. Authorities

1. **Groundwater Protection Act**
  - a) This document is the Action Plan for the Lower Umatilla Basin GWMA. This plan satisfies the requirements for developing an action plan to address groundwater contamination concerns in a GWMA declared under the Groundwater Protection Act (ORS 468B.180 to 468B.188). This Action Plan will satisfy the responsibilities and requirements for the development of an action plan by DEQ as the lead agency and those of the Oregon Department of Agriculture (ODA) for addressing farming practices under ORS 468B.184 (2).

**2. Groundwater Management Area Committee**

- a) The GWMAC for the Lower Umatilla Basin is composed of local area residents and governments representing a broad range of interests within the local area and basin. The committee is an official body appointed by DEQ under state law (ORS 468B.182) to assist the state in developing an action plan to address the groundwater contamination concerns in the basin. The committee and its sub-committees have met in open public forums since January 1996 to form the recommendations in this document.

**3. Department Of Environmental Quality**

- a) The GWMAC, ODA and DEQ have agreed to promote a voluntary approach for addressing the groundwater contamination in the area, which will complement the implementation of water quality permits. If after a scheduled evaluation point, DEQ determines that the voluntary approach is not effective, then mandatory requirements may become necessary. Progress will be based on the evaluation criteria outlined in Section VIII Evaluation of Action Plan Progress and Success.
- b) If mandatory requirements are deemed necessary, DEQ will work with the GWMAC to develop requirements for those sources over which they have jurisdiction.

**4. The Department of Agriculture**

- a) If mandatory requirements are deemed necessary, ODA will implement the requirements of the Agricultural Water Quality Management Program (ORS 568.900 to 568.933 and OAR 603-90-000 to OAR 603-90-120) and develop and implement mandatory requirements for agriculture and rural lands.

## **Section II Action Plan Approach**

### **A. Introduction**

1. The GWMAC has chosen to implement the Action Plan on a voluntary basis. This voluntary approach recognizes that individuals, businesses, organizations and governments, given adequate information and encouragement, will take positive actions and adopt or modify practices and activities to reduce nitrate-nitrogen loading to groundwater. This plan assumes additional regulatory requirements will not be necessary to achieve the plan's goal.
2. The voluntary approach was chosen by the committee because it has several key components which the committee considers important advantages. The committee believes:
  - a) A voluntary approach allows more flexibility than a regulatory approach in how individuals, businesses or organizations choose to address the nitrate problem and could lead to more innovative solutions.
  - b) People are more willing to accept responsibility and make the changes needed if they understand the issue and feel it is a choice they are making rather than being forced to participate.
  - c) The voluntary approach allows for the development of customized practices and strategies on an individual, business, farm or organizational basis rather than the blanket approach of regulatory requirements.
  - d) The voluntary approach provides the opportunity to encourage participation from individuals, organizations and businesses who are not now regulated.
3. Periodically the state agencies and the GWMAC will jointly evaluate the progress of implementing this action plan and how successful it is in reducing the nitrate-nitrogen levels in the groundwater. Based upon the action plan criteria in section VIII, DEQ will determine whether the action plan is succeeding in significantly reducing nitrate loading to groundwater. DEQ will work with ODA, the GWMAC, the local Soil and Water Conservation Districts and city and county governments in evaluating the success of the action plan. DEQ will base their evaluation on documented progress in implementing the recommendations outlined in this action plan under section

VIII and the effectiveness of those recommendations in improving groundwater quality.

4. The voluntary nature of this action plan is in lieu of new regulatory requirements and is intended to complement water quality rules, regulations and permitting requirements. If the voluntary approach does not result in satisfactory progress towards reducing nitrate contamination in the groundwater, mandatory requirements will be considered as part of the action plan. The Groundwater Protection Act (ORS 468B.183) provides for inclusion of mandatory requirements as part of the action plan.

## **B. Groundwater Contamination Concerns**

The technical investigation initially identified five area activities contributing to nitrate contamination of the Lower Umatilla Basin's groundwater:

- 1) Irrigated agriculture;
- 2) Food processing water;
- 3) Confined animal feeding operations (feedlots and dairies);
- 4) Domestic sewage where septic systems occur in high densities; and
- 5) The U.S. Army Umatilla Chemical Depot's washout lagoons.

### **1. Irrigated Agriculture**

- a) Irrigated agriculture is the dominant land use in the basin with approximately 180,000 acres under cultivation. The major sources of nitrate-nitrogen from agricultural activities come from fertilizers and mineralization (decomposition) of organic matter. Nitrogen not utilized by plant growth is stored in the soil and can be leached to groundwater, if sufficient water is available to move it through the soil profile.

### **2. Food Processing Water**

- a) Basin food processing facilities generate large volumes of nutrient rich process water as part of their daily operations. These facilities are one of the few sources of nitrate that are already under direct regulatory requirements. These facilities are required to obtain National Pollution Discharge Elimination System (NPDES) or Water Pollution Control Facilities (WPCF) permits from the state to discharge waste water to waters of the state or land apply waste water.
- b) Originally, food processors land applied their waste water to limited areas, during all seasons, and at amounts exceeding crop needs. These



activities contributed to local nitrate-nitrogen groundwater contamination. Today, DEQ's regulatory waste discharge permit system and the cooperation/innovation of the food processors, food processing facilities in the GWMA are expanding their land application areas, building or expanding process water storage, and scheduling process water applications to meet crop nutrient and water needs. These changes are designed to reduce nitrate loading to the groundwater.

### **3. Septic Systems (Rural Residential)**

- a) Domestic septic systems are contributors to the nitrate contamination problem in localized areas where high densities of septic systems exist. These areas occur primarily within the urban growth boundaries of local cities or in isolated subdivisions. Standard septic systems are not designed to remove nitrate and ammonia and generally provide a steady year-around supply of nitrate-nitrogen to the groundwater. In low density settings, the impact to the groundwater is low because of dilution by the groundwater and the small volume of discharge spread over a large area. However, as densities increase combined discharge volumes increase, overcoming the groundwater's ability to dilute the wastes increasing the potential for noticeable groundwater contamination.
- b) Several other activities associated with rural residential development were also identified as possible contributors to the nitrate problems in rural residential areas. These include:
  - 1) Over fertilization and watering related to landscaping, lawns and gardens.
  - 2) Well construction, location and leakage.
  - 3) Animal pastures.
- c) The combination of these activities with septic system discharges makes rural residential development a potentially important localized source of groundwater nitrate-nitrogen contamination.

### **4. Confined Animal Feeding Operations (Feedlots and Dairies)**

- a) A Confined Animal Feeding Operation (CAFO) is defined as the holding of animals; including cattle, sheep, and other animals; in buildings, pens or lots where the surface has been treated to support animals in wet weather (ORS 468B.205). CAFOs which confine

animals for more than four months in a year and have a waste water control system are required to obtain a permit from ODA. CAFOs not meeting the conditions stated above are not required to obtain a permit. Activities discussed in this action plan apply to all CAFOs, whether permitted or not.

- b) Legislation regarding runoff from CAFOs began evolving during the late 1960s and 1970s. CAFOs in the United States now must control discharges and meet state and/or federal requirements. CAFOs are increasingly incorporating pollution prevention technologies into their environmental management systems. CAFO managers are focusing on manure and waste water management while providing well-maintained feedlot conditions for animals.

## **5. U.S. Army Umatilla Chemical Depot Washout Lagoons**

- a) The area-wide nitrate contamination at the U.S. Army Umatilla Chemical Depot can be attributed to the operation of the Bomb Washout Plant. This plant, which operated from the mid-1950's until 1965, discharged explosives' washout water to the lagoons which contaminated the underlying aquifer with the nitroaromatics of TNT and RDX and nitrates. Nitrate compounds are a constituent of explosive compounds. Although discharge of washout water to the lagoons ceased in 1965, a groundwater nitrate plume continues to exist within the Depot.
- b) The washout lagoons are now part of a superfund remediation program. The Army is beginning the process of cleaning up the explosive compounds in the groundwater and soils. Nitrate contamination is not part of the cleanup. However, the Army, in written agreements with DEQ, has committed to not expanding the nitrate problem with their cleanup efforts.

## **Section III Action Plan Goal**

The ultimate goal of the Action Plan, as directed through statute (ORS 468B.188), 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 level triggering the state declaration of a GWMA. This level is 70% of the Maximum Measurable Level of 10 mg/l, which is based on the Federal Safe Drinking Water Standard of 10 mg/l.

## **Section IV Objectives to Accomplish the Action Plan Goal**

1. Implement the action plan in a manner that encourages voluntary actions by members of the community to address the protection of the groundwater quality.
2. Maintain a viable economy in the area while reducing nitrate loading to the groundwater.
3. Assure that the community continues to make progress towards reducing nitrates in the groundwater so that the voluntary approach towards the protection of the aquifers, which this action plan is based on, is maintained rather than the State having to implementing a mandatory or regulatory approach to reducing nitrates in the groundwater.
4. Make the plan a communication tool that provides direction and guidance to the community about the basic steps needed to prevent future nitrate contamination of the groundwater.
5. Assure compliance of regulated sources through periodic review of permit conditions.

## **Section V Methods for Implementing the Action Plan**

The committee considered the following methods most appropriate for implementing a voluntary action plan.

1. Develop an awareness in the Lower Umatilla Basin community about the nature of the local nitrate-nitrogen groundwater contamination problem including causes, effects, concerns and remedies.
2. Identify, organize and provide information which will assist individuals, public entities, businesses and organizations to reduce nitrate loading.
3. Encourage research, investigation and the development of materials useful for addressing nitrate contamination concerns where information is not available or in a useable form.
4. Develop educational material and a program which will allow the community to independently assess and choose the practices most useful to them for reducing the nitrate loading to groundwater.
5. Review permits and inspect regulated sources to determine compliance with groundwater rules and regulations.

## Section VI Implementation Activities

### A. Irrigated Agriculture

Both irrigation and nutrient management must be considered to address the nitrate-nitrogen leaching concerns in irrigated agriculture.

