SAMPLE & ANALYSIS PLAN

Volunteer Groundwater Quality Monitoring: Nitrate in the Southern Willamette Valley

DEQ##-LAB-####-SAP
Version 3.0 – August 24 2006

Well Water Program
116 Gilmore Hall
Corvallis, OR 97331
Phone: (541) 737-6295
Fax: (541) 737-2082
http://wellwater.oregonstate.edu/volunteer.php

Group A: PROJECT MANAGEMENT

A1. Title and Approval Sheet

Laila Parker / Project Manager Date

Laura Moscowitz / Project Manager (2) Date

Steve Hanson / DEQ Volunteer Monitoring Specialist Date

Chris Redman / DEQ Quality Assurance Officer (QAO) Date

December 2004

This page intentionally left blank

A2. Table of Contents

A3. Distribution List

Oregon Department of Environmental Quality (DEQ)

Oregon State University (OSU)

A4. Project/Task Organization

Name	Project Title/Responsibility	Contact
Laila Parker	Project Manager	541-737-6311 or parkelai@onid.orst.edu
Laura Moscowitz	Project Manager	541-737-6311 or moscowil@onid.orst.edu
Gary Atwood	Sample collection & analysis	998-6139
Richard & Connie Burdick	"	richard.burdick@oregonstate.edu
Russ Carey	"	razoruss@hotmail.com
Nancy Corr	"	corrfranklin@aol.com
Pam & Dennis Fiske	"	dennispamfiske@aol.com
Katie Goldberg	"	katiejoshrose@earthlink.net
Diana Hollingshead	"	diana@eugeneskindivers.com
David Landrum	"	d.landrum@hughes.net
Kristin Lee	"	lee@eugene.econw.com
Susan Lorshbough	"	rslorshbough@highstream.com
Phil & Nancy McCullum	"	pmccullu@uoregon.edu,
Marler McGinnis	"	daydream@cpros.com
Yvonne Miller	"	davonearth@peoplepc.com
Don & Connie Pratt	"	donp@goodwill-oregon.org
Chris Percival	"	crispy@cswinet.com
Jenny & Ed Rogers	"	jenedr@juno.com
Samantha Rounsavell	"	zanesr@centurytel.net
Rob Silbernagel	"	silbernagel.rl@juno.com
Maryanne Smith	"	coburghills@msn.com
Mindi & Neill Thornton	"	mindithornton@yahoo.com
Hilary White	"	pup@comcast.net
Emily Williams	"	sub_13_lime@yahoo.com
Laila Parker	Data Management & Analysis	541-737-6311 or parkelai@onid.orst.edu
Laura Moscowitz	Report Writing & Data Presentation	541-737-6311 or moscowil@onid.orst.edu
Steve Hanson	DEQ Volunteer Monitoring Specialist	503.229.5449

A5. Purpose Statement/Problem Definition/Background

The purpose of this project is to create a groundwater monitoring network in the Southern Willamette Valley in which volunteers will monitor their own and their neighbors' wells for nitrate. A secondary purpose is to increase awareness of local groundwater issues and improve public involvement in management efforts through community participation, outreach, and education. While this is expected to be a one-year pilot project examining the feasibility of using volunteer monitors to identify regional and temporal trends in groundwater nitrate, ideally monitoring would continue past the first year. The project is designed to involve minimal outside administration, in the hopes that volunteer monitors will eventually take ownership of the project and it will be self-sustaining. The data will be primarily used as a screening tool for the community to identify regions at high risk for nitrate contamination and to identify times of the year at which nitrate levels are highest in each locale. We would like for the data to be used by Oregon DEQ or another agency to look for regional and temporal trends in nitrate across the valley.

This monitoring program is one of many actions in response to the DEQ's declaration of the Southern Willamette Valley Groundwater Management Area (SWVGWMA). The SWVGWMA was designated as a result of evidence of high nitrate levels within the valley's groundwater, which supplies the majority of the drinking water in the region. The hydrogeology of the valley is complex, with good connections in some areas between the shallow and deeper zones of the aquifer, and confining layers in other areas which may restrict contaminated groundwater from moving directly into the deeper aquifer zones. In some areas of the Valley, the Willamette Silt Unit may offer some protection to underlying aquifers due both to its low permeability and its tendency to facilitate reduction of nitrate to nitrogen gas. As a result of this hydrogeologic complexity, and of the wide variety of land-use activities which may contribute nitrogen at the surface, the distribution of nitrate in the region's groundwater is highly variable. It is hoped that this monitoring project will help to clarify that variability for both residents and decision-makers.

A6. Project Task/Description

Residential drinking wells will be sampled for nitrate-nitrogen. Sampling will be conducted by 22 volunteer monitors, or pairs of monitors, who will each be responsible for testing 1-10 wells including their own. Monitors will recruit neighbors to participate in the program, and will be paired with neighboring well-owners who have expressed interest in the program. It is expected that no monitor will need to travel more than 2 miles from their home when conducting sampling, however some have agreed to travel longer distances. On the second Saturday of each month, monitors will collect water samples at each home from an outdoor spigot. Monitors will either analyze each sample in the field, or bring all the samples home and conduct the analysis there. If sample analysis is to occur later than one hour following sample collection, monitors will store the samples in a cooler or refrigerator, however analysis will occur that same day. Samples will be tested using a color comparator field nitrate-nitrogen test kit (#3354, LaMotte Co., Chestertown, MD). Readings will be recorded on a form to be given to the homeowner and on a datasheet either in electronic or paper format, which will be submitted to the data manager. Bacteria samples will also be taken in November 2006 both as an indicator of well condition and as a screening for the well owners. Bacteria samples will be collected by the project managers,

with the help of interested volunteers, and will be analyzed using the Colilert® test (IDEXX Laboratories, Westbrook, ME) in a lab volunteered by John Selker at OSU. Nitrate data will be summarized using descriptive statistics in a report to be sent out to interested parties. Recipients will include participating well owners, who will also receive a detailed description of their own well's data. Data will also be analyzed for seasonal and spatial trends following the methods used by Mutti (2006), and/or recommendations from the OSU Student Statistical Consulting Service.

Project Timetable:

Tasks to be completed	Months for year 2006 - 2007											
	8	9	10	11	12	1	2	3	4	5	6	7
Sampling planning and revision	x	x	x									
Quality control tests	x	x										
Duplicate sampling & testing				x								
Monthly nitrate testing			x	x	x	x	x	x	x	x	x	x
Data entry			x	x	x	x	x	x	x	x	x	x
Developing data analysis method		x	x	x	x							
Seeking additional funding and support	x	x	x	x	x	x	x	x	x	x	x	x

The major constraint on completing this program is that funding and logistical support do not exist beyond June 2007. This presents a challenge even to completing the one-year pilot study. Beyond that, in order for the program to produce meaningful long-term results, it must either become entirely volunteer-run or it must be taken under the wing of another OSU graduate student or another agency. Currently we are developing a 319 grant proposal to seek further funding. As the monitoring program gets underway, we will look for particularly committed volunteers and speak with them about potentially taking a larger role in keeping the program running.

