ARCADIS

Appendix G

Community Well Questionnaire and
Summarized Community Responses

ARCADIS
Infrastructure · Water · Environment · Buildings

ARCADIS U.S., Inc.
10352 Plaza Americana Drive
Baton Rouge
Louisiana 70816
Tel 225 292 1004
Fax 225 218 9677
www.arcadis-us.com

«Property_Owner»
«Contact_Address»
«CityStateZip»

Subject:
Hattiesburg Water-Well Survey – Hercules Incorporated
Hattiesburg Facility
Hattiesburg, Forrest County, Mississippi

ENVIRONMENT

Your Property:
«Parcel_ID»; «Property_Address»

Date:
xx xxxx 2011

Contact:
Craig Derouen

Extension:
238

Email:
craig.derouen@arcadis-us.com

Our ref:
LA002933.0003.00001
2933.3/C/2/jk

Dear Property Owner or Occupant:

ARCADIS U.S., Inc. (ARCADIS) is conducting an investigation on behalf of Hercules Incorporated (Hercules) and with the support of the Mobile Bouie Neighborhood Association, the North Main Historic Neighborhood Association and the City of Hattiesburg. The U. S. Environmental Protection Agency requested Hercules to find all wells within a half-mile radius ofthe Hercules facility, whether currently in use or not. This includes wells used for drinking water, irrigation, industrial supply, heat pumps or some other use.

ARCADIS is sending this letter to you because we believe your property is located within the half-mile radius of the former Hercules plant. To enable us to complete an accurate list, please respond to the questions and return the postcard within 10 days. By returning this survey with as much detail as you can provide, you are helping an important project to benefit your community. If you have any questions regarding this survey, please contact me by telephone at 1/800-XXX-XXXX.

Sincerely,

ARCADIS U.S., Inc.

Craig A. Derouen, P.E.
Task Manager

CD:jk

Your Property:

«Parcel_ID»;«Proper ty_Address»

ARCADIS

Please answer the following questions by placing an "X" in Yes or No box.

1. Is a water well installed on your property for drinking, irrigation or other purposes? Yes ☐ No ☐

   Well Type: Irrigation ☐ Drinking Water (Domestic) ☐ Industrial Water Supply ☐ Agricultural ☐ Public Supply ☐ Other _____

   Well Details: Year Installed: _____ Diameter: _____ Depth: _____ Pump Type: _____

2. If YES to #1: Is the water well still in use? If not, please explain. Yes ☐ No ☐

   _____

3. Are you obtaining your drinking water from a municipal or private source (i.e., from the city or village)? Yes ☐ No ☐

4. Are you aware of any water wells in the area other than any that may be on your property? If yes, please explain. Yes ☐ No ☐ Comments: _____

   _____

5. Are you aware of any environmental issues that may be on your property? If yes, please explain. Yes ☐ No ☐ Comments: _____

