APPENDIX B
FIELD AND LABORATORY QUALITY CONTROL PROGRAM

HMC GROUNDWATER MONITORING

EQUIPMENT:

Sample containers
Data sheets and pens
Electrical generator with gasoline
Winch
PCV pipe, 1 inch x 10 foot threaded sections sufficient for well depth
Submersible water pump and electrical cable
2 pair channel locks
Duct tape
90^{o} elbow and discharge valve
Watch
3-gallon bucket
Conductivity meter
Shovel
Bailer for low-flow wells
#24 (course) glass fiber 102 mm filter (Schleichers and Schuell) or the equivalent
0.45-micron cellulose nitrate 102 mm filter (Geofilter) or the equivalent

REGULATORY BASIS:

Materials License SUA-1471, Condition 35A states that the Licensee shall:

> "Implement the groundwater monitoring shown in Table 2 (8-99) submitted September 29, 1999, except that under "Reversal Wells," delete Well KF and replace with Well DZ, and except that well CW2 will remain in the sampling program monitored annually for G list of parameters, and Cr is to be deleted from the D and F lists of parameters."

Materials License SUA-1471, Condition 35B states that the Licensee shall:

> "Comply with the following groundwater protection standards at the point of compliance Wells D1, X, and S4 with background being recognized in Well P."
>
> molybdenum = 0.03 mg/l, selenium = 0.10 mg/l, vanadium = 0.02 mg/l, uranium = 0.04 mg/l, radium-226 and 228 = 5.0 pCi/l, thorium-230 = 0.30 pCi/l.

10 CFR 40, Appendix A, Criterion 7A states:

> "The licensee shall establish a detection monitoring program needed for the Commission to set the site-specific groundwater protection standards..."

PROCEDURE:

A. GROUNDWATER MONITORING PROGRAM, SCHEDULE, AND PREPARATION

1. Table 2 (8-99) of the September 29, 1999 submittal presents the well numbers, parameters, and the frequency of the groundwater-monitoring program. Sample size and preservatives may vary according to contract laboratory needs but follow the guidelines outlined in the latest edition of *Standard Methods for the Examination of Water and Wastewater*. Well locations are specified in the latest semiannual report. A schedule shall be prepared that designates the wells, analytical parameters, and monitoring frequency for the program. A standard Analytical Sheet (Form-21) is used for each groundwater sample filling in all information relative to the sample.

2. Obtain the correct size, new plastic sample containers and label with a permanent magic marker the following code:

   Well ID # / month-day-year / military time
   SS-0331/01-07-93/930

3. Each day the conductivity meter is used check the batteries in the meter and check that the meter was calibrated within the last 6-months using the conductivity standards specified in the latest edition of *Standard Methods for the Examination of Water and Wastewater*. Obtain a fresh sample of de-ionized water and check that the conductivity of de-ionized water reads the same as was recorded during the calibration.

B. SAMPLE COLLECTION

1. Using Form-21fill in the *Well Name/I.D.* and *Collection Date.* Additional information for the sample taken will be recorded when the sample is taken.

2. In each monitoring well-sampled measure the water level from the top of the well casing to the top of the water using a water level probe.

3. When collecting samples with the AMS SK3500 Well Management System, use the manufacture’s instructions as a guide to lower the submersible pump into the well.

4. Pump the well with the valve wide open until the pump starts sucking air. Close the discharge valve until only water is being pumped. If air is pumped along with water the conductivity measurements will not be accurate. Measure the time, in seconds, required to fill a 3-gallon bucket. Divide the measured seconds by 60 seconds and multiply by 3-gallons to obtain the flow rate in gallons per minute. Record the pumping rate in gallons per minute on the analytical sheet for the well being sampled.

5. Standardize the temperature/conductivity meter according to the manufacturer's instructions.

6. Take continuous temperature and conductivity measurements of the pumped water. Pump the well until the temperature and conductivity stabilize. Removal of at least two well

casing volumes of water from the well is usually required to stabilize the conductivity measurements

7. Rinse out the sample container at least twice with approximately one-third the volume of the container. Fill and cap the sample container.