#### 1. Irrigation Management

- a) Several irrigation methods have been used in the Lower Umatilla Basin: flood, furrow, solid set, wheel, drip and center pivot. Today the predominant method is center pivot. This is a relatively new technology, beginning in the early 1970s. However, acreages employing drip irrigation have rapidly increased during the 1990s.
- b) The oldest methods of irrigation, introduced in the early 1900s, include flood and furrow. These are still practiced today on a relatively small number of acres, most of which are either pasture or the gardens and yards of rural homeowners. Though flood and furrow methods of irrigation are predisposed to leaching of water through the soil profile, they do not necessarily contribute to nitrate loading of the groundwater when practiced on land receiving very low nitrogen inputs, such as irrigated pastures.
- c) By the late 1940s, much of the cropland was sprinkler irrigated using either hand lines, solid set systems, or wheel lines. When properly used these systems are much less prone to applying excessive water and thus less likely than earlier systems to result in nitrate leaching into the groundwater. Unfortunately, lack of adequate knowledge on the proper operation of such systems, or carelessness on the part of the operators, has often resulted in over-application of water where these systems are employed. The consequent nitrate leaching beyond the rooting zone may be an unfortunate byproduct of this method of irrigation when not properly used.
- d) The vast majority of crop acreages today in the Lower Umatilla Basin are irrigated with center pivot or drip systems. These systems are well suited to the application of a relatively low volume of water at frequent intervals to meet plant uptake needs (i.e., 0.5 inches every two days) and thus, when properly managed and operated, may result in very little, if any, nitrate leaching out of the rooting zone.

- e) All of the above systems can contribute to nitrate loading of groundwater if improperly used. By employing irrigation scheduling, proper nozzle sizes and set times, and applying low volumes of irrigation water at relatively frequent intervals, nitrate leaching from cropped land can be kept to a minimum, even under highly fertilized conditions. Center pivot and drip irrigation systems are the most amenable to this type of water application, and should be encouraged where economically feasible.
- f) **Current irrigation practice improvements**
  - 1) Irrigation practices have improved greatly over recent years. Crop water use and irrigation practices effects on yield and quality have been greatly refined. Accurate water use models and better technology to apply and monitor water application have resulted in less overall water use. Reduction in water use has been as high as 75% in some cases and well over 30% overall for the irrigation in the area.

## 2. Nutrient Management

- a) Applying nitrogen in excess of crop needs can cause groundwater contamination. Over application of nitrogen can occur in several ways:
  - 1) Applying fertilizers at rates greater than crop uptake. Over fertilization can occur when growers seek to assure good crop yield in the face of uncertainty about disease and the actual amount of nutrients available to a crop.
  - 2) Not accounting for all the nitrogen sources available for crop growth. For example, fertilizer can be applied without considering the amount of residual nitrogen remaining in the soil profile from previous years, the amount available in the irrigation water, or the amount in manure or other organic matter available to the crop.
  - 3) Excessive use of irrigation water causes nutrients to leach past the root zones of crops and eventually to groundwater. If this happens, farmers may need to apply additional fertilizer to replace nutrients lost through leaching.
  - 4) Applying both fertilizer and water without considering when a crop needs the nutrients or water can lead to nitrate leaching.

Water or fertilizer applied in excess of immediate crop needs may become available for transport to groundwater.

**b) Current fertilization management practice improvements**

- 1) Today growers pay more attention to the field application of fertilizer and water because costs have increased and growers have gained a better understanding of how crop quality and quantity are related to available nitrogen and water. Additionally, fertilizer use recommendations by crop advisories have continue to changed and be modified over the years favoring more efficient management techniques which protect groundwater. Weekly soil tests, soil water moisture sampling and irrigation scheduling are now the norm on high value crops in the Lower Umatilla Basin area.

**c) Recommended Management Practices**

- 1) Using the following practices would benefit irrigated agriculture and groundwater quality by reducing nutrient losses through leaching. No single practice will completely resolve the leaching problem. These practices should be implemented in combination to reduce further leaching of nitrates to the groundwater.
  - (a) Encourage growers to develop crop management strategies and plans to address irrigation and nutrient management. These plans should be developed jointly between the grower, Natural Resource Conservation Service (NRCS), Oregon State University Extension Service, and private agricultural service sector companies.
  - (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.
  - (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.

- (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.
- (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.
- (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 propose of growing a crop.
- (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 to 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 crops root zone. .



- (h) Precision farming: Balance fertilizer and irrigation applications to crop requirements according to variations within a field.
- (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. Pondered 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.)
- (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 the management activities and strategies identified here are applied to all crops grown in the basin, not just high value crops.
- (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.
- (l) Planting deep rooted trees such as hybrid poplar as a crop or down-gradient of a field would provide a crop to absorb nitrate from the soil and possibly from shallow groundwater in some areas.
- (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.
- (n) Encourage the conversion to more efficient irrigation systems and practices with a lower potential to leach excess water to the groundwater. More efficient

systems and practices are especially important on highly fertilized crops.

- (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.
- (p) Maintain irrigation equipment. Develop operation and maintenance schedules for irrigation equipment to ensure water is applied at correct rates.

## **B. Rural Residential Development**

### **1. Introduction**

- a) High densities of septic system discharges were identified as one of the major sources of nitrate loading to the groundwater in rural residential areas. The committee realized that several other activities associated with rural residences could also contribute to a nitrate loading problem. Because these activities tended to occur together, they were grouped under the heading of Rural Residential development.

### **2. Septic Systems**

- a) The standard household septic system is not designed to effectively treat waste water for nitrates. Properly operating systems deliver a certain amount of nitrate to the groundwater (an average of about 40 mg/l). Under certain soils, some denitrification may take place, however, treatment in the basin's soils are limited because of its sandy, porous nature.
- b) Generally this source of nitrate is not a concern when the volume of waste water is relatively small compared to the volume of groundwater. However, there is a concern when the density of septic systems exceeds the dilution capabilities of the groundwater system. In some areas of the Lower Umatilla Basin septic system densities are locally affecting groundwater quality.

**c) Recommended Management Practices**

- 1) Encourage local city and county governments and planning departments to review development impacts on area groundwater quality and to require mitigation where necessary.
- 2) DEQ should work with local governments to develop a process to take into consideration the cumulative effects of septic systems when planning for and reviewing developments which will rely on septic systems for waste disposal.

**3. Landscaping, Lawns and Gardens**

- a) Several landscaping, lawn and garden activities on the basin's sandy soils can deliver nitrate to the groundwater: Over fertilizing and watering; the timing of fertilizing and watering; and not understanding the causes of landscape, lawn and garden problems.
- b) **Recommended Management Practices**
  - 1) Prevent over fertilizing - Apply fertilizers at the correct agronomic rate for the plants being fertilized. Fertilizers applied at greater than agronomic rates can lead to a nitrogen build up in the soil profile, which is then available to leach to groundwater given enough water.
  - 2) Prevent over watering - Provide only that amount of water needed to maintain a healthy landscape, lawn or garden. Over watering tends to drive available nutrients below plant roots. These nutrients easily find their way to groundwater as additional water is applied or precipitation occurs. This situation also leads home owners to use additional fertilizer to replace the nutrients washed below the root zone.
  - 3) Timing of fertilizer and watering- Apply fertilizer and water in amounts and at times which do not contribute to nitrate leaching. Watering right after a fertilizer application can immediately wash nutrients past the root zone making them unavailable for plant uptake and a threat to groundwater quality.
  - 4) Understanding the cause of landscape, lawn and/or garden problems - Understand the nature of the landscape, lawn or garden problem needing addressed before attempting to solve the problem. Seek help, advice and information from knowledgeable professionals. Home owners need more information about causes of different plant problems. In many cases applying additional fertilizer or water will not

solve the plant health problem, but only will deliver additional nitrate to the groundwater.

**4. Wells - Construction/location/leakage**

- a) Contaminated water moving down a well casing from land surface to groundwater or moving between aquifer units via well bores could contribute to the nitrate contamination problem. Many basin wells were constructed before strict seal requirements came into effect. Improperly sealed wells can facilitate water movement, possibly carrying contaminants from land surface to the groundwater or between aquifer units.
- b) Locating a septic system or other contamination source too close or up gradient from a poorly sealed well may cause the well to capture contaminated water and allow contaminated water to move further into the aquifer or between aquifers.
- c) **Recommended Management Practices**
  - 1) Encourage owners of older wells to get their well casings and seals inspected to ensure that no leakage is occurring.
  - 2) Encourage owners of wells having an inadequate seal or casing to improve the well construction.
  - 3) The location of existing wells, septic systems and other possible contamination sources should be taken into account before siting a well or septic system.
  - 4) Locate potential liquid or solid contaminants away from well heads or provide barriers to prevent well contamination.
  - 5) When using chemagation provide anti back siphoning devices to prevent contamination of the well and groundwater through back siphoning of chemagation tanks.

**5. Animal Pastures**

- a) Pasturing animals on small acreages can degrade groundwater if not managed properly.

- 1) Allowing excess manure to build up in a pasture will allow nutrients to accumulate in the soil making them available to leach when irrigation or precipitation occurs.
- 2) Exceeding the carrying capacity of a pasture can enable animals to over graze grasses reducing their ability to utilize manure for plant growth. This leads to an accumulation of nitrates which is then available for leaching to groundwater.
- 3) Improperly storing manure where precipitation or irrigation water is allowed to percolate though the manure will leach nutrients into the groundwater.

**b) Recommended Management Practices**

- 1) Follow general grazing accepted pasture management practices to avoid over grazing of pastures. Include pasture maintenance and renovation, pasture rotation and winter grazing management.
- 2) Practice proper manure management techniques which include the proper collection, storage of manure, waste water control and application techniques.
- 3) Minimize waste water by providing dry manure storage facilities and diverting surface runoff.
- 4) Encourage pasture nutrient, and irrigation management practices for long term viability and to prevent possible groundwater contamination.

**C. Food Processing Water**

**1. General**

- a) Historically, the food processing industry did not apply process water at agronomic rates. Their main emphasis was process water disposal so as to avoid nuisance conditions such as, odor, flies and truck traffic problems. Neither the industry or DEQ considered the impact of process water application on groundwater quality. The focus was preventing run off from the application fields. Once the impact of the process water disposal practices were realized, modification to the process water disposal practices began. DEQ worked with the facilities to modified the industry's facility process water discharge permits to protect groundwater quality.

## **2. Recommended Management Practices**

- a) To properly manage nitrogen in a food processing facility, both water and nutrients must be managed. These steps can be used by the food processing industry or other industries which need to manage water and nutrient resources.
- b) Identify the limiting constituents or factors associated with the land and crop being used for process water management.
- c) Review pretreatment, waste minimization and conservation practices to reduce the quantity and strength of the process water.
- d) Determine whether there are pollution prevention opportunities through waste minimization efforts, marketing of by-products or reuse of process waters for other internal functions. Pollution prevention opportunities can save in several ways: reduced processing and disposal costs, possible revenue generating services or products and reduced regulatory oversight costs.
- e) Develop management plans for irrigation and nutrient use; develop a water and nutrient budget; and balance with crop needs by applying at agronomic rates.
- f) Develop controls for the budget and management plans. Observe and monitor process regularly to allow for recognizing problems early and making adjustments accordingly. Controls provide a check on whether assumptions are correct and allows periodic system adjustments (fine tuning).
- g) Assess the impact of activities through periodic monitoring of the process and the groundwater. Prepare reports on how activities are functioning and whether the process is meeting the goals that were established (for the food processors this means the conditions of their permits).
- h) Develop a cycle to continually reassess functions and systems to reduce costs. Determine what is the most economic means to achieve the goals established. Develop viable alternatives on how to meet groundwater protection goals.