A7. Measurement Quality Objectives

The project is designed primarily to screen residential wells for high nitrate levels to aid rural residents in making management decisions regarding drinking water safety. Our sampling will characterize the ambient nitrate levels in residential drinking water from wells. Sampling is designed based on some assumptions that nitrate levels can be measured without accounting for diurnal fluctuations or drawdown. As this project is focused on characterization of the nitrate levels in residents' drinking water, it is important to note that people often consume water from the tap at times when the well has not been 'purged' by water-demanding activities such as showers. The drawdown assumption is supported by Mutti's (2006) findings of a minimal difference in nitrate levels from wells which were purged for 6.5, 9, 15 and 18 minutes. The assumption that any diurnal fluctuation effect can be ignored was tested by a group of three volunteer monitors, for a total of 14 morning/evening data points. On average, a difference of 0.3 ppm nitrate was detected between morning and evening readings, with a standard error of

35%. While these data are not conclusive, they suggest that if diurnal fluctuation does exist, it is not strong enough to be detected by these kits.

Other programs have required monitored wells to be constructed according to established standards, however as this program is designed to describe the quality of water which residents are consuming, similar constraints were not used in recruiting volunteers. Attempts will be made to correlate the data with relevant well information. When possible, well logs will be obtained from the Oregon Department of Water Resources Well Log Query website (http://apps2.wrd.state.or.us/apps/gw/well_log/Default.aspx), however well logs are often unavailable or do not contain adequate information to easily match them to existing wells. We will be conducting bacteria tests for every well in the program in November 2006 which should assist in determining whether there is a surface water contribution to the well, thus providing some information about well construction. Additionally, we plan to take depth measurements of wells for which well logs have not been obtained. These data on well depth, age and surface water contribution may be used in interpreting the nitrate data.

Given the limitations of the color reader in the nitrate field test kit, a lower level of accuracy and precision is expected than if the water samples were tested for nitrate in a laboratory. We do not expect to generate "A" level nitrate data as defined by the DEQ's field data quality matrix. The grade of the data quality will be determined following quality control checks which will be made at 15 sampling stations, as described in Section B5. We do, however, expect to generate "A" level bacteria data as defined by the DEQ's field data quality matrix. Bacteria tests will be conducted following DEQ-recommended protocols, using the recommended Coliliert® test kit.

Our understanding is that no comparable volunteer monitoring programs exist in which volunteers take and measure nitrate samples from wells using field kits. As a result, we do not expect comparability with other programs. The Draft Southern Willamette Valley Groundwater Management Area Action Plan calls for this program to sample at least 50 wells. Currently we estimate that 150 wells will be sampled monthly under the program.

Table 2: Accuracy and Precision Targets

Matrix	Parameter	Precision	Accuracy	Measurement Range
Water	Nitrate-Nitrogen	0.6 ppm ± 0.2 ppm*	1.9 ppm ± 0.2 ppm (or 35% error ± 3 %)	1 ppm to 15 ppm
Water	Total coliform, *E. coli*	± 0.6 log	NA	0 to >2419

*see Section B6

A8. Training Requirements and Certification

By the beginning of the program, all monitors will have participated in at least one training session in the use of the field kit and in sampling protocol; most monitors will have attended two training sessions. Training sessions include the Well Water Clinic held at Oregon State University on June 22 Community Orientation Meetings held in Junction City, Coburg, Corvallis, Monroe and Harrisburg during the week of July 17, and two regional training and organizational sessions held October 4 in Junction City and October 11 in Corvallis. Training sessions are run by project managers Laila Parker and Laura Moscowitz. Four volunteer

monitors (including one monitor pair) came to the Well Water Clinic, with an additional 22 volunteer monitors (including three monitor pairs) coming to the regional meetings in July. All monitors with the exception of one attended either the Junction City or Corvallis meeting in October. All volunteers who came to training meetings were given a nitrate test kit with which to experiment and to familiarize themselves with the method before beginning sampling.

The October trainings were designed to organize the assignment of volunteered wells to neighboring monitors, to distribute additional testing materials (sample bottles, manual, etc.), and to review the testing protocol. As part of the protocol review, all volunteers were given two unlabeled water samples of nitrate concentrations 2 ppm and 6 ppm, which they tested independently using the provided manual (see Appendix E3). Each volunteer entered their results into a data form similar to that which they will use during sampling. Volunteers were then asked for their feedback on using the manual and the data form, and their datasheets were collected at the end of the program. Overall, the mean difference between the lab values and the values read using the kit was 0.8 ppm ± 0.2 ppm, while the mean percent error was 23% ± 5%. Comparing these results to those obtained by a group of OSU students and described in Section B6 suggests that the experience gained by the volunteers in using the kits over the course of the summer made a positive impact on their accuracy using the kits.

A9. Documentation and Records:

Document or Record Name and Description	Storage Location	Storage Time
Volunteer Groundwater Quality Monitoring Sampling Analysis Plan	DEQ Laboratory & OSU Extension Office	5 years
Community Well Water Testing Program Manual Methods manual, developed at OSU	Monitors' test kits and OSU Extension Office	5 years
Monitor Datasheets	Monitors' homes (folder or hard drive) & OSU Extension Office	5 years
Quality Control record notebook	OSU Extension Office	5 years

Group B: DATA GENERATION AND ACQUISITION

B1. Sampling Process Design

The project extent is determined by previously designated boundaries drawn by DEQ, and includes the overlay of the areas described by both the DEQ's initial Southern Willamette Valley study area and the current Southern Willamette Valley Groundwater Management Area (SWVGWMA). The initial study area is being used as it was drawn to encompass an area within which nitrate was expected to be a contaminant of concern, based on topography and soils. There is a small region of the SWVGWMA in South Corvallis which is not included in the initial study area but is included in this project as the project was designed to target the SWVGWMA.

As sampling occurs on private property, sites will be selected based on residential interest in response to newspaper articles, flyers, well water clinics, and conversations with neighbors who may already have volunteered for the program. Nitrate levels will be assessed at each site, using a field nitrate-nitrogen kit, on the second Saturday of every month. Coliform bacteria assays will be conducted on a one-time basis (with potential to conduct once a year if funding exists) in the second weekend of November, when it is assumed that there will have been adequate rainfall to assess surface water contributions.