8. Shut off the pump and pull the pump from the well using the manufacture's instructions as a guide.

9. For monitoring wells that have a pump installed in the well follow steps 4-7 above.

C. BAILING LOW-FLOW WELLS

1. Wells that produce only a few (1-2) gallons per hour need to be bailed because well pumps cannot remove the last few gallons of water in the well. For a low-flow well those few gallons remaining in the well would, if not removed, be a significant percentage, e.g. 10%, of the water sampled from the well.

2. Remove the well cap and verify that the number on the well matches the number on the analytical sheet. Measure the distance from the top of the well casing to the water and record on the analytical data sheet. Position the bailing boom over the well and lower the bailer to the bottom of the well. Pull the bailer out of the well and measure the water volume in a 3-gallon bucket. The bailer typically removes 1.5-gallons of water at a time from a 5-inch well and 0.1-gallons at a time from a 2-inch well. Continue to bail the well until dry and record the total volume of water removed on the analytical sheet.

3. Return to the well approximately 24 hours later, measure the distance from the top of the well casing to the water, and record on the analytical sheet. Bail out 3 additional gallons of water from a 5-inch well and 1-gallon from a 2-inch well. Rinse out the sample container at least twice with approximately one-third the volume of the container. Collect the sample and cap the container.

D. SAMPLE PREPARATION AND ANALYSIS

1. At the end of each day of well sampling bring the water samples to the Analytical Laboratory for filtering. If a water sample contains algae, pre-filter the sample through a #24 (course) glass fiber 102 mm filter (Schleichers and Schuell) or the equivalent. After algae have been removed or if not present filter the water samples through a 0.45-micron cellulose nitrate 102 mm filter (Geofilter or the equivalent). Rinse the filter container with de-ionized water initially and filter using argon gas to pressurize the system.

2. Add the preservative specified in of *Standard Methods for the Examination of Water and Wastewater* and cap the container. If the sample foams, allow the gas to bleed off before tightening the cap on the container. Place the sample in a shipping container to be shipped to the contract laboratory for analysis.

3. The contract laboratory uses standard EPA methods for analysis.

E. INJECTION WELL CLEANING PROCEDURE

1. The injection well cleaning procedure is used on each injection well when injection flow has decreased and the hydrologist deems that they need cleaning.

2. A contract driller is retained to clean the wells using his standard well air development procedures to clean the well screens.

3. Record on the *Injection Well Maintenance Record* (Form-31) the initial flow rate, the final flow rate, the date the well was cleaned, parts replaced, and any observations. Assure that the *Injection Well Maintenance Record* is filed in the individual well files. If injection rates are inadequate, or other problems are evident with function of the well, the Radiation Protection Administrator should be notified.

F. ANALYSIS AND REPORTING OF GROUNDWATER DATA

1. Documentation for inputting analytical data and generating various reports is available in a 3-ring binder labeled ***Groundwater Control – System Documentation*.**

a) MANAGEMENTS

Managements are entered on a weekly basis with a *Ground Water Status Report* produced using the generated reports.

b) ANALYTICAL

Internal data as well as outside lab analytical data is entered as time allows. Data sheets are then filed in individual well files.

2. Prepare for review and submission, by the Radiation Protection Administrator, the following reports specified in the Nuclear Regulatory Commission License SUA-1471 and State of New Mexico Discharge Permits DP-725 and DP-200:

1) DP-725 to the State of New Mexico, as permit requirement.

2) Semi-annual DP-200 to the Nuclear Regulatory Commission and the State of New Mexico, as permit requirement.

3) Annual DP-200 to the Nuclear Regulatory Commission and the State of New Mexico, as permit requirement. Water quality data is transmitted to the Contract Hydrologist for inclusion in this report.

4) Water usage report to the New Mexico State Engineer, due the 10th of each month.

