Hall-Wentland Water Quality Monitoring Plan
For the
2008-9 Recharge Season (10/20/2008 to 5/15/2009)

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Overview:

Monitoring for the proposed testing is designed to meet five basic goals. These are to evaluate: (1) pre-test surface and shallow aquifer groundwater conditions, (2) changes in shallow groundwater caused by factors other than those related to testing, (3) changes in shallow groundwater caused by the testing (track the test performance), (4) potential problems caused by the testing that may require modification of the test and/or mitigation actions, and (5) events that effect test operations, such as a freezing or a flooding. To meet these objectives, monitoring will track:

- Source-water quality and volume coming onto the Site
- On-site, in the three purpose built wells (HW-1 through HW-3), groundwater water quality and levels
- Off-site, both up gradient and down gradient (the MC wells), groundwater levels,

The following sections present proposed monitoring locations, constituents to be sampled, sampling procedures (including QA/QC), and reporting.

A. Sampling Parameters

The selection of specific water quality constituent's recommended for sampling in this section is based in part on current monitoring for the nearby Hudson Bay District Improvement Company (HBDIC)/Walla Walla Basin Watershed Council (WWBWC) recharge project on White Ditch (being done under a limited license issued by OWRD)[1] and a basic review of land uses in the East Little Walla Walla and Site area.

The monitoring focuses on screening source water and groundwater for a range of synthetic organic compounds (SOC's) and related compounds that are common in the agricultural setting typical in the Test area. Specific SOC's selected for sampling and analysis are those typically screened for drinking water compliance. These constituents are listed on Table 1.

[1] Bower, HBDIC Recharge Project Water Quality Monitoring Plan, 2008

Table 1. SOC for Hall-Wentland Recharge Monitoring

Chemical (common name)	Chemical (trade name)	Currently being reported by EPA Method
2,4 D acid	Dacamine	515.1
Dimethoate	Cygon	525.2
Metalaxyl	Ridomil	525.2
Napropamide	Devrinol	525.2
Simazine	Princep, Aquazine	525.2
1-Naphthaleneacetamide	Amid-thin	525.2
Diazinon	Diazinon	525.2
Fenarimol	Rubigan	525.2
Lindane	Lindane	525.2
Methidathinon	Supracide	525.2
Mevinphos	Phosdrin	525.2
Myclobutanil	Systhane, Rally	525.2
Triflumizole	Procure	525.2
Azinphos-methyl	Guthion	525.2
Carbaryl	Sevin	531.1
Chlorpyrifos	Dursban, Lorsban	525.2
DDD (TDE)	Rhotane, DDD	525.2
DDE	degradation product	525.2
DDT	Anofex, Gesarol	525.2
Dicofol	Kelthane	525.2
Malathion	Cythion	525.2
Methyl Parathion	Penncap	525.2
Phosmet	Imidan	525.2
Propargite	Omite, Comit	525.2
Triadimefon Dimethoate	Bayleton	525.2
Oxamyl	Vydate	531.1
Hexazinone	DPX 3674, Pronone, and Velpar	525.2
Parathion-Ethyl	Niran, Phoskil (56)	525.2
Paraquat	Gramoxone	Special
BrO3	Bromate	Special

*Additional Fecal E. Coli sampling may be conducted if routine testing show values above drinking water standard. In the first two seasons of the project, fecal hits in surrounding wells have suggested a background presence of fecal bacteria in the groundwater.

In addition to SOC sampling, water quality monitoring also will include sampling and analysis for several basic water quality parameters. Constituents comprising the basic water quality parameters proposed for sampling in this Plan are as follows:

- Static water level
- Standard field parameters, pH, elect. conductivity, temp, and turbidity
- nitrate as nitrogen
- nitrite as nitrogen
- Total dissolved solids (TDS)
- Hardness
- Chloride
- Orthophosphate
- Chemical oxygen demand (COD)
- Fecal coliform

The basic parameters for sampling and analysis are selected to optimize routine sampling to address constituents commonly of concern (nutrients and salts) and provide an indication of potential impacts by analyzing for selected constituents (nitrate and chloride) that are typically good indicators of general water quality. Additional parameters may be proposed for future sampling if the results of the initial proposed sampling indicate this is necessary.