If there are resources to expand the project, it is presumed that a new outreach campaign will recruit new volunteers. It is expected that the project boundaries will remain constant, but that decision may be reversed by future managers of the project.

Ideally, as each well owner has agreed to participate in the program, each monitor will have complete access to the sampling sites he or she is responsible for. In order to minimize imposition on well-owners, monitors will take their readings at outdoor spigots. Well owners will be expected to show monitors the location of such spigots and otherwise facilitate the sampling process as needed. A small project to test for a measurable difference in nitrate between indoor and outdoor faucets (which might be caused by water treatment devices) was designed, but only carried out by one monitor (total of two indoor/outdoor data points). However we do not expect water softeners to affect nitrate levels (ODEQ, 2004). Appendix E1 contains a map of all sampling stations, and a table showing station ID numbers. See Section B9 for further discussion of these data.

B2. Sampling Method Requirements

Nitrate

As discussed above, nitrate samples will be collected at outdoor spigots on the designated sampling day. Monitors will follow a protocol in a manual produced by OSU Extension (Appendix E3), which will include the basic steps as follows:

1. A 5-mL sample of water is added to a test tube
2. Tablet #1 is added to the test tube and dissolved.
3. Tablet #2 is added to the test tube and dissolved.
4. After 5 minutes, the test tube is inserted into a color comparator reader and the nitrate concentration in the tube is read.

Initially we had intended to give all monitors a bottle of a known nitrate concentration, which they could analyze each month and use as a visual standard against which to compare their samples. However, both our own experimentation and the experience of others (e.g. Katznelson, 1997) suggest that using such a standard does not improve the accuracy of the readings, and for this reason we decided not to use a standard.

The split samples taken by project managers for quality control in November will use the sample collection containers, holding times and preservation specified in Table 4 of the QAPP DEQ04-LAB-0047-QAPP. Samples will be collected from the same outdoor tap from which volunteer samples are taken, just after the monitor collects his/her sample. 500 mL samples will be collected in reused, washed 500 mL polyethelyne bottles supplied by DEQ, to which 12

drops of concentrated H2SO4 will be added. Bottles will be kept in a cooler and then transferred to a refrigerator at the OSU Selker Lab until they can be transported to the DEQ Water Quality Lab.

Bacteria

100 mL water samples will be collected in 120 mL sterile transparent nonfluorescent bottles. Samples will be collected from the same outdoor tap from which nitrate samples are taken. Water will be run for at least 3 minutes before samples are taken, and care will be taken to ensure that the cap and neck of the bottle are not contaminated as the sample is taken. Samples will be stored in an iced cooler during the sampling day for a maximum of 6 hours before being transferred to a refrigerator in the OSU Selker Laboratory.

B3. Sample Handling and Custody Procedures

Nitrate

Monitors may either read each sample at the sampling station (well) or they may collect all their samples and do the testing at home. Each monitor will have a sample bottle for each well which is labeled with a unique identifying number corresponding to the well's location (see Appendix E1). A list of these numbers and the locations to which they correspond will be maintained at OSU Extension and each monitor will have a list of the sites for which they are responsible. This number scheme will be used to minimize association between the well owner and the nitrate reading. The protocol for sample labeling is discussed in the monitors' manual (Appendix E3). Monitors will also record this information on the field data sheet shown in Appendix E2.

During the split sampling field trip, collected samples will be labeled with the site's identifying number, date, time, and the sampler's name. As described above, samples will be transferred to a refrigerator at the OSU Selker Lab until they can be transported to the DEQ Water Quality Lab. Samples will either be driven to the Water Quality Lab in Portland by one of the project managers on the following Tuesday morning when the lab is open, or will be shipped by Greyhound as specified in the DEQ's Watershed Assessment Mode of Operations Manual (03-LAB-0036-SOP).

Bacteria

Collected samples will be labeled with the site's identifying number, date, time, and the sampler's name. Samples will be stored in an iced cooler during the sampling day, for a maximum of 6 hours before being transferred to a refrigerator in the OSU Selker Laboratory. Samples will be processed and incubated within 8 hours of arriving at the laboratory.

B4. Analytical Methods Requirements

Nitrate

Monitor-collected samples will be analyzed using the LaMotte Nitrate-Nitrogen test kit (#3354, LaMotte Co., Chestertown, MD). This kit was chosen based on its being relatively easy to use, non-toxic, and inexpensive. The kit uses zinc to reduce nitrate to nitrite, which then undergoes diazotization/coupling to form a pink color, with darker colors indicating higher

nitrate levels. The color of the sample is then matched to a color standard using a slide viewer system, and an approximate nitrate-nitrogen level (ppm) is read. Monitors will either analyze each sample in the field, or bring all the samples home and conduct the analysis there. Sample analysis will occur no later than one hour following sample collection. Processed samples will be poured down the drain. Details of the methods are attached in the manual in Appendix E3.

Split samples will be collected and transported as described in Sections B2 and B3. They will be analyzed using standard methods for nitrate-nitrite at the DEQ Water Quality Laboratory.

Bacteria

Bacteria samples will be collected, transported and stored as described in Sections B2 and B3. Upon their arrival at the OSU Selker Laboratory, they will be analyzed using the IDEXX Colilert® Quanti-Tray/2000 method by the project managers. One packet of Colilert reagent will be added to each sample, mixed and dissolved. The sample will then be poured into the Quanti-Tray pack and sealed following the IDEXX protocol. Sealed samples will then be placed in an incubator at 35°C for 24 hours. At the end of this period, but before 28 hours have passed, samples will be read following the Most Probable Number protocol. Data will be recorded into a datasheet and subsequently entered into the master database. Waste will be disposed of in the garbage without sterilization.

B5. Quality Control Requirements

Nitrate

During the second sampling day (November), project managers will accompany randomly selected volunteer monitors on their sampling trips, collecting simultaneous samples at stations sampled by the monitor. A total of fifteen samples will be collected, representing roughly 10% of the stations to be sampled that month. The split samples will be sent to DEQ's Water Quality lab for analysis. Resultant values will be compared with the monitors' values to determine the accuracy of the monitors' sampling results.

Monitors' accuracy with the field kit alone will be assessed during the training to be held October 4, at which time the volunteers will be given unidentified samples of a known concentration to read using the kit, as described in Section A8.

We had originally planned to also take routine ambient monitoring samples, through coordination with the DEQ's GWMA monitoring plan. However, there is only one well within the volunteer monitoring network which is also being monitoring by the DEQ, and their monitoring schedule does not appear to coincide with ours. They are sampling quarterly, and sampling in the month of November will be at the end of the month. Thus the utility of this approach for data quality control is up for debate.

