

**APPENDIX I**  
**SOIL ANALYSES**

This appendix summarizes the results of soil analyses for radionuclides, for materials to be used for disposal cell cover construction. In response to questions from the NRC on suitability of borrow materials that would comprise the upper two feet of cover, SFC has collected samples from the on-site borrow areas where the upper portion of cover and topsoil will be obtained. These samples were analyzed for natural uranium, thorium-230, and radium-226, with the results compared with background activity concentrations.

SFC has identified several borrow areas for sources of soil to be used for construction of the disposal cell cover and liner system. Several areas within the facility area and would comprise a small percentage of the overall material requirement: (1) the tornado berm, (2) the cut area east of the DUF4 building, (3) uncontaminated portions of the settling pond (Pond 2) berms, and (4) the fertilizer pond berms. The majority of the soil for liner and cover construction will be obtained from the soil borrow area south of the fertilizer ponds (South Borrow Area). South Borrow Area soils will comprise the upper portion of the disposal cell cover.

In addition, the Agland Area has been selected as the borrow area where topsoil will be obtained for finishing the cell cover.

The South Borrow Area and Agland Area were selected to provide soils that are of similar radiological characteristics to native soils in the site area and where sufficient quantities are expected to be available.

Sample analyses have been compiled for soil samples collected from background locations, the South Borrow Area, and the Agland Area. Table I.1 presents the analyses of background soil samples. Basic statistical information (number of analyses, minimum, maximum, average and standard deviation) is included. Tables I.2 and I.3 contain similar information for the Agland Area and South Borrow Area, respectively. The locations of the soil samples collected from the Agland and South Borrow areas are shown on Figure 20 (included at the end of this appendix). Background soil sample locations are shown on Figure No. 21 in Appendix D, Volume II, of the Reclamation Plan.

The mean and standard deviation of each data set are summarized at the bottom of each table, and show that the borrow area activity concentrations are similar to those in the background areas. In addition, the measured radiological concentrations are well below the cleanup levels.

The data included here provide the basis for SFC's statement in the Reclamation Plan, Section 5.1.3 that the borrow area soil to be used for the top two feet of the cover are of similar radiological characteristics to native soils in the site area.

Table I.1

Background Soil Sample Analyses

Location	Depth, ft		U-Tot µg/g	Ra-226 pCi/g	Th-230 pCi/g
	Top	Bottom			
HA288	0	0.5	3.87 ± 0.0869	1.39 ± 0.403	1.13 ± 0.358
HA289	0	0.5	3.73 ± 0.0688	0.92 ± 0.361	0.915 ± 0.319
HA290	0	0.5	2.73 ± 0.0483	0.693 ± 0.289	0.593 ± 0.277
HA291	0	0.5	3.93 ± 0.0556	0.867 ± 0.345	0.597 ± 0.271
HA292	0	0.5	3.07 ± 0.0525	0.733 ± 0.324	0.55 ± 0.265
HA292 DUP	0	0.5	2.62 ± 0.0451	1.11 ± 0.361	0.629 ± 0.264
HA293	0	0.5	3.24 ± 0.0678	1.44 ± 0.476	0.98 ± 0.375
HA294	0	0.5	3.27 ± 0.0627	0.968 ± 0.353	0.753 ± 0.289
HA295	0	0.5	3.38 ± 0.059	0.937 ± 0.36	1.02 ± 0.352
HA296	0	0.5	3.14 ± 0.0609	1.09 ± 0.39	0.434 ± 0.223
HA297	0	0.5	3.34 ± 0.0669	1 ± 0.317	0.469 ± 0.239
HA298	0	0.5	3.76 ± 0.0776	1.7 ± 0.46	0.942 ± 0.384
HA299	0	0.5	3.08 ± 0.0621	0.735 ± 0.341	0.968 ± 0.416
HA300	0	0.5	1.20 ± 0.0191	0.65 ± 0.32	0.39 ± 0.191
HA224	1	2	4.32 ± 0.0797	1.03 ± 0.374	0.904 ± 0.333
HA224	2	2.6	2.91 ± 0.0453	1.09 ± 0.381	1.1 ± 0.384
HA307	0	0.5	3.27 ± 0.0608	0.985 ± 0.402	0.826 ± 0.312
HA308	0	0.5	3.11 ± 0.0542	1.25 ± 0.443	0.709 ± 0.351

