

Attachment D

Attachment D: Leachate Monitoring and Testing Program

PROGRESS ENERGY FLORIDA CRYSTAL RIVER UNITS 4 AND 5 PROPOSED LEACHATE MONITORING AND TESTING

- I. Computerized and manual literature search with the objective of obtaining an adequate data base from literature.
- II. Pre-operational Water Table Monitoring Program with the objective to acquire 12-month baseline.

Install 12 shallow peizometer well points

Install 2 deep peizometer well points

Monitor water table level

- 1 well-recorder to establish degree of tidal influences - one month

- 13 wells - weekly

Monitor in situ (pH, conductance, redox, dissolved oxygen) - weekly (all wells)

Monitor key water quality indicators (Discontinued August 2008) (4 wells)

Monitor extended water quality indicators quarterly (4 wells)

Monitor rainfall and evaporation - weekly

Develop flow net and water budget

- III. Laboratory screening of ash from low pyritic sulfur coal with the objective of evaluation of leachate formation and attenuation reactions. The program will establish the following:

- Percolation rates of compacted ash (fly and bottom ash)

- Solute release rates

- Limestone neutralization effectiveness

- Clay liner effectiveness

- Correlate extended and key water quality indicators

- Total ash leachate capacity

- Active area vs. Inactive area leachate rates

- Available fractions of solutes

Techniques for screening:

- Shake test (fly, bottom ash)

- Column leaching (6-10 months)

(1) Compacted fly ash (lifts and liners)

- (2) Alternative lifts of ash and limestone
- (3) Ash with clay liner
- (4) Ash with compacted limerock and fly ash liner

IV. Evaluate leachate attenuation in subsoil and water table aquifer.

- Oxidation - reduction
- Chemical precipitation/solubility/pH/Eh
- Adsorption isotherms
- Ion exchange capacity
- Metals content of limerock

V. Cost-effectiveness evaluation of alternative liners

- Water quality criteria
- Biological effects
- Cost of leachate control and treatment
- Cost of runoff control and treatment

VI. Develop final design for field test cell program defined in paragraph VII below.

VII. Field test cells program with the objective of verifying.

Monitor water budget

- Direct infiltration rates
- Direct runoff
- Direct rainfall
- Water table

Potential test cell configuration

- Ash with compacted fly ash liner only
- Ash with compacted limestone and fly ash liner
- Alternative lifts of ash and limestone with compacted fly ash liner
- Ash with selected clay liner
- Alternative caps and vegetation

Monitor leachate formation and attenuation

- 4 well clusters per cell at three depths
- Weekly water table elevations in situ water quality from all wells (pH, conductance, redox, dissolved oxygen)
- Monthly key indicators from 2 clusters per cell
- Quarterly extended indicators from 2 per cell
- 2 base well points shall be maintained up slope of the active area

VIII. Evaluate leachate management program results and develop final design of ash storage area.

IX. Periodic reports on the progress of this program will be submitted to the Department for its information and review.

X. In situ water quality indicators

pH	Redox
Conductance	Dissolved Oxygen

XI. Key water quality indicators - monthly

Conductance	Cadmium
pH	Zinc
Redox	Copper
Dissolved Oxygen	Nickel
Temperature	Selenium
Color	Chromium
Turbidity	Arsenic
Chloride	Beryllium
Iron	Mercury
Lead	

XII. Extended water quality indicators - quarterly

Key indicators plus:

Total Dissolved Solids	Gross Alpha
Suspended Solids	Aluminum
Barium	Calcium
Magnesium	Sodium
Molybdenum	Vanadium
Cobalt	