If quality control results show a sampling problem with the LaMotte test kits, we will contact the manufacturer and look into using an alternate field test kit. If the results show monitor error, we will either conduct refresher training sessions and/or accompany monitors on upcoming sampling days.

Bacteria

The bacteria sampling will occur only once during the sampling year. If the DEQ would like this sampling event to include side-by-side sampling as a quality check, we can arrange for samples to be provided to the DEQ Water Quality Laboratory according to the time requirements set forth in the DEQ04-LAB-0047-QAPP. Alternatively, we could conduct duplicate samples at 10% of the wells, and examine the duplicate results to determine our accuracy. We plan to refer any residents in whose well water we identify coliforms to a certified water quality lab for further testing, thus the function of this sampling is more as a screening than as a definitive test.

B6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Nitrate

Before each sampling day, monitors will inspect their test kit to ensure that sampling tubes and bottles are clean and dry, supplies of chemical tablets are adequate for the number of samples to be taken, and all the contents of the kit are present. When chemistry tablets are low, monitors will request an additional supply from project managers. Project managers will be responsible for testing each new batch of tablets as it is received from LaMotte before distributing the tablets to monitors.

Before each sample is taken, monitors will rinse the relevant equipment (sample bottle, test tube, beaker, syringe) with the water to be sampled. All materials will be rinsed with tap water after sampling is finished to remove any reagent residue. Given the level of precision afforded by this method, we are not concerned about nitrate residues on the equipment. All materials will be air-dried before being stored.

Accuracy and precision of the nitrate test kit was evaluated through an experiment conducted in September 2006. Twelve graduate students/research assistants in the Department of Biological & Ecological Engineering volunteered to participate. Each participant was given eight nitrate samples (two sets of four concentrations) to read using the LaMotte kit. The samples were donated by Pacific Analytical Lab in Corvallis, and were all residential well water samples which had been analyzed by the lab and then stored for a required period of 30 days before being donated to our program. After reading the first set of four samples, half of the participants were given a reference 4.0 ppm nitrate standard made from nitric acid buffered with NaOH to be at pH 5.5. These six participants were asked to read the standard before reading each sample. Results indicated no significant difference between accuracy or precision in readings conducted with or without the standard. Overall, the mean difference between the lab values and the values assigned using the kit was 1.9 ppm ± 0.2 ppm, while the mean percent error was 35% ± 3%. The mean difference between values read for subsequent samples was 0.6 ppm ± 0.2 ppm.

Bacteria

As the incubator in the Selker lab at OSU has not been used recently, we will inspect it before use and check that all parts are working and that its temperature reading is accurate. If we find any problems with the incubator, we will seek out another incubator (this should be relatively easy to find).

B7. Instrument Calibration and Frequency

Nitrate test kit instrumentation will not be subject to calibration. However, if the program lasts for more than the initial year, monitors will be expected to participate in refresher training sessions.

B8. Inspection/Acceptance Requirements

Each monitor will be responsible for storing his or her equipment in a cool and dry place, protected from freezing, direct sunlight, and extreme temperatures. Monitors will be responsible for ensuring that kits are adequately supplied, and will contact project managers if any additional supplies are required. Bacteria sampling equipment will be handled as specified.

B9. Data Acquisition Requirements

All wells have been assigned an ID #, recorded by the responsible volunteer monitor and the project managers, however we are still lacking street addresses for some wells, which we expect to receive in the coming month as new volunteers complete and return their application materials. Latitude and longitude has been identified for a majority of the wells using the LASER website; additional information will be added as we receive the addresses, although for some cases we expect to need to take location data with a GPS unit during the bacteria sampling in November. During the process of obtaining latitude and longitude data, each well was checked for correspondence to an existing LASER identification number; in cases where such a number did already exist it was recorded in Appendix E1.Source of latitude and longitude for each site will be noted in the database.

Whenever possible, well logs will be obtained from the Oregon Department of Water Resources Well Log Query website (http://apps2.wrd.state.or.us/apps/gw/well_log/Default.aspx). These logs will be found using address, tax lot, previous owner, well depth and well age information provided by volunteers. As well logs often do not exist for existing wells or do not contain adequate information to easily match them to existing wells, we do not expect to find logs for every well in the program. Currently, well logs have been found for only 27% of the 65 participants for whom well logs were sought. Thus we plan to supplement this data for wells for which we have not located well logs by taking well depth measurements over the course of the following months, using two well depth probes owned by OSU Extension.

B10. Data Management

Data will be stored electronically, in field data sheets, and in postcards sent to well owners. Monitors will have the option of recording their data in paper or electronic format. The paper field data sheets are printed in a duplicate form. Monitors will keep the lower sheet and mail the upper sheet to the Data Manager. The electronic forms can be download from the volunteer website (http://wellwater.oregonstate.edu/volunteer.php) and mailed to the Data Manager; a copy will be stored on the monitor's computer. Monitors will also be responsible for mailing well owners monthly postcards with their nitrate reading and some information about interpreting that reading. Well-owners may decide to store these postcards in a long-term, retrievable manner. Monitors will be provided with all the necessary postage for mailing both postcards and field data sheets. The Data Manager (this role may be taken by an eager volunteer) will be

responsible for entering the data on-line into a database established at OSU. Each year, the project manager will also be responsible for entering the year's accumulated data into DEQ's LASAR database according to the normal grab water quality submittal format. Data will be submitted in Excel spreadsheets. The first data submission will occur at the end of the pilot study or when funding expires, but not longer than a year following the beginning of the project (e.g. October 2007).

A description of the data fields used in the field data sheet are shown in the list in Appendix E2. These data fields are a modification of the ODEQ grab data submittal procedure for the 2004 303(d) list. Also to be found in this Appendix are two sample data sheets – one blank and one filled-in, as well as the postcard which monitors will send to their respective well owners. Project managers will be responsible for monthly checks of the on-line database for completeness and reasonableness. If any station is missing data or if the data seems unreasonable, the project manager will contact the appropriate monitor to discuss the issue.

Software will be selected to present the data spatially and to conduct the statistics discussed in section A6. Results will be presented on the volunteer website and in an annual report to be sent to volunteers and other interested parties.

Group C: ASSESSMENT AND OVERSIGHT

C1. Assessment and Response Actions

Following the receipt of analytical results from split sampling field trips, results from the laboratory and the monitors' analysis will be compared. Volunteer data will be considered to be adequate if the difference between volunteer and laboratory results is within 2 standard deviations of the mean difference between duplicate samples using the kit (0.6 ppm ± 1.7 ppm). Data beyond this action level will prompt review of the sampling methodology, the test kit, and the volunteers' ability to use the kit.