1. Monitoring Locations and Frequency

Four basic types of monitoring points are used, including: (1) source-water monitoring, (2) groundwater monitoring at the Site, (3) groundwater monitoring more distant from the Site (e.g., distal), and (4) surface-water monitoring. Monitoring frequency and constituents for each are described in the following sections.

1.1 Source-water Monitoring

Source-water monitoring will be at the point where recharge test water enters the Site. Monitoring will include both water quantity and quality. The volume of water delivered to the Site will be monitored via a gauge at the entrance point. Water quality samples will be collected at the gauge.

Monitoring is as follows:

- Flow volume onto the Site will be gauged and recorded using a data logger. Rating measurements and tables will be generated for flow at the diversion point.
- Water quality sampling for the basic water quality constituents is as follows. However, the exact timing of these sampling events will be based on predicted ditch use. A total of three sampling events are as follows:
    - Approximately one month prior to the projected beginning of the recharge period, assuming the canal is in operation. If the canal isn't operating than a sample will be collected as soon as is reasonably practicable prior to the start of testing.
    - Within 5 days following the start of testing
    - In the final week of testing.

- Two water quality sampling events for SOC's are proposed, as follows:

    - One SOC water quality sampling event will be done concurrent with the basic constituent water quality sampling event one month before SAR testing.

    - The second SOC water quality sampling event will be done during the recharge period. The event is anticipated to occur sometime in late winter or early spring (probably late February to late March) if testing is ongoing at the time. This event will generally coincide with the first 2 to 4 weeks of widespread spring farming activity in the general up gradient area of the Site.

The results of source-water quality monitoring will be used by project and OWRD staff (in consultation with ODEQ staff) to determine if modifications to test operations are warranted. For example, if the basic constituent samplings show unacceptable results (such as nitrate-N, chloride, and TDS exceeding ODEQ guidance levels) proposed testing will be modified and/or additional sampling undertaken to determine if testing can proceed. If SOC sample results indicate specific herbicide's and pesticide's are present in greater than trace concentrations in source water testing will be reevaluated in consultation with OWRD and ODEQ staff.

1.2 Groundwater Monitoring

SAR test groundwater monitoring will be done in both on-site and off-site wells. Proposed monitoring is as follows:

- In the month prior to, during, and the month following the test, water level data will be collected (at a minimum) daily in Site wells.
- Three water quality monitoring events for the basic constituents defined in Section 4.1 are proposed for Site wells as follows:
    - One groundwater quality sampling event is proposed approximately 1 month prior to the test for basic water quality parameters. All Site wells will be sampled.
    - During testing one sampling event is proposed, within 2 weeks following the start of recharge.
    - A final groundwater quality sampling event will be done approximately 4 weeks following the end of the test in all previously sampled wells.
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- Two water quality sampling events for SOC's are as follows:
    - One SOC water quality sampling event will be done concurrent with the basic constituent water quality sampling event one month before SAR testing.
    - The second SOC water quality sampling event will be done during the recharge period.

The results of groundwater quality and level monitoring, in conjunction with surface (source) water sampling will be used by project, OWRD, and ODEQ staff to determine if modifications to test operations are warranted. For example, if the basic constituent and SOC samplings show groundwater quality degradation proposed testing will be modified and/or additional sampling undertaken to determine if testing can proceed.

1.3 Surface Water and Springs

Surface water monitoring in McEvoy spring creek will be done to evaluate the potential effects of testing on flow. This monitoring will include the collection of both water quality data and flow data.

1.3.1 Sampling Procedures

Equipment and sampling procedures proposed for recharge test monitoring are provided in the following sections.