## **D. Groundwater Recharge**

### **1. General**

- a) The technical investigation found that water leakage from irrigation canals and ditches was recharging the alluvial aquifer in certain areas of the basin. Canal leakage rates are high enough to dilute local groundwater and reduce nitrate concentrations in those localized areas. Local irrigation districts have also begun a program to improve their water delivery systems by decreasing canal leakage rates. Reducing leakage rates would provide less recharge water to dilute nitrate concentrations. Nitrate concentration levels may increase in certain areas as dilution water becomes less abundant.
- b) The committee recognized recharge of groundwater as a possibility for actively washing nitrates through the aquifer, thereby, having the potential to assist in both diluting the nitrate already present in the aquifer and moving nitrate contaminated water through the system faster.

### **2. Recommended Management Practices**

- a) Encourage the development of recharge projects using winter and spring excess river flows where such projects would be beneficial in meeting the GWMAC's goal.

## **E. Confined Animal Feeding Operations (Feedlots and Dairies)**

### **1. General**

- a) The following recommendations are generally considered Best Management Practices for CAFOs, but do not limit the use of other practices that apply to a particular operation if the practice is effective. These practices can be implemented in combination to obtain the desired protection.
- b) To manage waste water effectively at CAFOs the following aspects of the operation need to be addressed: Surface Water Management; Waste Water Effluent Management; Solid Manure Management; and Management of Feedyard Surfaces.

**2. Surface Water Management**

a) The Lower Umatilla Basin provides a good location for concentrated feeding operations due to its low annual rainfall and low levels of surface runoff. Although natural precipitation in the Lower Umatilla Basin area is low, heavy rainfall or snow events can at times generate enough runoff water to cause a problem. Managing runoff water to minimize contact with manure and feed will reduce the amount of water that will need to be managed as effluent.

**b) Recommended Management Practices**

1) Feedyard operations should incorporate facility management techniques which will divert clean surface water and stormwater runoff away from feedyard facilities where they can come in contact with manure and stored feed products.

2) Where surface and storm waters become contaminated from contact with manure and stored feed products, runoff should be diverted for effluent management.

**3. Waste Water Effluent Management**

a) Lagoons and waste water conveyance facilities are an important part of a feedyard's waste water management. These facilities allow the capture, managed use and disposal of runoff water.

**b) Recommended Management Practices**

1) Surface and groundwater protection measures should include lagoons or holding ponds to catch and hold waters that come in contact with manure or feed stores. Existing lagoons and waste water conveyance facilities should be redesigned and/or modified to meet state standards for storing wastes, leachates and effluent runoff where reasonable.

2) Apply waste and waste water at agronomic rates which allows for evapotranspiration and nutrient uptake by the crop, hayland or pasture.

3) Storage facility sediments should be applied at agronomic rates to crops using best management practices.



- 4) Best management practices should also be followed when cleaning out sediments from lagoons and holding ponds to prevent damage to the seals or structures which could result in leakage.
- 5) New lagoons and waste water conveyance facilities should be designed and constructed in accordance with state standards to minimize leakage of stored waste water.

#### **4. Solid Manure Management**

- a) Solid manure should be managed as a nutrient source for growing crops and as such should follow the recommendations on fertilizing and irrigation practices outlined in the irrigated agriculture portion of the action plan. Several activities specific to solid manure should be pursued to help prevent it's over application.
- b) **Recommended Management Practices**
  - 1) Manure should be stored in a manner which minimizes impact to groundwater.
  - 2) Periodically analyze manure for its nutrient value for use in applying to crops.
  - 3) The OSU extension service, NRCS or other agricultural field services should be consulted to select a system of Best Management Practices including agronomic rates for manure application.

#### **5. Management of Feedyard Surfaces**

- a) Studies have shown that concentrating animals in a small area produces a surface seal of compacted organic matter and soil which inhibits movement and leaching of effluent through the seal. Anaerobic conditions can also be created in the seal which will assist in the denitrification process.
- b) **Recommended Management Practices**
  - 1) Direct drainage to adequately constructed effluent facilities.

- 2) Ensure a surface seal, meeting state standards, on lot surfaces through livestock management, site selection and other best management practices as needed.
- 3) Maintain the surface seal while removing manure and shaping the feedlot pens.

## **F. U.S. Army Umatilla Chemical Depot Washout Lagoons**

### **1. Clean Up Activities**

- a) In 1993, the Army signed a Record of Decision for the cleanup of the Washout Lagoons Contaminated Soils. In 1994, Records of Decision were signed for the cleanup of the Bomb Washout Plant and the groundwater under the lagoon. Clean-up of the nitrate plume was not included as part of these Records of Decision.
- b) **Soils Cleanup** - Soils cleanup, completed in July 1996, was accomplished by bioremediation (windrow composting). With the discontinued operation of the plant and cleanup of the contaminated soils, the source of groundwater contamination has been eliminated.
- c) **Groundwater Cleanup** - Construction of a Groundwater Treatment Plant (carbon adsorption pump and treatment) has been completed and operation began in January 1997. This system is intended to remove nitroaromatics of TNT and RDX from the groundwater. The treatment system is not designed to remove nitrates. Because of the closed design of the treatment system there is no opportunity to use the nitrate laden residue water for any other purpose than recirculation for the treatment system.
- d) Three extraction wells will be used to pump contaminated groundwater from the ground and through the treatment plant. The treated water and residual nitrates will then be piped to infiltration fields within the capture zone of the extraction wells. The water will then infiltrate back to the groundwater where it will again be captured by the extraction wells and pumped through the treatment system. The treatment for nitroaromatics is expected to take approximately 27 years.

### **2. Groundwater Monitoring**

- a) The treatment system is designed to contain the treated water and residual nitrates within the capture zone of the extraction wells. Groundwater monitoring wells have been installed beyond the

infiltration fields to monitor the effects of the treatment system on groundwater quality. Information from these wells will be used as necessary to adjust operation of the pump and treat system to assure that the nitrate laden residue water is contained within the treatment system and does not spread further into the aquifer.

- b) As with the other sectors identified as contributing to the nitrate problem in the area, the Army Depot is not being required to actively clean up the contamination. Rather they are removing the source of nitrate loading to the groundwater and are assuring they will not exacerbate the nitrate contamination with the use of their treatment method. The nitrate contamination now under the Depot will be allowed to naturally dissipate over time through dilution and migration to natural discharge points.

3. **Future use**

- a) Eventually the Depot property is expected to be turned over to the local community. A local reuse committee has been formed and is now meeting to discuss possible options for use of the depot property. At this time water rights to the groundwater within the Depot will not be made available. However, whether water becomes available or not potential users of the property will need to conform to the GWMA Action Plan in place at the time.

## 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 and Morrow County Soil and Water Conservation Districts (SWCDs) will be the local agencies leading implementation of the action plan. A Memorandum of Agreement between the SWCDs, 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 emphasizes 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 leading 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 encourage 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 encourage 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 the 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 encourage 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 Governor's Watershed Enhancement Board 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 familiarized 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 develop 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 Project 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. Development 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 the 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, FAA 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 a Justice Department 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 loadings 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 criteria 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 (OMM) 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 BMP's 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 Best Management Practices (BMP's) that will address waste management problems within CAFOs.
- d) Develop educational materials which recommend Best Management Practices 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 component.

## **Section VIII Evaluation of Action Plan Progress and Success**

### **A. Introduction**

1. The GWMA Committee has recommended the following schedule for the evaluation of the action plan's progress and success in reducing nitrate contamination of the groundwater.
2. Ultimately the goal of the action plan and Groundwater Protection Act is to reduce the contamination of nitrate in the aquifer to below the point where a GWMA needs to be declared (i.e. below 7 mg/l in the Lower Umatilla Basin Area).
3. 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.

### **B. Annual Progress Report**

1. A progress report will be prepared each year outlining activities undertaken in the previous year to further action plan implementation. The Report should include a chapter for each of the tasks outlined under VII Implementation Tasks. SWCD, DEQ and ODA will be the agencies leading implementation of this component.
2. Additionally, every four years, an extensive review and evaluation of the effectiveness of the plan will be completed as a joint effort between DEQ, ODA, the Committee, the local lead organizations and local governments. The first review will occur in 2001.

### **C. Schedule**

1. At four years - After the first four years 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. Evaluation will include documentation of the 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 alternative have been adopted

that reduce nitrate loading to the groundwater. (Qualitative evaluation of adoption rates only).

2. At eight years - After 8 years, an evaluation will be made on whether the protection strategies are still being promoted and whether a high enough proportion of the citizens and organizations are participating in adopting recommended practices, activities and strategies to protect groundwater quality. (Qualitative evaluation of adoption rates only).
3. At twelve years - At 12 years the first quantitative evaluation of whether groundwater quality is improving will be made. Groundwater quality will be evaluated along with an assessment of whether there is continued promotion and adequate adoption of groundwater quality protection practices, activities and strategies by individuals, organizations, businesses and governments. (Qualitative and quantitative evaluation).
4. Every four years thereafter - Both a qualitative and quantitative evaluation of the action plan's progress and success will be undertaken to document continued improvement in groundwater quality. The evaluation will be a joint effort between DEQ, ODA, the Committee, the local lead organizations and local governments.
5. At each step, the committee and state agencies will need 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.

#### **D. Qualitative Evaluation**

1. The Department recognizes that groundwater, once contaminated, may take many years to improve. It would be fortunate if our analysis shows a downward trend in the nitrate contamination levels early on, however, DEQ does not necessarily expect to see an overall reduction in nitrate levels during the early phases of the action plan implementation. Therefore, DEQ supports the use of qualitative measures to initially evaluate the progress of the implementation and whether the action plan will ultimately be successfully.
2. The intent is to demonstrate management practices and strategies which reduce the leaching of nitrate to groundwater have been developed and are being implemented. It is assumed that even though results of the adoption of new practices and strategies have not yet been translated into a reduction of nitrate in the groundwater, the new practices, activities and strategies will, given time and the increased adoption rate of the beneficial practices, result in better groundwater quality.