The project managers will be responsible for training the volunteers before the monitoring program begins, and for conducting refresher training courses as necessary. The need for refresher training courses may be determined based on review of the correlation between split samples or feedback from monitors. Project managers will stay abreast of developments in test kits and may determine that an alternate test kit should be used if it is deemed to be more accurate or easy to use.

C2. Reports to Management

Quality control tests will be conducted by the project managers, who will take action if necessary. Monitors will report their sampling results monthly, including duplicate samples when necessary, and project managers will review that information.

Group D: DATA VALIDATION AND USABILITY

D1. Data Review, Validation, and Verification

Data result values will be classified based on standards determined by the project managers in consultation with the DEQ Volunteer Monitoring Specialist Steve Hanson. Determination of whether collected data meets the plan's objectives will be conducted as described in section D1 of the QAPP DEQ04-LAB-0047-QAPP

D2. Validation and Verification Methods

Data validation and verification will proceed as set forth in section D2 of the QAPP DEQ04-LAB-0047-QAPP. Monitors will be responsible for reviewing field data sheets at the end of each sampling day for completeness and reasonableness. After entering the data into the database, the data manager will review entries for transcription errors. Following data entry, project managers will review the database for reasonableness and completeness, and will respond as necessary as described in section B10. Project managers will also be responsible for reviewing laboratory results from split sampling trips, and comparing the results with the relevant monitor-collected data. Data quality levels will be determined following the split sampling trip in November through consultation with the DEQ Volunteer Monitoring Specialist Steve Hanson

D3. Reconciliation with Data Quality Objectives

Reconciliation with data quality objectives will proceed as described in section D3 of the ODEQ QAPP DEQ04-LAB-0047-QAPP, although re-sampling is not expected to occur if data quality indicators do not meet the project's specifications. Instead, the focus will be on retraining volunteers and improving the sampling plan if necessary.

Group E: APPENDICES

E1. Well Locations

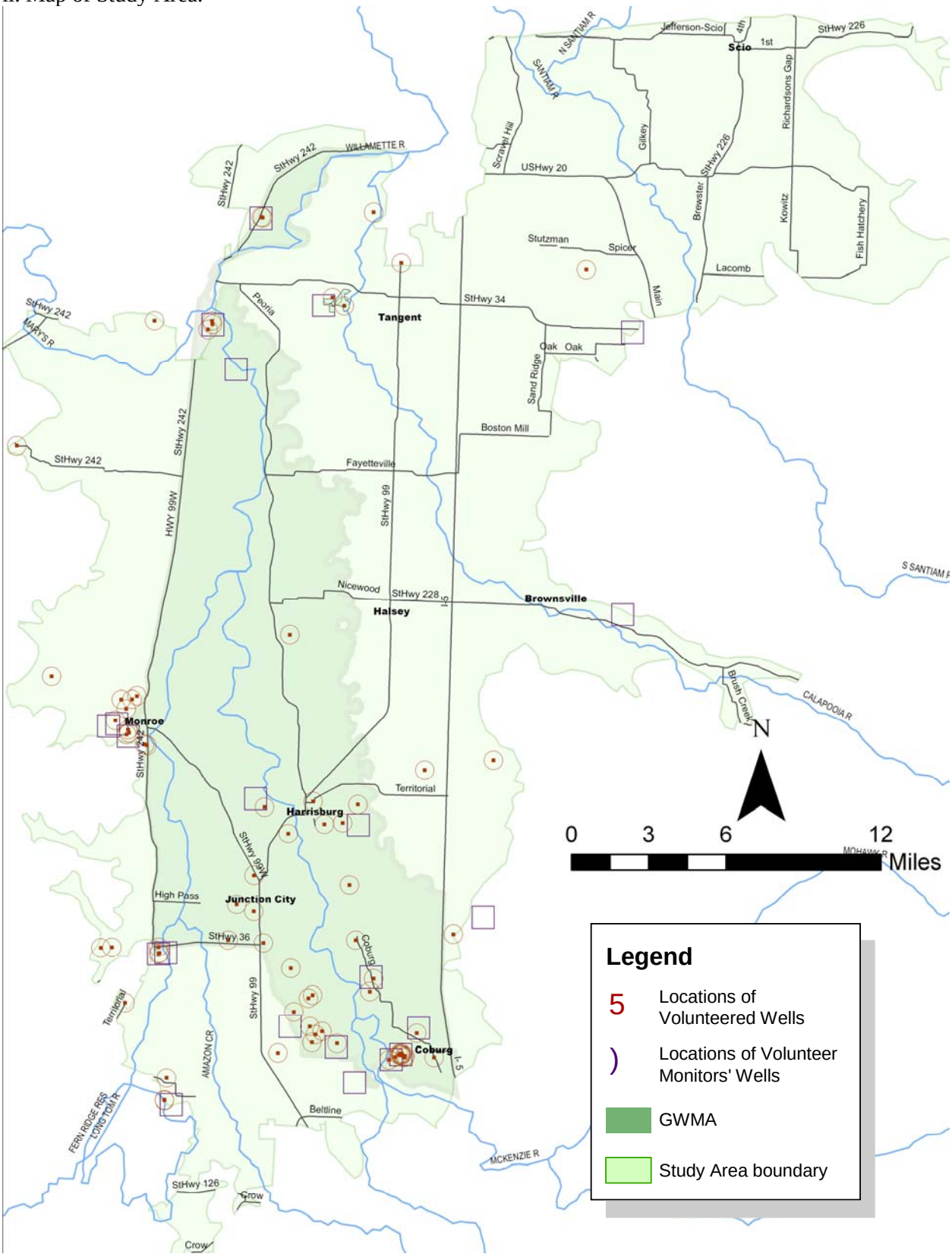
i. List of wells. Well ID numbers are assigned based on the monitor's kit number: if the monitor's kit number is 1, their well ID # will be SWV1.0, and the wells they test will be SWV1.1, SWV1.2, etc. Address gaps will be filled as applications are received and missing latitude/longitude data will be collected by GPS if necessary over the months of October/November. LASER #s are provided when found to exist for that well.