   _____

Signature of property owner/occupant: _____ Date: _____

Please Print Name: _____

ARCADIS

No.	Date Received	Date Postcard Signed	Parcel No.	Lanmments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
1	8/4/11	8/2/11	2-024P-32-015.00	J	Y	ZEON Chemicals and Hercules has probably contaminated my land.
2	8/4/11	8/2/2011	2-028H-05015.00	T	N	
3	8/4/11	8/2/2011	2-028H-05014.00	T	N	
4	8/4/11	8/2/2011	2-029C-04-159.00	Fre	N	
5	8/4/11	8/2/2011	2-024P-32-007.00	Jc	N	
6	8/4/11	8/2/2011	2-024P-32-008.00	Jc	N	
7	8/4/11	8/2/2011	2-029E-04-140.00	Ji	Y	Tree's that won't produce fruits or nuts. Spardioc episodes of dirty drinking water kitchen/bath.
8	8/4/11	8/2/2011	2-029E-04-162.00	Bobbice of the erty.	Blank	
9	8/4/11	8/2/2011	2-028B-05-028.00	Mic	N	
10	8/4/11	8/2/2011	2-028B-05-025.00	Mic	N	
11	8/4/11	8/2/2011	2-028B-05-030.00	Mic	N	
12	8/4/11	blank	2-028B-05-029.00		Blank	
13	8/4/11	8/2/2011	2-029D-04-027.00	G	N	
14	8/5/11	8/3/2011	2-029K-09-187.00		N	
15	8/5/11	8/2/2011	2-029C-04-114.00	Le	Blank	
16	8/5/11	8/2/2011	2-029E-04-065.00	Ric	N	
17	8/5/11	8/3/2011	2-029F-04-093.00	H (Sands	N	
18	8/5/11	BLANK	2-028A-05-050.00	F	Y	
19	8/5/11	8/2/2011	2-029F-04-160.00	Ms.	N	
20	8/5/11	8/3/2011	2-029G-03-438.00	or drinking ??) Allen erly	Y	Sewer Leak - 222 JD Randolph Street
21	8/5/11	8/3/2011	2-029F-04-197.00	San	N	
22	8/5/11	8/3/2011	2-029C-04-101.00	Terry	N	
23	8/5/11	8/3/2011	2-028H-05-139.00	Terry I	N	
24	8/5/11	8/3/2011	2-029F-04-271.00		Y	BLANK
25	8/5/11	8/3/2011	2-028A-05-098.00	Ja	N	
26	8/5/11	8/3/2011	2-028H-05-259.00	B	N	
27	8/5/11	8/3/2011	2-029C-04-071.00	Patr	N	
28	8/5/11	8/3/2011	2-029C-04-017.00	Cha	N	
29	8/5/11	8/2/2011	2-029L-09-116.00	Earn (E.S. W	N	
30	8/5/11	8/2/2011	2-029K-09-101.00	D	N	
31	8/5/11	8/2/2011	2-028I-08-074.00	ng may be ring at 410	N	
32	8/5/11	8/4/2011	2-028H-05-158.00	Vo	N	
33	8/5/11	8/2/2011	2-029L-09-068.00	K	N	
34	8/5/11	8/3/2011	2-028B-05-010.00	Ja	N	
35	8/5/11	8/3/2011	2-029B-03-130.00	A	Y	Chemical that came from Hercules not sure.