This section lists the equipment for groundwater monitoring.

- Submersible pump (Grundfos or similar) or dedicated bailers/sampling line
- Temperature measuring instrument
- pH and conductivity meter(s) with calibration reagents
- Water level meter (0.01 foot resolution required)
- Shipping cooler with ice packs or ice
- Five gallon pail marked at the 5 gallon level, stopwatch
- Laboratory supplied sample containers with appropriate preservatives
- Tap water, deionized water, phosphate-free soap, cleaning brushes, field note book, log sheets

1.3.2 Water Level

An electronic water level meter will be used to measure the depth to groundwater in each observation well to the nearest 0.01 foot. Static water levels will be measured at an indicated reference point prior to purging any water from the well. The reference points will be on the top of the well casings. Static water levels in all wells should be measured on the same day. Accumulation of sediment in the well should also be checked by lowering a weighted tape to the bottom of the well, reading the depth at the well casing's reference point, and comparing this value to the as-built well depth.

1.3.3 Decontamination

All non-disposable field equipment that may potentially come in contact with any soil or water sample shall be decontaminated in order to minimize the potential for cross-contamination between sampling locations. Thorough decontamination of all sampling equipment shall be conducted prior to each sampling event. In addition, the sampling technician shall decontaminate all equipment in the field as required to prevent cross-contamination of samples collected in the field.

1.3.4 Purging and Field Parameters

Sufficient water will be purged to ensure that the sample collected represents water from the geological formation. Borehole volumes are calculated as the volume of water in the casing and the volume of water in the filter pack.
During purging, measure pH, temperature, and electrical conductivity of the water removed. At a minimum, these parameters are measured at the start of purging and after each successive borehole volume is removed. Temperature should be measured first because it changes most rapidly. Purging continues until at least three borehole volumes have been purged and the field parameters are established to within ± 10 percent over three consecutive measurements. At this point, the observation well is considered

adequately purged and can be sampled.

All field instruments should be calibrated each day prior to sample collection. Instrument calibration and maintenance should precisely follow the manufacturers recommended procedures. Electrical conductivity and pH standards used to calibrate the instruments should be within the range encountered at the monitoring sites. Calibration records should be recorded on the sample collection forms.

1.3.5 Sampling

Samples will be collected after sufficient water has been purged according to the procedure described above. Samples will be collected from the discharge end of the pump hose after the flow rate has been reduced to less than approximately 0.2 gallons per minute. If a bailer is used it will be controlled to minimize agitation and aeration. Sample containers should be sealed with tape, labeled, and immediately placed in a cooler with ice. Sample containers should be filled completely to eliminate head space. Sample containers will be provided by the analytical laboratory (EDGE LABS) and should be requested at least one week in advance of the sampling. The containers should be appropriate for the parameters analyzed and all shipping coolers should have chain-of-custody seals placed on them prior to shipping.

Samples should be stored immediately after collection in an ice chest containing sufficient ice to cool the samples to 4 degrees Celsius (°C). Use "blue ice" if possible. If water ice must be used, the ice should be sealed in plastic bags, as should the sample bottles. Samples should remain cooled at 4°C and delivered to the laboratory within 24 hours of collection. Sample receipt at the laboratory must be sooner if analysis includes parameters with a shorter holding time. Care should be taken to prevent excessive agitation of samples or breakage/leakage of containers. Samples should be analyzed within the specified holding time for each constituent.

1.3.6 Chain of Custody and Sample Handling

A chain-of-custody form should be completed and signed by the sampler on the day samples are collected. The chain-of-custody form must be signed by laboratory personnel upon receipt and any other individuals that maintain custody of the samples in the interim. Coolers should be sealed and shipped or driven to the lab as soon as possible. The method of shipping (bus, next day air, etc.) is usually determined by the parameter having the shortest holding time. In any case, shipping times of more than 24 hours should not be used as the cooler(s) may warm and compromise sample quality.