Name	Street Address	City	Latitude	Longitude	Well ID #	LASER #
Jenny & Ed Rogers	93072 Macarthur Lane	Junction City	44.1895	-123.2784	SWV1.0	
Bill Mattox					SWV1.1	
					SWV1.2	
					SWV1.3	
					SWV1.4	
					SWV1.5	
					SWV1.6	
					SWV1.7	
					SWV1.8	
					SWV1.9	
Diana Hollingshead	89955 Shore Lane	Eugene	44.1012	-123.2699	SWV2.0	
Candi Outka	89981 Shore Lane	Eugene	44.1012	-123.2699	SWV2.1	
Nova Hollingshead	89962 Day Lane	Eugene	44.1044	-123.2729	SWV2.2	
Donnie Marguess	89950 Day Lane	Eugene	44.104	-123.2726	SWV2.3	
Art Nersecien	27232 Orchard Road	Junction City	44.1179	-123.2739	SWV2.4	
Kristin Lee	30704 Luckey Lane	Junction City	44.1378	-123.1435	SWV3.0	
Miriam Reinhart	30710 Luckey Lane	Junction City	44.1378	-123.1434	SWV3.1	
Jean Phifer	30193 Heather Oak Drive	Junction City	44.1653	-123.1623	SWV3.2	
Kathryn Sampson	30057 Heather Oak Drive	Junction City	44.1653	-123.1664	SWV3.3	
Laura & Dave Pimentel	91871 Prarie Road	Junction City	44.1574	-123.1798	SWV3.4	
Tiffany & Tad Lueck	30599 Maple Drive	Junction City	44.1709	-123.1482	SWV3.5	
Emily Williams	27085 Walnut Lane	Brownsville	44.3847	-122.9335	SWV4.0	
Ron Bonham	29680 Crook Drive	Halsey	44.3711	-123.1906	SWV4.1	
Winnie Baron					SWV4.2	
Marler McGinnis	31161 Priceboro Drive	Junction City			SWV5.0	
Bob & Joan Franz	30855 Priceboro Drive	Junction City			SWV5.1	
Roger Bristol	31166 Territorial Drive	Harrisburg	44.2741	-123.1261	SWV5.2	
Ken & Kim Morrison	21626 Coburg Road	Harrisburg			SWV5.3	
Lou & Lin Wilcox	1084 S 11th Street	Harrisburg			SWV5.4	
Maryanne & Dan Smith	91508 Stallings Lane	Eugene	44.1487	-123.0757	SWV6.0	
John Critelli	91406 Stallings Lane	Eugene	44.1463	-123.0757	SWV6.1	
Brad Chvatal	90934 Coburg Road	Eugene	44.1333	-123.0638	SWV6.2	
Mclmgren					SWV6.3	
Walker					SWV6.4	
Segebert					SWV6.5	

Gary Atwood	96311 Howard Lane	Junction City	44.2767	-123.2106	SWV7.0	
Rachael Feuerstein	96044 Noraton Road	Junction City	44.2768	-123.2078	SWV7.1	
Judith Ridge	95700 Highway 99E	Harrisburg			SWV7.2	
Al Beaser	94656 Toftdahl Lane	Junction City	44.2323	-123.2092	SWV7.3	
Ed England	96281 Howard Lane	Junction City	44.2761	-123.2106	SWV7.4	
Curtis Griffith	660 Quincy Street	Harrisburg	44.275	-123.1648	SWV7.5	
additional person					SWV7.6	
additional person					SWV7.7	
Russ & Kim Carey	3755 Kendra Street	Eugene			SWV8.0	
Connie & Don Pratt	32032 Coburg Bottom Lp	Coburg	44.1348	-123.0902	SWV9.0	
Lonnie Ballard	32014 Coburg Bottom Lp	Coburg	44.1348	-123.0916	SWV9.1	
Kellie Shelton	31976 Coburg Bottom Lp	Coburg	44.1348	-123.0936	SWV9.2	
Cecil Phillips & Ralph Patti	32033 Coburg Bottom Lp	Coburg	44.1348	-123.0902	SWV9.3	
Richard Murphy	32023 Coburg Bottom Lp	Coburg	44.1348	-123.0904	SWV9.4	
Neil Murphy	32009 Coburg Bottom Lp	Coburg	44.1342	-123.0825	SWV9.5	24884
Robert Rust	32043 Coburg Bottom Lp	Coburg	44.1348	-123.0898	SWV9.6	
Sam & Katy	32044 Coburg Bottom Lp	Coburg	44.1348	-123.0899	SWV9.7	
Pam & Dennis Fiske	91562 Prairie Road	Junction City	44.1487	-123.1765	SWV10.0	
Julian & Debbie Brailsford	91544 Prarie Road	Junction City	44.1482	-123.1762	SWV10.1	
Doug & Brenda Lane	30185 Lassen Lane	Junction City	44.1463	-123.1584	SWV10.2	
Lance & Loreis Evenson	29799 Sovern Lane	Junction City	44.1807	-123.1779	SWV10.3	
Phil Collins	90920 Brown Lane	Eugene	44.1319	-123.1859	SWV10.4	
Tim & Lyn Cogswell	30428 Lassen Lane	Junction City	44.1463	-123.1517	SWV10.5	
Pat Bohanan	30282 Lassen Lane	Junction City	44.1463	-123.1556	SWV10.6	
David Landrum	92580 Coburg Road	Coburg	44.1771	-123.116	SWV11.0	16648
Lori	92515 Coburg Road	Coburg	44.1765	-123.115	SWV11.1	
Tiffany	92514 Coburg Road	Coburg	44.1765	-123.115	SWV11.2	
Minors	93242 Coburg Road	Coburg			SWV11.3	
Chase (house water)	92186 Coburg Road	Coburg	44.1646	-123.1077	SWV11.4	
Chase (yard)	92186 Coburg Road	Coburg	44.1646	-123.1077	SWV11.5	
Richard & Connie Burdick	33440 Oakville Road SW	Albany	44.5532	-123.1671	SWV12.0	
Helen Sprig	32075 Beta Drive	Tangent	44.5776	-123.1078	SWV12.1	
Mike Garner	31490 Easy Avenue SW	Albany	44.6063	-123.1319	SWV12.2	
Orville "Swede" Ohling	33522 Oakville Road SW	Albany	44.5544	-123.1636	SWV12.3	24698
Bill Alden	33767 Oakville Road SW	Albany	44.5643	-123.1533	SWV12.4	
Katie Goldberg	2625 SE Crystal Lake Dr	Corvallis	44.5397	-123.2558	SWV13.0	
Laura Pagano	2410 SE Crystal Lake Dr	Corvallis	44.5425	-123.2558	SWV13.1	
Janet & Ed Starkey	825 SE Goodnight Ave	Corvallis	44.5369	-123.2588	SWV13.2	
Carrie Kart	1170 SE Alexander Ave	Corvallis	44.5451	-123.2562	SWV13.3	
Rob Silbernagel	24985 Orchard Tract Rd	Monroe	44.3151	-123.32	SWV14.0	
Annie Ingersoll	25834 Larkin Road	Monroe	44.3382	-123.372	SWV14.1	
Mike & Nikki Louie	24990 Orchard Tract Rd	Monroe	44.3151	-123.3196	SWV14.2	
Morgan & Jessica Bradley	25192 Orchard Tract Rd	Monroe	44.3218	-123.313	SWV14.3	