3. The following shall be part of the action plan evaluation:
  - a) A summary of the practices, activities and strategies being recommended for the reduction of nitrate loading to the groundwater. Include a description of the practice, what environmental problem the practice is trying to address, why its being recommended, and the benefits and costs of adoption of the practice (both economic and environmental).
  - b) Document the extent of changes and adoption of groundwater quality protection practices, activities and strategies (which are recommended to protect groundwater quality).
  - c) Survey each sector to document adoption of beneficial groundwater protection practices, activities and strategies. The survey could also be used as an additional education tool.
  - d) Develop compliance assessment results for currently regulated facilities.

## **E. Quantitative Evaluation**

1. The ultimate goal of the action plan and the Groundwater Protection Act is to reduce the contamination of nitrate in the aquifer. Specifically, the goal is to reduce nitrate levels below 7 mg/l, which is the point where a GWMA is declared.
2. DEQ will continue to sample for nitrate on a bimonthly basis from the monitoring well network established for this propose (see Appendix D). DEQ will also make field measurements and analyze groundwater for common constituents and pesticides as needed.
3. Evaluation of whether this action plan is successful will depend on:
  - a) The results of trend analysis, based on statistical analysis of monitoring results from DEQ's monitoring well network.
  - b) Evaluation of nitrate changes along several groundwater follow paths from upgradient to downgradient sites.
4. DEQ will also work with the committee and other state agencies to evaluate other factors associated with a reduction in the loading of nitrate to the groundwater (an example would be: long term trends in nitrate levels of shallow and deep soil samples).

5. DEQ will work with the committee and other state agencies to evaluate the data.

## **F. Audience**

1. Reports should be targeted for two audiences:
  - a) Residents within the basin. - The public in the Lower Umatilla Basin Area should be the primary audience. The report should act as an educational tool to inform people about the nitrate concern in the basin and how it is being addressed. The report should also be useful as a reference of the practices, activities and alternatives being promoted in the area to prevent groundwater contamination.
  - b) State agencies and the interested public outside of the basin. - The report should also be targeted to document the progress being made to address the contamination problem. DEQ and ODA should be able to use the report to demonstrate to the interested public that the contamination problem is being addressed in the area. Additionally, the committee, DEQ and ODA should be able to use the report to:
    - 1) make a determination on whether the action plan is being implemented in such a manner that the contamination will be reduced in the future;
    - 2) document what practices, activities and/or strategies have been implemented and to what extent; and
    - 3) identify what changes in the action plan would better address the nitrate contamination problem.

## **G. Individual Sector Evaluation Criteria**

1. **Irrigated Agriculture**
  - a) Base Line Information (by December of 1999) - 70% of the Lower Umatilla Basin's irrigated acres have requested and been assessed for the current adequacy of groundwater protection measures and have been inventoried for the current type of irrigation and fertilization management practices being used. Responsible parties - SWCD's, NRCS and OSU Extension.

- b) At 4 years (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 - SWCD's, NRCS, OSU Extension, and private agricultural service providers.
- c) At 8 years (December of 2005) - 85% 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 - SWCD's, NRCS, OSU Extension, and private agricultural service providers.
- d) At 12 years (December of 2009) - 95% 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. Practices are being evaluated and further improvements have been identified that would further improve and optimize management plans for groundwater quality protection. Responsible parties - SWCD's, NRCS, OSU Extension, and private agricultural service providers.
- e) Analysis and trending of monitoring well network data indicates a downward trend in nitrate levels throughout most of the GWMA. Responsible parties - DEQ, ODA, and GWMA Committee.

## **2. Rural Residential**

- a) Base Line Information (by December of 1999) - Complete a survey of Lower Umatilla Basin residents to determine the level of awareness of the groundwater nitrate problem, the causes and what they can do about reducing the loading. Responsible parties - Local governments, SWCD and OSU Extension Service.
- b) At 4 years (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 which contributes to the problem. Responsible parties - Local governments, SWCD and OSU Extension Service.
  - 1) 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.

- 2) Evaluate the ability of the state to consider the cumulative impact of septic systems when issuing permits. Responsible parties - DEQ
- c) At 8 years (December of 2005) - Through a random survey 80% of area residents are aware of the groundwater nitrate problem and know of at least one activity or practice which contributes to the problem. 50% of those surveyed can cite at least one activity or practice they have changed because of their awareness of its impact on groundwater quality. Responsible parties - Local governments, SWCD and OSU Extension Service.
- 1) All local area governments can cite procedures, requirements and/or practices they have instituted as a result of the declaration of the GWMA. Responsible parties - Local governments
  - 2) Areas in the lower basin have been identified where high densities of septic systems may impact groundwater quality. Responsible parties - DEQ and Local governments
  - 3) Methods to address and reduce the impact to groundwater quality of septic systems have been adopted in all areas considered a high risk for nitrate loadings from high densities of septic systems. Responsible parties - Local Governments.
- d) At 12 years (December of 2009) - Through a random survey 80% of area residents are still aware of the groundwater nitrate problem and are aware of at least one activity or practice which contributes to the problem. 75% of those surveyed can cite at least one activity or practice they have changed because of their awareness of its impact on groundwater quality. Responsible parties - Local governments, SWCD and OSU Extension Service.
- 1) All local area governments can cite procedures, requirements and/or practices they have instituted as a result of the declaration of the GWMA. Responsible parties - Local governments.
  - 2) Methods to address and reduce the impact to groundwater quality of septic systems have been adopted in all areas considered high risk for nitrate loadings from high densities of septic systems. Responsible parties - Local Governments.
  - 3) Analysis and trending of monitoring well network data indicates a downward trend in nitrate levels throughout the GWMA. Responsible parties - DEQ, ODA, and GWMA Committee.

**3. Food Processor Process Water**

- a) Base Line Information (by December of 1999) - Continue monitoring of existing monitoring wells as specified in facilities permits. Responsible parties - DEQ and food processor permittees.
- b) At 4 years (December of 2001) - Monitoring data shows improving groundwater quality trends for nitrate and meeting permit conditions and objectives. Responsible parties - DEQ and food processor permittees.
- c) At 8 years (December of 2005) - 1) Monitoring data shows improving groundwater quality trends for nitrate and meeting permit conditions and objectives. Responsible parties - DEQ and food processor permittees.
- a) At 12 years (December of 2009) - Monitoring data shows no violation of permit specific concentration limits since its establishment. Responsible parties - DEQ and food processor permittees.
  - 1) Analysis and trending of monitoring well network data indicates a downward trend in nitrate levels throughout most of the GWMA. Responsible parties - DEQ, ODA, and GWMA Committee.

**4. Confined Animal Feeding Operations (Feedlots & Dairies)**

- a) Base Line Information (by December of 1999) - 75% of the Lower Umatilla Basin's CAFOs have requested and/or been assessed for the current adequacy of groundwater protection measures at their facilities. Responsible parties - ODA, SWCDs, NRCS and OSU Extension.
- b) At 4 years (December of 2001) - 50% of CAFOs are implementing an accepted system of BMPs or are covered by an implementation plan. Responsible parties - ODA, SWCD's, NRCS, OSU Extension, and private agricultural service providers.
- c) At 8 years (December of 2005) - 75% of all CAFOs are implementing an accepted system of BMPs or are covered by an implementation plan. Responsible parties - ODA, SWCD's, NRCS, OSU Extension, and private agricultural service providers.

d) At 12 years (December of 2009) - 90% of all CAFOs are implementing an accepted system of BMPs or are covered by an implementation plan. Responsible parties - ODA, SWCD's, NRCS, OSU Extension, and private agricultural service providers.

1) Analysis and trending of monitoring well network data indicates a downward trend in nitrate levels throughout most of the GWMA. Responsible parties - DEQ, ODA, and GWMA Committee.

**5. U.S. Army Umatilla Chemical Depot Washout Lagoons**

a) Base Line Information (by December of 1999) - Will continue to follow its plan as outlined in the Record of Decision and the Remedial Action Management Plan for Groundwater. Responsible parties - U.S. Army and DEQ

b) At 4 years (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 - U.S. Army and DEQ

c) At 8 years (December of 2005) - 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 - U.S. Army and DEQ

d) At 12 years (December of 2009) - 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 - U.S. Army and DEQ

1) Analysis and trending of monitoring well network data indicates a downward trend in nitrate levels throughout most of the GWMA. Responsible parties - DEQ, ODA, and GWMA Committee.

## Section IX Action Plan Support and Approval

### A. Statement by Chair

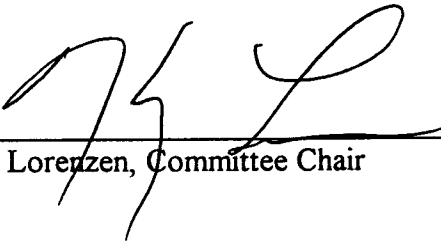
The Groundwater Management Area Action Plan for the Lower Umatilla Basin has been developed over the course of several years through enormous combined efforts of State agency staff and local area citizens who volunteered their valuable time.

The development of the Action Plan and its anticipated implementation represent a new model for environmental protection. Under this new model, the authority and associated responsibility for environmental remediation efforts rest with those citizens responsible for the condition requiring action. This is a significant departure from the much maligned approach in which activities are directed by government mandate.

The flexibility and freedom from regulation provided by a voluntary approach also carries with it a significant burden. If it does not succeed, its failure will work to strengthen the hand of those who advocate stronger forced regulation.

I am confident that the affected citizens of Umatilla and Morrow Counties, working in conjunction with the Oregon Department of Agriculture and the Oregon Department of Environmental Quality, will successfully solve the groundwater nitrate concentration problem through implementation of this Action Plan.

I thank all who have participated. Special thanks are directed to Rick Kepler of the Oregon Department of Environmental Quality and Dave Wilkinson of the Oregon Department of Agriculture for their patience and tireless work.