1.3.7 Field Records and Data Validation

All field notes, analytical results, and other pertinent data associated with the project should be maintained in a secure location and be archived for at least a five year period. Data validation for both field and lab Quality Assurance and Quality Control (QA/QC) will be performed using a checklist. All pertinent information with respect to QA/QC will be checked.

The following items are included on the QA/QC review checklist:

- Field data sheets (or notebooks) and observations (observations are used to check for potentially erroneous data) will be reviewed to make sure they are completely filled out.
- Chain-of-custody forms will be completed, being signed by all sample handlers.
- Holding times for all constituents will be met.
- Field blind duplicate results will be evaluated to make sure they are compatible.

Laboratory method blanks, matrix spike, matrix spike duplicates, and surrogate percent recovery data supplied by the analytical laboratory will be evaluated to make sure they are compatible.

1.4 Data Reporting and Analysis

The following procedures for reporting analyses are proposed for this project.

1.4.1 Record Keeping

All field notes, laboratory results, critical calculations, and published reports will be maintained by the project team during the project. Following the project copies of this material will be maintained by Walla Walla County. If possible, both paper and electronic copies will be maintained.

1.4.2 Evaluation

Monitoring data and observations should be evaluated when they are received from the sampler and laboratory.

Materials to be received include:

- Field monitoring and sample collection records
- Original laboratory reporting sheets

Data evaluation will include:

- Verification of analytical methods and detection limits, along with the date the analysis was performed
- Review of document handling, sampling and analytical problems, and actions

taken to correct any problems
- Summarizing water level data in tabular and/or graphical form
- Summarizing water quality analytical results in tabular form and/or graphical form
- Performing data validation checks, as appropriate to the data set
- Identifying any significant increases in parameter concentrations

1.4.3 Reporting

All monitoring activities performed during the project will be included in the final project report. This report will present the following monitoring information:

- Water quality data, including duplicate sample results in tabular form and time-series plots for specific parameters
- Water level data, including hydrographs showing water level changes over time
- Basic statistical parameters for each parameter of interest: mean, median, maximum, minimum, standard deviation, number of data points, and number of non-detects
- Evaluation of field and laboratory data, including observed changes and groundwater flow direction and gradient
- Discussion and conclusions, including recommended changes to recharge testing

The methods needed to evaluate water quality and water level data will depend on the objectives of the evaluation. In general, the principal objective is to evaluate whether or not recharge tests have affected groundwater levels and quality. Evaluation methods include:

- A comparison of water quality data with a concentration limit or with background water quality
- Comparison of water quality over time
- Comparison of water quality between up-gradient and down-gradient wells

For the Site, it is anticipated that insufficient data will be available for statistical analysis until late in the project. Until that time, evaluation of data set trends will be solely qualitative, with the data being reevaluated after each sampling event.

2.0 Laboratories which will process the water quality samples are as follows:

Baseline Chemicals and Soluble Organic Compounds:

Edge Analytical
11525 Knudsen Road
Burlington, WA 98233
Tel: 360.757.1400
Tel: 800.755.9295
Fax: 360.757.1402

Our contact there is:

Cindy O'Toole
Chemist-EDGE LABS
Edge Analytical, Inc
(800)755-9295

Fecal E. Coli Samples:

City of Walla Walla Water Plant, Contact: Tom Krebs (Phone 522-3775).
Where: Walla Walla Water Plant 581 Mill Creek Road, Walla Walla WA. 99362

Coming up Mill Creek road (left side) (call Tom Krebs for directions)
* Call for bottles at least 4 days prior to sampling. Sampling best done on Tuesday, Wednesday or Thursday for laboratory needs. Fecal E. Coli samples need to get to the laboratory within 8 hours from the sample is collected to insure accurate values in the results. Coordination with Walla Walla City Water Plant lab technicians is key for this portion of the water quality sampling to go smoothly.