Mike & Amy Bodi	26599 Price View Rd	Monroe	44.3297	-123.3107	SWV14.4	
Mindi & Neill Thornton	2322 SE Kiger Island Dr	Corvallis	44.519	-123.2362	SWV15.0	
Nancy Newcomb	2425 SW 45th Street	Corvallis	44.5451	-123.3013	SWV15.1	
Dena Alexander	24194 Decker Road	Corvallis	44.4684	-123.4045	SWV15.2	
Carol Finley		Corvallis			SWV15.3	
Bette Lenehan		Corvallis			SWV15.4	
Hilary & Robert White	4050 NE Fair Acres Dr	Corvallis	44.6018	-123.2191	SWV16.0	
Julie O'Briant	4130 NE Fair Acres Dr	Corvallis	44.6004	-123.2197	SWV16.1	
Michelle Lorrica	4115 NE Fair Acres Dr	Corvallis	44.6007	-123.2196	SWV16.2	
Michelle Lorrica (rental)	4116 NE Fair Acres Dr	Corvallis	44.6007	-123.2196	SWV16.3	
Ali	4150 NE Fair Acres Dr	Corvallis	44.6001	-123.2199	SWV16.4	
Mark Merklein	4105 NE Fair Acres Dr	Corvallis	44.6009	-123.2195	SWV16.5	
Mark Merklein (rental)	4061 NE Fair Acres Dr	Corvallis	44.6016	-123.2192	SWV16.6	
Phil & Nancy McCullum	24843 Kyle Road	Monroe	44.3186	-123.329	SWV17.0	
Ron Tippetts Sr.	24494 Territorial Road	Monroe	44.2938	-123.2954	SWV17.1	
Tim Nash	Coon Road	Monroe			SWV17.2	
Yvonne Miller	26436 Coon Road	Monroe	44.3104	-123.3068	SWV18.0	
Catherine Utter	26317 Alpine Road	Monroe	44.3283	-123.3162	SWV18.1	
Bob Zysett	25425 Springhill Drive	Monroe	44.3288	-123.3099	SWV18.2	
Dave Crosby	26411 Coon Road	Monroe	44.3097	-123.3096	SWV18.3	
Mike Stoffel	26440 Coon Road	Monroe	44.3106	-123.3068	SWV18.4	
Roger King	26330 Cherry Creek Rd	Monroe	44.3088	-123.3145	SWV18.5	
Suzanne Vasquez	24474 Territorial Road	Monroe	44.2937	-123.2954	SWV18.6	
J Stanley Davidson	32175 Harris Drive	Harrisburg	44.2944	-123.0865	SWV19.1	
Mary Jarvis	34050 Belts Drive	Harrisburg	44.297	-123.0142	SWV19.2	
Lynn Tanantell	93341 West Point Rd	Harrisburg	44.2034	-123.0455	SWV19.3	
Susan Lorshbough	93030 Applegate Trail	Junction City	44.1861	-123.2811	SWV20.0	
James Pitney	93256 Pitney Lane	Junction City	44.198	-123.2189	SWV20.1	
Virgy Burkhard	26398 Richardson Lane	Junction City	cnf	cnf	SWV20.2	
Elaine Payne	94050 Oaklea Drive	Junction City	44.2165	-123.2217	SWV20.3	
Carl & Enola Nielsen	93903 Prarie Road	Junction City	44.2117	-123.2089	SWV20.4	
Virginia Siewart	92599 Applegate Trail	Junction City	44.1749	-123.286	SWV20.5	
Barbara Marra	93050 Applegate Trail	Junction City	44.1867	-123.2808	SWV20.6	
Chris Percival (well 1)	90880 Knox Road	Eugene	44.1317	-123.097	SWV21.[illegible]	16659
Chris Percival (well 2)	90880 Knox Road	Eugene	44.1317	-123.097	SWV21.1	16659
Kurt & Barbara Wuest	90918 Smith Lane	Eugene	44.1322	-123.0872	SWV21.2	
Shannon Gray	32158 Coburg Bottom Lp	Coburg	44.1337	-123.0868	SWV21.3	
John McBeath	90976 Knox Road	Coburg	44.1342	-123.0969	SWV21.4	
Alan Schacher	90866 Knox Road	Eugene	44.1311	-123.0971	SWV21.5	
Ed Brown	90867 Knox Road	Eugene	44.1312	-123.0969	SWV21.6	
Sam Rounsavell	294 S 13th Street	Lebanon	44.5428	-122.9249	SWV22.0	
Donald Rounsavell	34171 Tallman Road	Lebanon	44.5764	-122.9673	SWV22.1	

ii. Map of Study Area.



E2. Data Forms

i. Description of Data Fields to be included for each station in the database, with notation as to whether they will be recorded on the monthly datasheet, are constants to be maintained in the database, or will be entered by the database manager.

ORGANIZATION: Southern Willamette Valley Community Well Water Testing Program, always in database

SITE DESCRIPTION: identifying information entered by monitor each time data is recorded, serves as a check on Station ID

POINT OF SAMPLE COLLECTION: description of location from which well water sample is obtained

WELL DEPTH: from well log, if possible, always in database

WELL AGE: from well log, if possible, always in database

WELL CONSTRUCTION: from well log, if possible, always in database

ELEVATION: in feet, of the sample site, always in database

LATITUDE - in decimal degrees, always in database

LONGITUDE - in decimal degrees, always in database

SOURCE. source of latitude and longitude is GPS data from bacteria sampling, always in database

STATION ID: A unique number will been assigned to each sampling site and recorded each time data is reported. *Example:* SWV1.0

DATE of Collection: The date the sample was taken in MM/DD/YYYY format. *Example:*10/14/2006.

TIME of Collection: Use the 24 hour clock and HH:MM format. *Example:* 14:35 to designate 2:35 p.m.

NITRATE SAMPLE RESULT: The nitrate value of the water sample in ppm

DUPLICATES: Nitrate measurements of duplicate samples will be taken at a minimum of 10% of the total number of monitoring sites during the first sampling period.

EQUIPMENT USED: LaMotte kit #, will be recorded at each sampling.

CHEMISTRY BATCH NUMBER: Information to be provided to monitors, will be recorded at each sampling

MONITOR: The person(s) who collected the data, with contact information (full name and phone number), to be recorded at each sampling

CHECKED TRANSCRIPTION ERRORS: Data managers should always enter 'yes' here after entering data.