  
Henry Lorenzen, Committee Chair

12/11/97  
Date

**B. Concurrence with Action Plan**

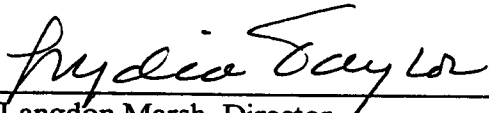


Bruce Andrews, Director  
Department of Agriculture

1-2-98

Date

**C. Acceptance of Action Plan**



Lydia Taylor, Director  
Department of Environmental Quality

11/2/98

Date



# **Appendix A**

## **Committee Members**

## Appendix A - Committee Members

Henry Lorenzen, Committee Chair

Robert Levy, Irrigated Agriculture Sub-Committee Co-Chair  
Chester Prior, Irrigated Agriculture Sub-Committee Co-Chair

Ron Baker, Confined Animal Feeding Operations Sub-Committee Co-Chair  
Terry Uhling, Confined Animal Feeding Operations Sub Committee Co-Chair

Mike Henderson, Food Processors Sub-Committee Co-Chair  
Jeff Lyon, Food Processors Sub-Committee Co-Chair

Art Kegler, Rural Residential Sub-Committee Co-Chair  
Leann Rea, Rural Residential Sub-Committee Co-Chair

Tom Able Jr.	Don Horneck
Bob Adelman	Birgitta Lamb
Marie Baldo, LtC	Frank Mader
Ed Brown	Jeff McMorran
Monte Burmester	Virginia Miller
Louis Carlson	Kent Nielson
George DesBrisay	John Olson
Robert Ehmann	Jerald Rea
Donald Eppenbach	Paul Tresham
Luther Fitch	Phil Walchli
Vern Frederickson	Craig Williams
Bill Hansell	Don Wysocki
Dan Hernandez	Fred Ziari

The Committee would like to recognize the following people for their efforts in assisting in the development of the Action Plan

Katherine Anderson	Rick Kepler
Robert (Bob) Baggett	Ed Liggett
Barry Beyeler	Tamra Mabbott
Ann Beier	Michaele Pelzer
Carol Michael-Bennett	Dave Wilkinson
Mark Daugherty	Ray Wilson
Gail Glick	

lub\aplan\final action plan\appendix A committee members

# **Appendix B**

## **Duties, Roles and Responsibilities**

## **Appendix B - Duties, Roles and Responsibilities**

The following is a brief description of the roles and responsibilities to be undertaken by the participating agencies and organizations.

### **A. Lower Umatilla Basin Groundwater Management Area Committee**

The Lower Umatilla Basin Groundwater Management Committee and Subcommittee have been appointed to assist the State of Oregon, represented by the Department of Agriculture and the Department of Environmental Quality, in the formation and implementation of a groundwater management plan. After the approval of the agricultural portions of the plan by ODA and adoption of the plan by DEQ, the committee will continue to meet periodically to review the implementation of the management plan.

The committee will establish sub-committees as necessary to implement portions of the plan. These sub-committees will periodically review and report plan implementation progress to the management committee. The management committee will review these reports and provide recommendations for plan revisions to local governments, state and federal agencies.

#### **Sub-Committees**

- Irrigated Agriculture
- Confined Animal Feeding Operations
- Food Processors
- Rural Residential

### **B. Oregon State University Agricultural Experiment Station**

The Oregon State University Agricultural Experiment Station serves as the principal agricultural research agency in the state. The Lower Umatilla Basin Area has two stations able to assist in achieving the action plan goals. Oregon State University is represented locally by the Hermiston Agricultural Research and Extension Center and the Columbia Basin Agricultural Research Center. Both Experiment Stations will work cooperatively with the private agricultural service sector, local growers and state and federal agencies to explore technological alternatives and management practices which will reduce loading of nitrate to groundwater. As funding permits, they will continue to conduct research projects that provide practical information for groundwater quality management practices.

**C. Oregon State University Extension Service**

The Oregon State University, Extension Service, provides educational programs for a variety of agricultural, commercial, home, and youth audiences emphasizing agricultural management practices, and environmental safety. The OSU Extension Service will work cooperatively with the private agricultural service sector, the Soil and Water Conservation Districts and local growers to compile information and provide educational programs to individuals, organizations, and the public on the concerns with nitrate contamination and how to reduce nitrate contaminating the area's groundwater. Additionally, the Extension Service should facilitate the acceptance and implementation of the groundwater protective agricultural management practices identified for protection of groundwater in the Lower Umatilla Basin Area.

Specifically, the Extension Service shall seek to:

- Develop an educational program to provide state of the art information concerning soil fertility testing and fertilizer application.
- Develop educational tools the rural residential sector can use to reduce nitrate loading of the groundwater such as:
  - a) producing a video on the subject how septic systems work;
  - b) developing an Extension publication on the subject of "Gardening and groundwater protection"; and
  - c) promoting the use of Home\*A\*Syst and similar informational material to increase homeowner understanding of how drinking water becomes polluted with nitrates and other contaminants.
- Act as a conduit to connect researchers and educators with potential funding sources designed to remedy the groundwater situation in the Lower Umatilla Basin.
- Assist with the implementation of such projects once initiated by finding suitable locations, cooperators, and acting as a local "presence" for researchers from outside the area.

**D. USDA Natural Resources Conservation Service**

The Natural Resource Conservation Service (NRCS) activities include working through the local Soil and Water Conservation Districts (SWCDs) to implement technical and financial assistance programs relating to soil and water resources.

After formal research and development of "BMPs", NRCS, in cooperation with FSA, DEQ, ODA, and OSU, will perform public, group, and individual demonstration projects to insure the acceptance of the established "BMPs" by the industry and community. In cooperation with FSA and SWCD, NRCS shall provide technical and financial assistance which will assist land operators in the planning and implementation of nutrient, pest, and irrigation management plans designed to protect groundwater and surface water quality through the use of "best management systems".

**E. Umatilla and Morrow County Soil and Water Conservation Districts**

Primary activities of the Soil and Water Conservation Districts (SWCD) include soil erosion control; conservation and development of water resources; control of water pollution from agricultural non-point sources; and protection, conservation, development and enhancement of the quality and productive potentials of land and water resources in Oregon. The SWCD is administered and coordinated by the Department of Agriculture.

The Umatilla and Morrow County SWCDs have been authorized under the amended Oregon State Statute 568.225 to participate in effectuating the policy set forth in the Oregon State Groundwater Quality Protection Act Of 1989. As such, the Umatilla and Morrow County SWCDs are recognized by the State of Oregon as the principal local agencies responsible for implementing and coordinating agricultural and rural land water quality protection programs in Umatilla and Morrow County. The SWCD shall promote, assist and encourage landowners in addressing and implementing this action plan. The SWCDs will develop work plans and compile and issue reports and assessments on implementation of the action plan to the ODA and DEQ.

For the action plan, the SWCD will coordinate recommended implementation activities in the action plan. SWCD will establish schedules for plan renewals and responses to plan applications, voluntary compliance actions, provide technical assistance, act as a clearing house for groundwater protection information, identify priority area activities, and develop and present water quality protection education programs.

**F. Oregon State Water Resources Department**

The Water Resources Department (WRD), groundwater programs and activities mainly concern water supply. However, these programs directly affect groundwater management and protection. WRD is also involved in a number of programs to ensure water is used efficiently and without waste.

For this project, the WRD shall provide hydrogeologic characterization for the investigative report and recommend solutions where water quality or quantity problems exist or may develop, enforce well construction standards to protect the quality and quantity of the region's groundwater resource, and ensure proper regulation and distribution of water in accordance with water rights and allocation. The WRD shall cooperate with and assist other involved agencies in the planning and implementation of measures to improve the efficiency of water use in the area.

**G. Oregon State Department of Environmental Quality**

The Department of Environmental Quality administers the Oregon State Groundwater Quality Protection Act and implements the groundwater quality protection requirements for federal and state agencies, cities, counties, industry, and citizens.

DEQ shall establish a regional groundwater monitoring network and perform periodic water quality assessments to evaluate the performance of the management action plan in reducing the groundwater contamination resulting from the identified sources of contamination as outlined in the investigative report. DEQ will establish monitoring requirements for determining water quality conditions and establish and coordinate local monitoring efforts to obtain information on groundwater quality.

DEQ also has the responsibility for approving the final action plan and overseeing its implementation. DEQ will work in conjunction with the committee, ODA and other state and local agencies to periodically evaluate the implementation of the action plan to determine whether the plan is effective in reducing nitrate loading to the groundwater.

DEQ also administers rules and regulation for the permitting of process water discharges. The Department will continue to work with permittees to protect the state's groundwater resources.

**H. Oregon State Health Division**

The Department of Human Resources Health Division (HD), carries out the provisions of the federal Safe Drinking Water Act by establishing drinking water standards and certifying water and treatment systems and operators. HD is responsible for identifying health hazards, and issuing public notification on such hazards.

For this project, the HD will perform all health risk assessments concerning groundwater quality and provide for the regulation and protection of all public water supplies within the management area.

## **I. Oregon State Department of Agriculture**

ODA has the lead role in assuring the implementation of groundwater protection activities in the agricultural sectors. Additionally, ODA must approve the agricultural elements of the action plan before DEQ can approve the action plan in its entirety. As agricultural activities are potential nonpoint sources of pollution, ODA is involved with the identification of existing agricultural management practice problems and development and implementation of alternatives for such practices. ODA's network with OSU's Experiment Station and Agricultural Extension Service and the Soil and Water Conservation Districts, provides an avenue for financial assistance to farmers for conservation projects, research and demonstration projects, and public education and information.

The Natural Resources Division of the Oregon Department of Agriculture provides administrative, financial and technical support to all of the Soil and Water Conservation Districts in the state, including Umatilla and Morrow County Soil and Water Conservation Districts. The Natural Resources Division works with SWCDs to develop annual work plans, reviews and evaluates district projects, practices, budgets, contracts, and assists districts in helping meet their obligations.

ODA will work with DEQ to review and evaluate the effectiveness of the implementation of the agricultural elements of the action plan.

## **J. City and County Governments**

In general local governments are not involved with environmental regulation of agriculture practices, food processing, confined animal feeding operations or the U.S. Army Umatilla Chemical Depot washout lagoons. County Planning Departments are however, directly involved in rural residential land use. Planning Departments issue zoning permits to build on land, review land partition and subdivision proposals and enforce code provisions. County Planning Commissions also act on requests to rezone properties, allow non-residential uses and to make amendments to comprehensive plans for longer term land use needs. Local government's roles are one avenue for education about groundwater quality concerns and planning for development which is compatible with the protection of the groundwater resource.