QUALITY CONTROL:

The Site Manager, or his designee, shall complete the following activities:

1) verify that required groundwater sampling is completed,

2) verify the accuracy of data reflected in groundwater reports,

3) analyze trends in groundwater constituents,

4) assure that injection well are maintained and cleaned as necessary, and

5) implement changes in the program as needed.

REFERENCES:

I. Standard Methods for the Examination of Water and Wastewater - American Public Health Association, Washington DC, 19th Edition, 1995.

APPENDIXES:

A. Table 2 (8-99)
B. Form-21 - Analytical Sheet
C. Form-31 – Injection Well Maintenance Record

REVISIONS:

Original:	02-22-93
Revision 1:	05-18-98
Revision 2:	10-20-03

DISTRIBUTION:

Manager - Grants & Southwest U.S./Radiation Protection Administrator
Utility Operator/Radiation Management
Utility Operator/Water Management

APPROVAL:

_____
Alan D. Cox
Manager - Grants & Southwest U.S./Radiation Protection Administrator

APPENDIXES

A. Table 2 (8-99)

B. FORM-21 – ANALYTICAL SHEET

C. FORM 31 – INJECTION WELL MAINTENANCE RECORD

TABLE 2 – Groundwater Monitoring Program (8-99 as modified by Amendment 34)

Well Number	Parameters to be Monitored	Frequency of Monitoring
#1 & #2 Deepwells	**D**	**Annually**
Broadview Acres Wells **446, SUB1, SUB2, SUB3**	**G**	**Annually**
Felice Acres Wells **490, 492, 493, 494**	**G**	**Annually**
Murray Acres Wells **802, 844**	**G**	**Annually**
Pleasant Valley Wells **688, 846**	**G**	**Annually**
Regional Wells **920, 942**	**G**	Annually
Site Monitoring Wells F, FB, GH, MO, CW2	**G**	**Annually**
Collection System Wells	**Total Volume**	**Monthly**
Injection System Wells	**Total Volume**	**Monthly**
Reversal Wells **B, BA, KZ, DZ*, SO, SP, S1, S2**	**Water Level**	**Weekly**
Point of Compliance Wells **D1, X, S4**	**B, F**	**Annually**
Background Well **P**	**B**	**Annually**

* Well DZ replaced well KF by Amendment 34 - License Condition 35 A

B = Water Level, pH, TDS, SO_4, Cl, HCO_3, CO_3, Na, Ca, Mg, K, NO_3, U, Se, Mo, Ra-226
D = Ca, Mg, K, Na, HCO_3, CO_3, Cl, SO_4, pH, TDS, Al, As, Ba, Cd, Co, Cu, CN, F, Fe, Pb, Mn, Hg, Mo, Ni, NO_3 as N, Se, Ag, Zn, U, Filtered Ra-226
F = V, Ra-228, Th-230
G = Water Level, SO_4, U, Se, TDS, Mo

FORM-21 - ANALYTICAL SHEET

WELL NAME WELL I.D.	COLLECTION DATE____/____/____ MM/ DD / YY TIME:_____ HR:MIN	COLLECTED BY: ADRIAN VENABLE TITLE: UTILITY / RAD	WATER LEVEL CODE: 0013 FILE	PUMPING RATE (gpm) MEASURED CODE: 0058 FILE BAIL VOLUME (gal) CODE: 0017 MEASURED FILE

PUMPING OR BAILING DURATION (min) CODE: 0059 START _____ REMARK STOP: _____ **K** _____	Q (totalizer reading) CODE: 0054 _____ ___	CONDUCTIVITY TIME_____ TIME_____ TIME_____	CODE 0012 TEMP_____ TEMP_____ TEMP_____	CODE 0051 COND_____ COND_____ COND_____

PREVIOUS WATER LEVEL:_____	TOTAL DEPTH (FILE):_____ TOTAL DEPTH (MEASURED):_____	ANALYSIS REQUESTED: _____ _____ _____ _____

COMMENTS:

Name:	Pump Size
Address:	Casing Diameter:
	Usage:
Telephone Number:	