DATA REVIEW DATE: The date that the data was reviewed to ensure accuracy and completeness of all data points, entered by database manager

DATA REVIEW CONTACT: Name and contact information for the data reviewer, entered by database manager.

LAB CONTACT: If samples were analyzed by a laboratory, provide contact information (full name and phone contact).

QA/QC PROTOCOL FOLLOWED: "Volunteer Groundwater Quality Monitoring: Nitrate in the Southern Willamette Valley"

QA/QC PLAN AVAILABLE: Answer yes and provide contact information (full name and phone number).

COMMENTS: Any comments if appropriate.

ii. Sample Datasheet

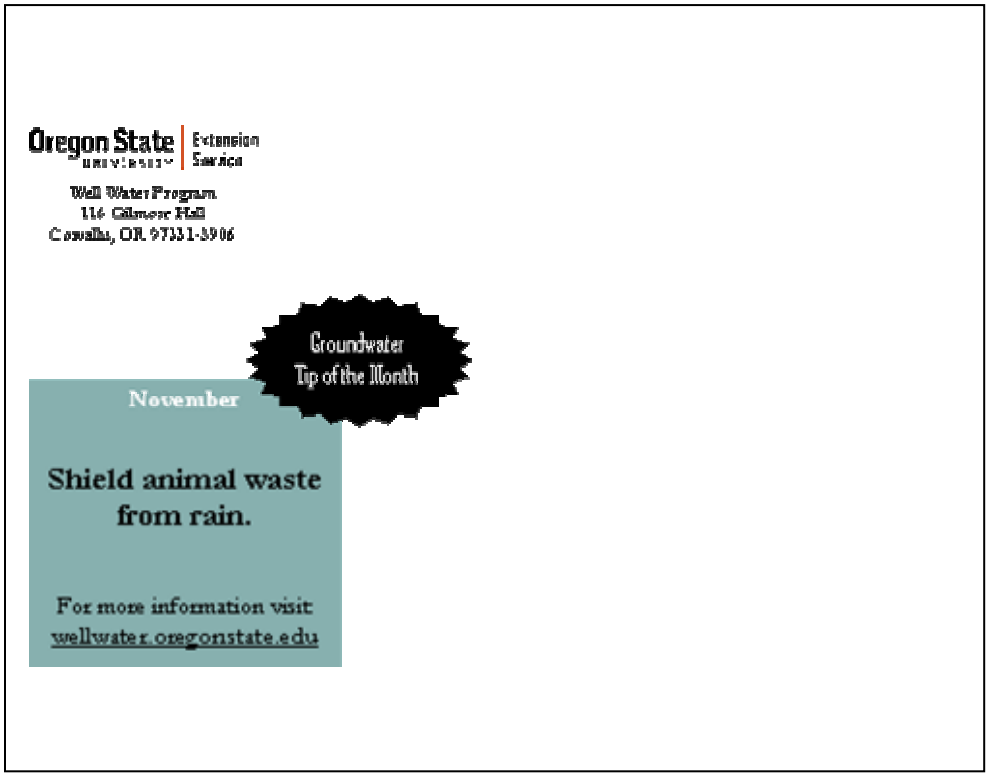
Sampling date:_____ Time: _____Weather: _____

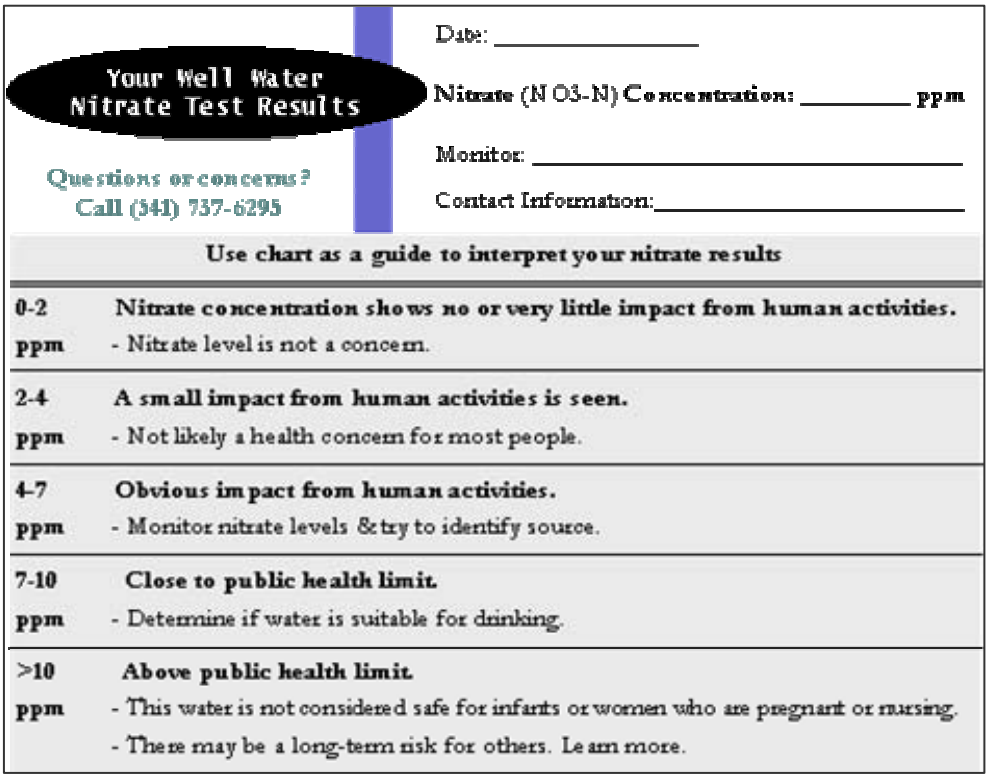
Kit #:_____ Reagent 1 Batch #:_____ Reagent 2 Batch #:_____

Monitor name(s): _____ Contact info:_____

Well ID #	Site Description	Point of Sample Collection	Nitrate Sample Result	Comments
			ppm	
			ppm	
			ppm	
			ppm	
			ppm	

iii. Sample Postcard





E3. Manual

The Volunteer Manual can be found at: http://wellwater.oregonstate.edu/volunteer.php

E4. Literature Cited

Katznelson, R. 1997. Nutrients test kits: What can we expect? The Volunteer Monitor 9(1).

Mutti, J. G. 2006. Temporal and Spatial Variability of Groundwater Nitrate in the Southern Willamette Valley of Oregon. M.S. Thesis, Oregon State University.

Oregon Department of Environmental Quality (ODEQ). 2004. Watershed Assessment Section Mode of Operations Manual. Version 3.1 03-LAB-0036-SOP. Portland, OR.