Number of Analyses	18	18	18
Minimum	1.2	0.653	0.388
Maximum	4.32	1.7	1.13
Average	3.22	1.03	0.77
Standard Deviation	0.67	0.28	0.24

Table I.2

## Agland Topsoil Sample Analyses

Location	Depth, ft		Sample Date	Uranium µg/g	Radium-226 pCi/g	Thorium-230 pCi/g
	Bottom	Top				
AGLAND	0.0	0.5	4/23/1992	2.00	0.900 ± 0.500	0.700 ± 0.400
AGLAND	0.0	0.5	8/17/1998	1.60	0.540 ± 0.190	0.800 ± 0.500
AGLAND	0.0	0.5	8/17/1998	1.20	0.810 ± 0.260	1.30 ± 0.500
AGLAND	0.0	0.5	7/15/2002	1.87		
AGLAND	0.0	0.5	7/15/2002	1.63		
AGLAND	0.0	0.5	3/12/2003	1.60	0.711 ± 0.102	0 ± 0.114
AGLAND	0.0	0.5	3/8/2004	1.52		
AGLAND	0.0	0.5	3/8/2004	1.18		
AGLAND	0.0	0.5	9/9/2004	1.80	0.615 ± 0.143	1.37 ± 0.177
AGLAND	0.0	0.5	9/9/2004	1.32	0.219 ± 0.097	1.25 ± 0.156
AGLAND	0.0	0.5	12/3/2004	2.25	0.464 ± 0.079	0.907 ± 0.183
AGLAND	0.0	0.5	12/3/2004	1.88	0.393 ± 0.079	1.73 ± 0.247
AGLAND	0.5	1.0	4/23/1992	2.10	1.80 ± 0.700	0.600 ± 0.400
AGLAND	0.5	1.0	8/17/1998	1.30	0.680 ± 0.250	0.500 ± 0.400
AGLAND	0.5	1.0	7/15/2002	1.38		
AGLAND	0.5	1.0	3/8/2004	1.77		
AGLAND	0.5	1.0	9/9/2004	2.03	3.17 ± 0.396	1.04 ± 0.172
AGLAND	0.5	1.0	12/3/2004	1.93	0.548 ± 0.114	2.19 ± 0.239
AGLAND	1.0	1.5	8/17/1998	1.20	0.740 ± 0.280	1.50 ± 0.600
AGLAND	1.0	1.5	7/15/2002	1.61		
AGLAND	1.0	1.5	3/12/2003	1.90	0.786 ± 0.103	0 ± 0.164
AGLAND	1.0	1.5	3/8/2004	1.46		
AGLAND	1.0	1.5	9/9/2004	1.73	0.540 ± 0.106	1.00 ± 0.157
AGLAND	1.0	1.5	12/3/2004	2.09	0.550 ± 0.126	1.71 ± 0.260
AGLAND	1.5	2.0	8/17/1998	1.10	0.860 ± 0.340	0.700 ± 0.300
AGLAND	1.5	2.0	7/15/2002	1.58		
AGLAND	1.5	2.0	3/8/2004	1.60		
AGLAND	1.5	2.0	9/9/2004	1.80	0.103 ± 0.053	0.744 ± 0.142
AGLAND	1.5	2.0	12/3/2004	1.94	0.454 ± 0.083	1.42 ± 0.216
AGLAND	2.0	2.5	8/17/1998	1.40	0.390 ± 0.230	1.70 ± 0.500
AGLAND	2.0	2.5	7/15/2002	1.34		
AGLAND	2.0	2.5	3/8/2004	1.70		
AGLAND	2.0	2.5	9/9/2004	1.91	0.158 ± 0.111	1.43 ± 0.197
AGLAND	2.0	2.5	12/3/2004	1.97	0.564 ± 0.120	1.59 ± 0.241
AGLAND	2.5	3.0	8/17/1998	1.20	0.390 ± 0.190	0.900 ± 0.300
AGLAND	2.5	3.0	7/15/2002	1.86		
AGLAND	2.5	3.0	3/8/2004	1.77		
AGLAND	2.5	3.0	9/9/2004	1.85	0.614 ± 0.136	0.420 ± 0.156
AGLAND	2.5	3.0	12/3/2004	2.13	0.738 ± 0.142	1.93 ± 0.241
AGLAND	3.0	3.5	8/17/1998	1.10	0.590 ± 0.200	0.800 ± 0.700
AGLAND	3.0	3.5	7/15/2002	1.86		
AGLAND	3.0	3.5	3/8/2004	1.34		
AGLAND	3.0	3.5	9/9/2004	1.78	0.781 ± 0.119	1.45 ± 0.172
AGLAND	3.0	3.5	12/3/2004	2.25	0.570 ± 0.113	1.78 ± 0.211
AGLAND	3.5	4.0	8/17/1998	1.20	0.790 ± 0.200	1.10 ± 0.400