# **Appendix C**

## **Resources**

## Appendix C - Resources

### A. General

#### 1. Organizations:

- Columbia Basin Agricultural Research Center  
PO Box 370  
Pendleton, OR 97801  
(541) 278-4186
- Department of Environmental Quality  
Eastern Region, Pendleton Office  
700 SE Emigrant, Suite 330  
Pendleton, OR 97801  
(541) 276-4063
- Hermiston Agricultural Research and Extension Center  
PO Box 105 (Hinkle Road)  
Hermiston, OR 97838  
(541) 567-8321
- Morrow County Extension  
430 Heppner-Lex Hwy  
PO Box 397  
Heppner, OR 97836  
(541) 676-9642
- Morrow County Planning Department  
PO Box 706  
Irrigon, OR 97844  
(541) 922-4624
- Morrow County Soil and Water Conservation District  
PO Box 127  
Heppner, OR 97836  
(541) 676-5452
- Natural Resource Conservation Service  
1229 SE 3<sup>rd</sup>.  
Pendleton, OR 97801  
(541) 278-8019

- Oregon Department of Agriculture  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541) 278-6721
- Umatilla County Soil and Water Conservation District  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541)276-8170
- Umatilla County Planning Department  
216 SE Fourth St.  
Pendleton, OR 97801  
(541) 278-6249

**2. Materials:**

- "Hydrogeology, Groundwater Chemistry and Land Uses in the Lower Umatilla Basin Groundwater Management Area", Oregon Department of Environmental Quality, 1995

**B. Irrigated Agriculture**

**1. People:**

- Jim Loiland  
Lower Umatilla Basin Groundwater Management Area Coordinator  
Umatilla County Soil and Water Conservation District  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541) 276-8170
- Tom Straughan  
Oregon Department of Agriculture  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541) 278-6721

- Jeff McMorran  
OSU Extension Service  
PO Box 105 (Hinkle Road)  
Hermiston, OR 97838  
(541) 567-8321 ext. 2240
- Don Wysocki  
Columbia Basin Agriculture Research Center  
PO Box 370  
Pendleton, OR 97801  
(541) 278-4186

**2. Materials:**

- "Irrigation Management Practices Checklist for Oregon", OSU Extension Service - EM 8644, August 1996
- "Water Quality Protection Guide", Oregon Department of Agriculture, January 1995
- Managing Nitrogen for Groundwater Quality and Farm Profitability, R.F. Follett et. Al. 1991 Soil Sci. Am, Madison WI
- "Irrigation Management Practices to Protect Ground Water and Surface Water Quality Washington State" State of Washington Department of Ecology and Washington State University, EM4885, April 1995
- "Defining Best Management Strategies for Nutrient and Water Application on Irrigated Crops in the Lower Umatilla Basin", Larry Coppock and Associates, 1997

**C. Rural Residential**

**1. People:**

- Jim Loiland  
Lower Umatilla Basin Groundwater Management Area Coordinator  
Umatilla County Soil and Water Conservation District  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541) 276-8170

- Robert (Bob) Baggett  
On-site Manager  
Department of Environmental Quality  
Eastern Region, Pendleton Office  
700 SE Emigrant, Suite 330  
Pendleton, Or 97801  
(541) 276-4609
  
- Patty Perry  
Umatilla County Planning Department  
216 SE Fourth St.  
Pendleton, OR 97801  
(541) 278-6249
  
- Gail Glick  
Home\*a\*Syst Coordinator  
Oregon State University  
Gilmore Hall Room 116  
Corvallis, OR 97331-3906  
(541) 737-6294
  
- Tamra Mabbott, Director  
Morrow County Planning Department  
PO Box 706  
Irrigon, OR 97844  
(541) 922-4624
  
- Carol Michael-Bennett  
Morrow County Extension  
430 Heppner-Lex Hwy  
PO Box 397  
Heppner, OR 97836  
(541) 676-9642

**2. Materials:**

- "Home\*A\*Syst" Homestead Assessment System, OSU Extension Service - EM 8546, October 1993
  
- "Drinking Water - a community action guide" Concern, Inc. Washington DC, December 1986
  
- "Is Your Water Safe To Drink", M.K. Bosworth, Kansas Rural Center, Inc. Whiting, KS Sept. 1986

## **D. Food Processor Process Water**

### **1. People:**

- Ed Liggett  
Department of Environmental Quality  
Eastern Region, Pendleton Office  
700 SE Emigrant, Suite 330  
Pendleton, OR 97801  
Phone (541) 278-4604
- Joni Hammond  
Water Quality Manager  
DEQ Eastern Region  
700 SE Emigrant, Suite 330  
Pendleton, OR 97801  
(541) 278-4610

## **E. Confined Animal Feeding Operations (Feedlots and Dairies)**

### **1. People:**

- Randy Mills  
OSU Extension  
721 SE Third, Suite 3  
Pendleton, OR 97801  
(541) 278-5403
- Ron Minor  
Oregon State University  
Gilmore Hall Room 116  
Corvallis, OR 97331-3906  
(541) 737-6295
- Jim Moore  
Oregon State University  
Gilmore Hall Room 116  
Corvallis, OR 97331-3906  
(541) 737-6299

- To be Named  
Oregon Department of Agriculture  
1 SW Nye Suite B  
Pendleton, OR 97801  
(541) 278-6722
- Ray Wilson  
National Resource Conservation Service  
1229 SE 3<sup>rd</sup>.  
Pendleton, OR 97801  
(541) 278-8019

**2. Materials:**

- "Oregon Animal Waste Installation Guide Book", NRCS - ODA , June 1993
- "National Engineering Hand Book, Part 651 "Agriculture Waste Management Field Hand Book"
- "Livestock Waste Facilities Handbook", Oregon Extension MWPS 18

**F. Army Depot Washout Lagoons**

**1. People:**

- Mark Daugherty  
BRAC Environmental Coordinator  
Department of the Army  
Umatilla Depot  
Hermiston, OR 97838  
(541) 564-5294
- Brian McClure  
Department Of Environmental Quality  
400 E Scenic Dr., Room 307  
The Dalles, OR 97058  
(541) 298-7255 Ext. 32

# **Appendix D**

## **Bi-Monthly Groundwater Monitoring Plan**



# **Appendix D**

## **Lower Umatilla Basin**

### **Bi-Monthly Groundwater Monitoring Plan**

#### **WELL NETWORK FIELD WORK PLAN**

November 1991.

Modified May 1994

Modified for Action Plan August 1997

Appendix D .....	D-1
A. OVERVIEW .....	D-2
1. Phase I - Reconnaissance Sampling .....	D-2
2. Phase II - Monitoring Well Network .....	D-2
3. Phase III - Synoptic Survey .....	D-4
4. Plan Modifications and Updates .....	D-4
B. PROJECT SAMPLING DURATION & FREQUENCY .....	D-5
C. MONITORING NETWORK PROTACALLS .....	D-5
1. Well Monitoring Network .....	D-5
2. Logistics .....	D-6
3. Sample Parameters .....	D-7
4. Quality Assurance & Quality Control .....	D-7
5. Corrective Action .....	D-8
6. Field Documentation & Data Reporting .....	D-9
7. Health & Safety .....	D-9
8. Table 1 - Monitoring Network Wells .....	D-10
9. Table 2 - Constituent Sampling Status and Schedule .....	D-11
10. Table 3 - Constituents Sampled and Status .....	D-12
11. Parameter List and Descriptions .....	D-14
12. Contact List .....	D-17
13. Data Distribution List .....	D-19

**A. OVERVIEW**

**1. Phase I - Reconnaissance Sampling**

- a) The reconnaissance ground water quality assessment project was designed to focused upon developing sufficient data to preliminarily:
- understand the general chemistry of local groundwater;
  - identify the list and concentration range of contaminants present in local groundwater;
  - identify the extent of groundwater contamination; and
  - help establish the project boundary limits. In all 198 wells where sampled in a 15 month period in the Lower Umatilla Basin area.

**2. Phase II - Monitoring Well Network**

- a) The bi-monthly monitoring well network was established to determine seasonal variability and trends over time. The intention is to continue

to collect data throughout the implementation of the action plan, which could extend for a number of decades. The network was established after reviewing water chemistry and well construction data collected from the 198 wells sampled during the reconnaissance phase of the project. Forty bi-monthly wells were chosen for routine sampling. (Table 1).

- b) The bi-monthly monitoring wells were chosen for their hydrogeological placement, geographic location, and groundwater water chemistry characteristics.
- c) The selection of bi-monthly network wells used a two step process of pre-determined criteria.
- d) In step 1, a list of candidate wells was compiled using the following criteria:
  - The wells were located and observed by OWRD and/or DEQ staff during Phase I.
  - The well is completed in alluvium only or were completed in a single basalt water bearing zone.
  - The well appear accessible throughout the year for sampling.
- e) In step 2, a final list of wells was selected if the wells met one or more of the following:
  - The well is a member of a group of wells positioned along ground water flow path.
  - The well provides data for an isolated geographic location.
  - Ground water from the well has had moderate to high levels of nitrate.
  - Wells that had confirmed levels of pesticide or volatile organic detections were included in the sampling program.
- f) Well Identification Records (WIR) are to be kept in the field notebook. WIR's contain information about the well, including associated plumbing, purging information, and location of the well in relation to the property boundary or structures.
- g) Maps (including 7.5 minute quadrangle maps) will be carried into the field to assist in locating the wells. New sampling sites will be marked and identified on the maps.

### **3. Phase III - Synoptic Survey**

- a) During 1992, a synoptic survey was conducted, encompassing a large number of area wells (approx. 150 in number), and a number of surface water samples (approximately 25), for a pre-determined set of indicator parameters. The synoptic sampling is intended to give a point in time area wide snap shot of the groundwater quality.
  
- b) The goals of the synoptic sampling event were to:
  - 1. Establish the aerial concentration and distribution of nitrate and other chemicals in alluvial groundwater illustrated by isochemical maps,
  - 2. Establish the chemical identification of recharge water(s) (basalt, alluvial, and/or surface water) carrying nitrate to groundwater,
  - 3. Identify source(s)/surface activity contaminating alluvial groundwater with nitrate,
  - 4. Identify and quantify the transport of nitrate in alluvial groundwater, and
  - 5. Identify and quantify the chemical fate/evolution of nitrate in the groundwater.
  
- c) A separate project work plan was developed for the synoptic sampling event.

### **4. Plan Modifications and Updates**

- a) On September 4, 1990, the Lower Umatilla Basin (LUB) Groundwater Management Area (GWMA) Sampling and Analysis Plan (SAP) was completed. In November of 1991 an addendum to the SAP was added. In May of 1994, through an interoffice memorandum, additional changes were made to the SAP.
  
- b) This current plan incorporates and documents the previous revisions and addendums into a current updated plan.

## **B. PROJECT SAMPLING DURATION & FREQUENCY**

1. Sampling for the bimonthly monitoring network, started in September 1991 and is an on-going activity.
2. The DEQ laboratory ground water monitoring section prepares and makes available, a tentative schedule for monitoring. A copy of the bi-monthly sampling schedule will be sent to participating laboratories.
3. Sample scheduling will allow participating laboratories time to schedule logistics, supplies, and target dates as to when samples will be sent to them.