Table I.2

Agland Topsoil Sample Analyses

Location	Depth, ft		Sample Date	Uranium $\mu\text{g/g}$	Radium-226 $\text{pCi/g}$	Thorium-230 $\text{pCi/g}$
	Bottom	Top				
AGLAND	3.5	4.0	7/15/2002	2.05		
AGLAND	3.5	4.0	3/12/2003	1.90	0.759 $\pm$ 0.106	0.392 $\pm$ 0.161
AGLAND	3.5	4.0	3/8/2004	1.53		
AGLAND	3.5	4.0	9/9/2004	1.70	0.390 $\pm$ 0.100	1.26 $\pm$ 0.183
AGLAND	3.5	4.0	12/3/2004	2.30	0.750 $\pm$ 0.136	1.84 $\pm$ 0.202
HA061	0.0	0.5	11/14/1994	< 1.00		
HA061	0.5	1.0	11/14/1994	< 1.00		
HA265	0.0	0.5	9/13/1995	< 1.00		
HA266	0.0	0.5	9/13/1995	1.00		
HA269	0.0	0.5	9/14/1995	1.00		
HA273	0.0	0.5	7/20/1995	< 1.00		
HA274	0.0	0.5	9/14/1995	< 1.00		
HA275	0.0	0.5	9/14/1995	< 1.00		
HA276	0.0	0.5	9/14/1995	< 1.00		
HA543	0.0	0.5	3/4/2003	2.10	1.49 $\pm$ 0.189	1.09 $\pm$ 0.275
HA545	0.0	0.5	3/4/2003	1.60	0.622 $\pm$ 0.152	0.829 $\pm$ 0.284
HA546	0.0	0.5	3/4/2003	1.80		
HA732	0.0	0.5	8/4/2005	1.92	0.779 $\pm$ 0.142	
HA733	0.0	0.5	8/4/2005	1.99	1.42 $\pm$ 0.221	
HA734	0.0	0.5	8/4/2005	1.93	0.730 $\pm$ 0.144	
HA735	0.0	0.5	8/4/2005	3.26	1.07 $\pm$ 0.202	