## **C. MONITORING NETWORK PROTACALLS**

### **1. Well Monitoring Network**

- a) The regular bi-monthly sampling effort has attempted to maintain a well network of forty wells distributed throughout the groundwater management area. This well network consists of private domestic wells, industrial wells, commercial wells, irrigation wells, and a mobile home park supply well. The state owns none of these wells. The well owners participated in the bi-monthly groundwater monitoring effort on a voluntary basis. Because the state has no control over the access to these wells, the network may be modified over the years as some well owners chose not to continue to participate.
- b) The current network consists of 38 wells. To maintain the coverage within the area, DEQ will attempt to find suitable replacement wells, that represent similar conditions and location, for those wells lost through well owner withdrawal from the monitoring program.
- c) Well owners who will potentially be included in the monitoring network will be contacted by phone or in person to get the owner's permission to use their well in the network. An initial site visit letter will be written and delivered by field staff indicating when the well will be sampled, who will sample the well, when the next scheduled sampling event will occur, and who the well owner may contact for questions and concerns. Letters will be written by the project manager.
- d) Thereafter, well owners shall receive letters of intent to sample, at least one week prior to sample collection.
- e) Analysis of the well monitoring will be provided yearly to those well owners participating in the monitoring network. Well owners can also request a summary of the results from their well at other times by contacting the DEQ Laboratory.

## 2. Logistics

- a) Field work will require five days to complete, including travel. Overtime can be expected on occasion, to complete unscheduled or scheduled project requirements. Field staff will leave a contact phone number with the office in case of unscheduled sampling needs or emergencies.
- b) Laboratories require samples to be sent before the end of Thursday of the sampling week. Samples will be sent from the most convenient bus location and sent on the first available bus. If shipping is unavailable, the affected laboratories should be contacted to alleviate undue concern over holding times or late arrivals.
- c) All sampling, except the full screen in July, should require three full days of field work, including the driving time. The field sampling personnel have the options of either holding all daily samples on ice in coolers, and then transporting them all back to the DEQ Lab in Portland at once, or to ship the samples from the Greyhound bus station in Hermiston to the DEQ Lab.
- d) The full screen samples collected in July should require four full days of field work, including the driving time. The full screen samples shall be shipped daily from the Greyhound bus station in Hermiston. The pesticide portion of the samples shall be shipped separately to the Oregon Department of Agriculture Lab in Salem, and the rest of the samples shall be shipped to the DEQ Lab in Portland.
- e) Unforeseen difficulties, such as vehicle breakdown, sampling equipment malfunction, locked well houses, and intense storms could result in additional time being needed to complete the field sample collection work.
- f) A list of contacts will be carried in the field notebook. Contacts will include the participating laboratories, key project staff, and project area contacts such as, SWCD, bus station, key committee members, etc. (See 12.-.Contact List).

### 3. Sample Parameters

- a) Sample parameters were chosen at the beginning of Phase I and several changes have been made in Phase II. Parameters were chosen to identify potential contaminants, characterize the chemistry of ground water from individual wells, monitor seasonal trends, and chemically identify ground water recharge sources (Table 3 lists the parameters). All parameters are reported as total recoverable unless otherwise stated.
- b) The parameter Bromide may be added to the parameter list at a later time. Iron will be reported as total recoverable and dissolved. Selenium has been added to Phase II and will be reported as total recoverable.
- c) Phase II network well samples will be collected in the same manner as established during Phase I to maintain consistency in the sampling program. Sampling will be conducted by experienced ground water unit staff, knowledgeable in monitoring protocol.
- d) Temperature, conductivity, and pH readings are to be continued in Phase II. Temperature is an unstable parameter, which is influenced by variables in sampling that are difficult to control. Water line plumbing, pressure tank, and ambient air temperature can affect the reading of an accurate groundwater temperature. Temperature has not been identified as a critical parameter. Common sense needs to be used at any given well location, on how much time should be spent obtaining a temperature reading.
- e) Temperature should be monitored during purging and is most useful as an indicator of when "fresh" groundwater is being obtained. It is not always practicable for a representative groundwater to be obtained, therefore, a five minute purge is considered adequate for collecting samples.
- f) Instruments will be calibrated and maintained according to manufactures specifications and or to water quality section manual procedures.

### 4. Quality Assurance & Quality Control

- a) Components of quality assurance and quality control will include data quality objectives, equipment calibration, analytical procedures and reporting levels, quality control procedures, data reduction, validation, and reporting, performance and systems audits, data assessment, corrective action, and quality assurance reports. Both DEQ and ODA laboratories

will maintain their own QA/QC programs. OSU will not continue to be a participant in the analytical QC program.

b) Quality control samples will include:

- Transport and transfer blank for organic samples (full screen, July sampling event only). This water shall be obtained from boiled ASTM type II water, kept in the DEQ Lab Organic Section, room L71A.
- Transport blank for pesticide samples (full screen, July sampling event only). This water shall be obtained from the organic free reverse osmosis de-ionized water tap in the DEQ Lab Organic Section, room L63.
- Transfer blank for all inorganic samples. This water shall be obtained from any inorganic tap in the DEQ Lab that is ASTM type II, reverse osmosis de-ionized, double filtered.

c) Quality control in the field shall include field instrument checking and recalibration, if necessary, immediately prior to the beginning of sample collection each morning.

d) Duplicate samples shall be collected once per day, or one for every 10% of samples collected, whichever is more frequent. Like sample containers shall be filled one after the other (co-sample), from a continuous flow.

**5. Corrective Action**

a) Any changes at the well site, deviation from the Water Quality Section Manual procedures, or the work plan, will be documented in the field report and brought to the attention of the project manager. Significant changes or corrective action to the sampling plan needs to be well documented.

b) Non conformance with the project's quality assurance objectives needs to be followed through by flagging the data in question and inform the laboratory QA officer, the monitoring section coordinator, and the project manager. If warranted, a meeting will be held to determine the causative factors and to recommend subsequent action.



## **6. Field Documentation & Data Reporting**

- a) Field documentation will be the same as in Phase I. Some of the standard forms have been updated, such as the WIR, for the purpose of gathering addition information about the well.
- b) Data maintenance includes monitoring the upload of inorganic data from the Laboratory LIMS to ORACLE. At the time of inorganic data transfer, other data not handled by LIMS needs to be uploaded within a reasonable period of time. Associated data includes DEQ organic laboratory section, ODA data, and possibly other data from independent laboratories. The monitoring section is responsible for entering data, except inorganic data (electronic transfer by LIMS), into the ORACLE and STORET systems. A "Data Tracking Log" is to be kept and used to ensure data transfer from laboratories to the data base.
- c) Data distribution is the function of the lab front office. A list of data recipients will be up-dated by the monitoring staff and given to office staff for data distribution (See13. - Distribution List).

## **7. Health & Safety**

- a). All personnel participating in this project will follow the safety requirements contained in the "Section Manual", which conform to the Occupational Safety and Health Administration regulations. The sampling stations in this project are existing domestic and irrigation water wells. Samples obtained from these sources are not considered hazardous, but personnel should be aware of the potential hazards associated with the collection, handling, analysis, and disposal of the samples. It is the responsibility of the participating personnel to follow all necessary safety measures or to bring to the attention of the Agency Safety officer, through the section, issues concerning safety.

8. Table 1 - Monitoring Network Wells

WELL #	USGS 7.5 Minute Quadrangle Map Location
<i>Alluvial wells:</i>	
UMA033	Paterson
UMA034	Paterson
UMA038	Umatilla
UMA039	Stanfield
UMA046	Stanfield
UMA047	Stanfield
UMA048	Stanfield
UMA056	Stanfield
UMA058	Hermiston
UMA066	Hat Rock
UMA084	Hermiston
UMA085	Boardman
UMA088	Hermiston
UMA094	Hermiston
UMA096	Irrigon
UMA103	Irrigon
UMA109	Hat Rock
UMA110	Stanfield
UMA112	Ordnance
UMA116	Stanfield
UMA119	Hermiston
UMA122	Hermiston
UMA133	Ordnance
UMA144	Paterson
UMA156	Stanfield
UMA168	Ordnance
UMA177	Boardman
UMA180	Clarke
UMA185	Service Buttes
UMA187	Service Buttes
UMA190	Echo
UMA191	Stanfield
UMA198	Hermiston
UMA201	Boardman
<i>Basalt wells:</i>	
UMA028	Boardman
UMA029	Boardman
UMA106	Stanfield
UMA160	Clarke
UMA164	Paterson

9. Table 2 - Constituent Sampling Status and Schedule

Bi-monthly sampling for nitrates and field parameters continues throughout the year. Every four months, inorganic parameters are added, and once a year, in July, volatile organic compounds and EPA pesticide screening for all wells are included. A table listing the parameters, sampling frequencies, and testing methods appears below as Table 3. The following table illustrates the sampling schedule for any given year.

Sampling Schedule

Month											
Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
N		X		N		F		N		X	

Key:  
 N = Field Parameters, Nitrate, Ammonia, Total Kjeldahl Nitrogen, Total Dissolved Solids, Total Phosphate, Bromide, Chloride, Sulfate.  
 X = N + Dissolved Metals (Calcium, Magnesium, Sodium, Potassium, Aluminum, Iron, Manganese, Lanthanum, Lithium) + Hardness (calculated) + Total Organic Carbon.  
 ODA Atrazine Analyses for UMA 191 only.  
 ODA Dacthal Analyses for UMA 125 and UMA 156 only  
 F = N + X + Volatile Organic Compounds + Full Screen Pesticides.

This schedule was written for both DEQ and ODA laboratories. This schedule is for routine sampling parameters outlined in Table 3.