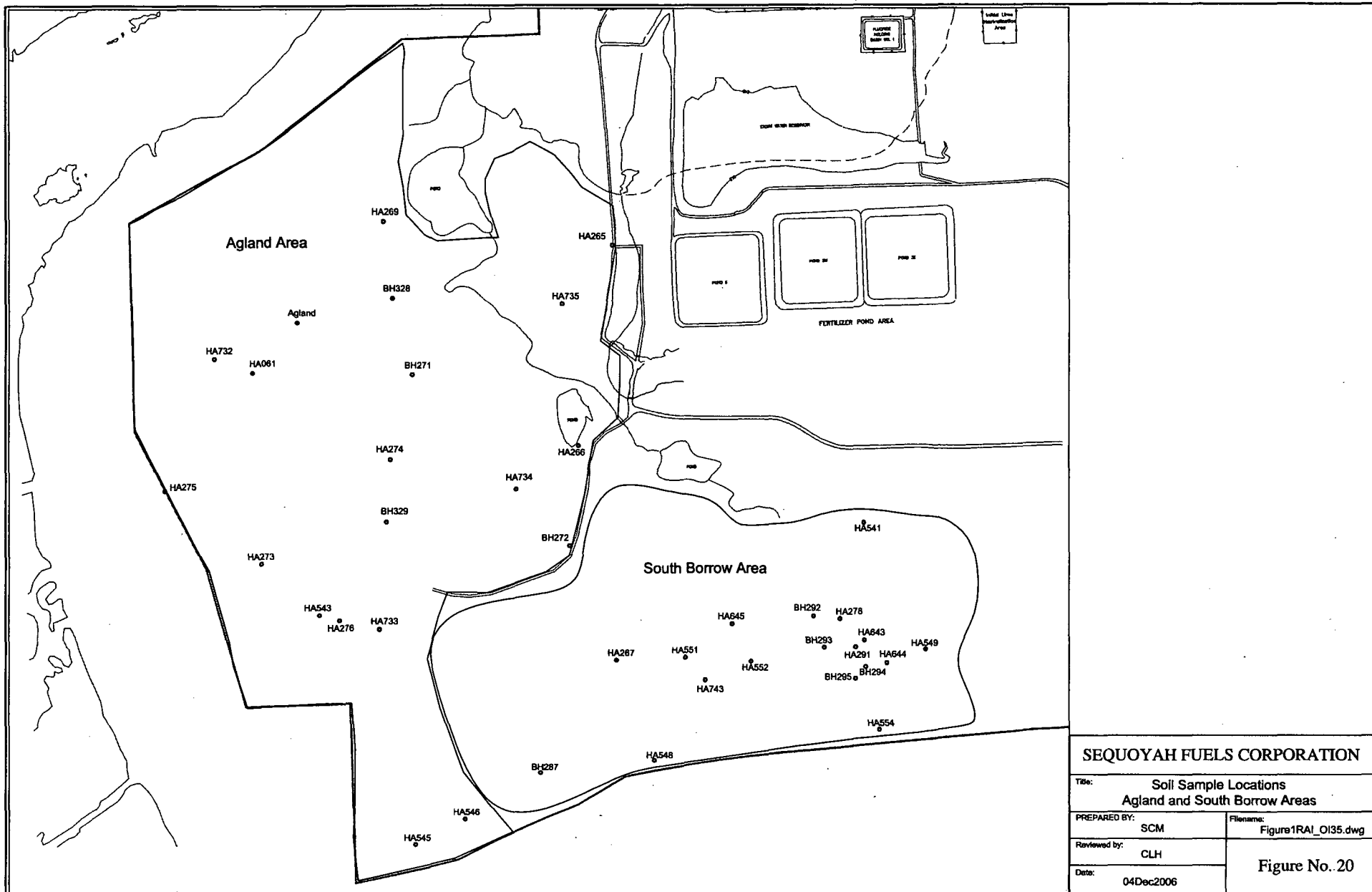
Number of Analyses	66	38	34
Minimum	1.00	0.10	0
Maximum	3.26	3.17	2.19
Average	1.64	0.75	1.12
Standard Deviation	0.43	0.52	0.54

**Table I.3**

**South Borrow Area Soil Sample Analyses**

Location	Depth, ft		Sample Date	Uranium μg/g	Radium-226 pCi/g	Thorium -230 pCi/g
	Bottom	Top				
HA267	0.0	0.5	9/13/1995	1.00		
HA278	0.0	0.5	9/14/1995	1.10		
HA291	0.0	0.5	11/7/1995	1.40	1.30 ± 0.620	0.800 ± 0.700
HA291	0.0	0.5	11/7/1995	3.93	0.867 ± 0.345	0.597 ± 0.271
HA541	0.0	0.5	3/4/2003	1.80		
HA548	0.0	0.5	3/4/2003	2.30		
HA549	0.0	0.5	3/4/2003	2.40		
HA551	0.0	0.5	2/28/2003	1.90	1.32 ± 0.175	1.19 ± 0.314
HA552	0.0	0.5	3/4/2003	2.20		
HA554	0.0	0.5	3/4/2003	2.20		
HA643	0.0	0.5	11/25/2003	3.24		
HA644	0.0	0.5	11/25/2003	3.65		
HA645	0.0	0.5	11/25/2003	2.55		
HA743	0.0	0.5	8/4/2005	2.12	1.27 ± 0.201	

Number of Analyses	14	4	3
Minimum	1.00	0.87	0.60
Maximum	3.93	1.32	1.19
Average	2.27	1.19	0.86
Standard Deviation	0.87	0.22	0.30



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Title: Soil Sample Locations Agland and South Borrow Areas		
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Date: 04Dec2006	Figure No. 20	