10. Table 3 - Constituents Sampled and Status

Inorganic Constituents

Constituent	Before May, 1994	Status	After May, 1994	Remarks
<b>Automated Cd Reduction/R1-353.2 (total recoverable)</b>				
Nitrate+Nitrite-Nitrogen	Every Sample	Continue Sampling	Every Sample	Constituent of Concern
<b>Automated Phenate/R1-350.1</b>				
Ammonia Nitrogen	Every Sample	Continue Sampling	Every Sample	
<b>Semi Automated Block Digestion/R1-351.2</b>				
Total Kjeldahl Nitrogen	Every Sample	Continue Sampling	Every Sample	
<b>Gravimetric, Dried 180 Degrees C/R1-160.1</b>				
Total Dissolved Solids	Every Sample	Continue Sampling	Every Sample	Constituent of Concern
<b>Colorimetric, Ascorbic Acid/modified R1-424F</b>				
Total Phosphate	Every Sample	Continue Sampling	Every Sample	Nutrient of Concern
<b>Bromide</b>				
	Not Sampled	Add Sampling	Every Sample	Relate to Source
<b>Automated Ferricyanide/R1-325.1</b>				
Chloride	Every Sample	Continue Sampling	Every Sample	Relate to Source
<b>Automated Methyl Thymol Blue/R1-375.2</b>				
Sulfate	Every Sample	Continue Sampling	Every Sample	Relate to Nitrate & Source
<b>ICP/Indicator Metals/Group I</b>				
Calcium	Every Sample	Continue Sampling	Every Sample	Relate to Source
	total & dissolved	dissolved only		
Magnesium				
Sodium				
Potassium				
Aluminum	Every Sample	Continue Sampling	Every Sample	These constituents are not necessary. They are associated with other constituents needed.
	total & dissolved	dissolved only		
Iron				
Manganese				
Hardness (calculated)				
Lanthanum				
Lithium				
<b>Wet Oxidation, R1-415.2</b>				
Total Organic Carbon	Sampled	Continue Sampling	Every Sample	Related to Nitrate
<b>Field Parameters</b>				
Temperature	Every Sample	Continue Sampling	Every Sample	To Assess Well Purging
Conductivity				To Assess Well Purging
Ph				To Analyze Chemistry
Alkalinity				Relate to Source

**Inorganic Constituents (continued)**

Constituent	Before May, 1994	Status	After May, 1994	Remarks
<b>Priority Pollutants/Group I (total recoverable)</b>				
Barium	Every Sample	Drop		
Beryllium	Every Sample	Drop		
Cadmium	Every Sample	Drop		
Chromium	Every Sample	Drop		
Cobalt	Every Sample	Drop		
Copper	Every Sample	Drop		
Molybdenum	Every Sample	Drop		
Nickel	Every Sample	Drop		
Silver	Every Sample	Drop		
Vanadium	Every Sample	Drop		
Zinc	Every Sample	Drop		
<b>AA Furnace (total Recoverable)</b>				
Arsenic	Every Sample	Drop		
Selenium	Every Sample	Drop		
<b>Automated Complexone</b>				
Fluoride	Every Sample	Drop		
<b>OIC Spectrophometric/R1-410.4</b>				
Chemical Oxygen Demand	Every Sample	Drop		Dissolved Oxygen more useful
<b>Nephelometric/R1-180.1</b>				
Turbidity	Every Sample	Drop		Not Being Done
<b>IM-ICP #2 (dissolved)</b>				
Silica	Every Sample	Drop		Useful but Can Drop
Boron	Every Sample	Drop		Interesting but Can Drop
<b>Bacteria</b>				
Total Coliform	Every Sample	Drop		Not Being Done but Not Needed
Fecal Coliform	Every Sample	Drop		
Enterococcus	Every Sample	Drop		

**Organic Constituents and Pesticides**

Constituent	Before May, 1994	Status	After May, 1994	Remarks
<b>Purge/Trap/GC/MS/R2-8260 R3-524.4</b>				
Volatile Organics	March and September only	Continue Sampling	Annually for All Wells	Discover Any New Problem
<b>Pesticide Analysis</b>				
Atrazine	Every Sample for UMA 191 March & Sept. Other Wells	Continue Sampling	Every Sample for UMA 191 Annually for All Wells	Constituent of Concern
Dacthal	Not Sampled	Add to Sampling	Every Sample for UMA 125 and 156 Annually for All Wells	Constituent of Concern
Full Screen	Not Sampled	Add to Sampling	Annually for All Wells	Discover Any New Problem

## 11. Parameter List and Descriptions

a) The bi-monthly network sampling program encompasses the following water quality parameters, by analytical grouping. Selection of parameters in Phase II was based on project requirements established in Phase I. Parameter values (minimum reporting detection levels) remain the same for the project objectives outlined in the initial project plan.

### b) Reporting Requirements

- Selenium was added to Phase II and will be reported as total recoverable.
- Iron is reported both as total recoverable and dissolved. It will be necessary during the sampling program, to investigate the possibility of suspended solids transport in the groundwater matrix. The identification of solids transport will be done by analysis of total recoverable metals along with dissolved metals, used in identifying the composition of ions.
- Cost saving in running certain parameter groups will include parameters not pertinent to project objectives, and are highlighted in the parameter list. A brief explanation for selection of each analytical group is given:

- Key: \* Project parameter selection.  
+ Additional parameters that will be reported with requested parameters.

- DEQ reporting “units” and “minimum limits” are contained in the “Field Sampling Reference Guide”, pages 45-50. The following list of parameter minimum reporting limits are reported in mg/l units, unless otherwise noted:

Aluminum <0.1	Arsenic <0.005	Barium <0.03
Calcium <0.1	Chromium <0.03	Copper <0.02
Chloride <0.5	Iron <0.04	Fluoride <0.1
Magnesium <0.5	Manganese <0.01	Potassium <0.5
Phosphate <0.01	Selenium <0.005	Silica <0.3
Sodium <0.5	Sulfate <0.5	Zinc <0.02
Ammonia <0.02	Nitrate+Nitrite <0.02	TKN <0.2
TDS 1	COD <5	Turbidity <5 NTU
Alkalinity 1	Hardness <3	VOA screen <0.0005
Pesticides(ref ODA)	Bact./TC,FC,EC	

- AUTOMATED Cd REDUCTION/R1-353.2 (total recoverable)  
Nitrate-Nitrite as N - indicator of contamination, data comparability with Phase I data and, trend, drinking water standard.
- ICP/INDICATOR METALS/GROUP I (total recoverable/dissolved on request/ dissolved Iron required on all samples)  
Aluminum \* Calcium \* Iron \* Magnesium  
Manganese \* Sodium \* Hardness (calc.)  
Lanthanum + Lithium \* Potassium

natural ground water characteristics, aquifer unit typing, detection of contamination, trends, data comparability with Phase I.

- PRIORITY POLLUTANTS/GROUP I (total recoverable)  
Barium \* Chromium \* Copper \* Zinc  
Beryllium + Cadmium + Cobalt + Nickel  
Molybdenum + Silver + Vanadium

natural ground water characteristics, aquifer unit typing (ions), detection of contamination, drinking water standards, trends, data comparability with Phase I.

- AA Furnace (total recoverable) Arsenic natural ground water characteristics, health risk assessment, detection of contamination, drinking water standard, trend, data comparability with Phase I.
- AUTOMATED FERRICYANIDE/R1-325.1  
Chloride
- AUTOMATED METHYL THYMOL BLUE/R1-375.2  
Sulfate natural ground water characteristics, detection of contamination, trend, data comparability with Phase.
- AUTOMATED COMPLEXONE  
Fluoride natural ground water characteristics, data comparability with Phase I, trend, drinking water standard.
- COLORIMETRIC, ASCORBIC ACID/modified R1-424F  
Total Phosphate detection of contamination, trend, data comparability with Phase I.

- AUTOMATED PHENATE/R1-350.1  
Nitrogen Ammonia detection of contamination, trend, data comparability with Phase I.
- SEMI AUTOMATED BLOCK DIGESTION/R1-351.2  
Total Kjeldahl Nitrogen detection of contamination, trend, data comparability with Phase I.
- GRAVIMETRIC, DRIED 180 DEGREES C./R1-160.1  
Filterable residue (total dissolved solids) detection of contamination, trend, data comparability with Phase I.
- OIC SPECTROPHOTOMETRIC/R1-410.4  
Chemical Oxygen Demand detection of contamination, trend, data comparability with Phase I.
- NEPHELOMETRIC/R1-180.1  
Turbidity detection of poorly constructed wells, sample alteration, drinking water standard, data comparability with Phase I, trend.
- PURGE/TRAP/GC/MS/R2-8260 R3-524.2  
Volatile Organics detection of contamination, data comparability with Phase I, drinking water standards, trends.
- PESTICIDE/HERBICIDE SCREENS  
Agricultural chemicals detection of chemicals in ground water, data comparability with Phase I, trend.
- IM-ICP #2 (dissolved)  
Silica+Boron natural ground water characteristics, comparability with Phase I data, trend.  
Note: method requires a dissolved sample be collected; total analysis digests silica from the lab glassware.
- AA-Furnace/R1-270.2 R2-7740  
Selenium natural ground water characteristics, comparability with Phase I data, drinking water standard, trend.
- BROMIDE - Ion Chromatography/Titration methods are not currently available.



- **BACTERIA** (on request)  
Total coliform      \* Fecal coliform      \* Enterococcus
- **FIELD PARAMETERS**  
Temperature \* Conductivity \* pH \* Alkalinity purge  
effectiveness, natural ground water characteristics, detection of  
contamination, hydrologic data, data comparability between Phase I  
& Phase II.

**12. Contact List**

OREGON DEPARTMENT OF AGRICULTURE  
Laboratory  
635 Capital Street N.E.  
Salem, OR 97310  
(503) 986-4565  
Contact: Norma Corrigan

OREGON STATE UNIVERSITY  
Agriculture Chemistry Department  
Corvallis, OR 97331  
(541) 737-3791

COFFEY LABORATORIES, INC.  
415 SW 5<sup>th</sup> St.  
Pendleton, OR 97801  
Office hours: 0800-1600, Mon-Fri  
(541) 276-0385 (after hours - 276-3283)  
Contact: Sally or Bryce Haynie

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY  
Laboratory  
1712 S.W. 11<sup>th</sup> Ave.  
Portland, OR 97201  
(503) 229-5983  
Contact: Bob McCoy, Sample Receiver

**OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY**

Eastern Region  
700 S.E. Emigrant  
Pendleton, OR 97801  
(503) 276-4063  
Contact: Joni Hammond, Manager, Water Quality

**OREGON DEPARTMENT OF HEALTH**

Drinking Water Section  
State Office Building  
Portland, OR 97201  
(503) 731-4010  
Contact: Dennis Nelson

**OREGON HEALTH DIVISION - Water Section, Pendleton Office**

700 S.E. Emigrant  
Pendleton, OR 97801  
(503) 276-8006  
Contact: Gary Burnett

**DEPARTMENT OF WATER RESOURCES**

1581 12<sup>th</sup> St. NE  
Salem, OR 97310  
(503) 378-8455  
Contact: Jerry Grondin Ext. 214

**DEPARTMENT OF WATER RESOURCES - Pendleton Office**

3920 Westgate  
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Contact: Mike Ladd, Regional Manager

**OSU AGRICULTURAL EXTENSION SERVICE**

PO BOX 105  
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(541) 567-8321  
Contact: Dr. Jeff McMorran

**13. Data Distribution List**

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