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No.	Date Received	Date Postcard Signed	Parcel No.	Lanmments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
36	8/5/11	8/1/2011	2-028H-05-146.00	Fa	Blank	Not sure.
37	8/5/11	8/2/2011	2-029F-04-078.00	Terr	N	
38	8/5/11	8/3/2011	2-029C-04-060.00	France	N	Estate of Thomas E. Cranford.
39	8/5/11	8/3/2011	2-028H-05-157.00	Li	N	I find it hard to grow plants & flowers in my garden. I was thanking if I should have my soil tested.
40	8/5/11	8/2/2011	2-029F-04-291.00	Jose	N	
41	8/5/11	8/2/2011	2-023M-33-004.00	Clai a Casico	Y	Creek coming by property comes from Hercules, ditch runs thru property from Hercules.
42	8/5/11	8/3/2011	2-029C-04-158.01	Don Rd.	N	
43	8/5/11	8/2/2011	2-029D-04-012.00	Clai a Casico	Y	1841 Lakeview (our house) creek from Hercules running by property: 190 Lakeview ditch from across by Hercules runs thru yard.
44	8/5/11	8/2/2011	2-029D-04-013.00	Maa Casico	Y	Creek running by (from Hercules and ditch thru yard coming from Hercules.
45	8/5/11	8/2/2011	2-023M-33-003.00	Clai a Casico	Y	Creek running by property from Hercules ditch runs thru property (comes from Hercules.
46	8/5/11	8/3/2011	2-029F-04-033.00	Sh	Y	Mold and mildew smell of air. I've lived here 23 yrs. Never had Bronchitis after a few years here.
47	8/5/11	8/2/2011	2-024P-32-018.00	Dwi	N	
48	8/5/11	8/3/2011	2-029G-03-302.00	Wil	N	
49	8/5/11		2-029L-09-119.00	M		To my knowledge we do not have any wells in that area. (Stafford Construction Co., Inc 601-264-0878.
50	8/5/11		2-029E-04-024.00	M		To my knowledge we do not have any wells in that area. (Stafford Construction Co., Inc 601-264-0878.
51	8/5/11	8/2/2011	2-029K-09-195.00	C	N	
52	8/5/11	8/2/2011	2-029D-04-029.00	Ma	N	
53	8/5/11	8/3/2011	2-029K-09-010.00	M	N	
54	8/5/11	8/2/2011	2-029F-04-022.00	Ch	N	
55	8/5/11	8/3/2011	2-028G-05-003.00	Mrs. M	Blank	
56	8/5/11	8/2/2011	2-029F-04-268.00		N	
57	8/5/11	7/20/2011	2-028A-05-069.00	St	N	
58	8/5/11	8/3/2011	2-028G-05-009.00	Mrs. M	Blank	
59	8/5/11	8/4/2011	2-029F-04-269.00		N	
60	8/5/11	8/3/2011	2-029F-04-296.00	Frec	N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Landowners	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
61	8/5/11	8/1/2011	2-029F-04-305.00	Stev	N	
62	8/5/11	8/2/2011	2-028A-05-109.00	Alexan Ros	N	
63	8/5/11	8/2/2011	2-029L-09-084.00	Ma	Blank	
64	8/5/11	8/3/2011	2-028G-05-004.01	Mrs. Ma	Blank	
65	8/5/11	8/3/2011	2-028G-05-007.00	Mrs. Ma	Blank	
66	8/5/11	8/3/2011	2-028G-05-006.00	Mrs. Ma	Blank	
67	8/5/11	8/2/2011	2-028H-05-042.00	Alic	N	
68	8/5/11	8/2/2011	2-029K-09-055.00	Karl H. I	N	
69	8/5/11	8/2/2011	2-028H-05-125.00	Karl H. I	N	
70	8/5/11	8/3/2011	2-029F-04-284.00	St	N	
71	8/5/11	8/2/2011	2-029L-09-025.00	Dr. Linda E.D. Drea	N	
72	8/5/11	Blank	2-028H-05-242.00	Ann	N	
73	8/5/11	8/3/2011	2-029F-04-315.00	Anita	N	
74	8/5/11	8/2/2011	2-029C-04-118.00	M	Blank	
75	8/5/11	8/2/2011	2-029F-04-195.00	Lula	N	
76	8/5/11	Blank	2-029B-03-142.00	Me	N	
77	8/5/11	8/3/2011	2-028B-05-011.00	Jack	N	
78	8/5/11	8/3/2011	2-023N-33.007.00	Franc	N	Estate of Thomas E. Cranford.
79	8/5/11	8/3/2011	2-023M-33-015.00	Frances	N	Estate of Thomas E. Cranford.
80	8/5/11	8/3/2011	2-023N-33-005.00	Frances	N	Estate of Thomas E. Cranford.
81	8/5/11	8/2/2011	2-028A-05-072.00	Jes	N	
82	8/5/11	8/1/2011	2-029L-09-107.00	Jani	N	
83	8/5/11	Blank	2-028A-05-049.00	Pa	Blank	Not aware of any other wells on property.
84	8/5/11	8/3/2011	2-023N-33-006.00	Frances	N	Estate of Thomas E. Cranford.
85	8/5/11	8/2/2011	2-028A-05-002.00	Micha Habita	N	
86	8/5/11	8/3/2011	2-028B-05-148.00	Jack	N	
87	8/5/11	8/2/2011	2-029C-04-113.00		N	
88	8/5/11	7/3/2011	2-029C-04-180.00	Ire	N	
89	8/5/11	8/1/2011	2-028B-05-118.00	Kenneth	N	
90	8/5/11	8/3/2011	2-028G-05-002.00	Mrs. Mar	Blank	
91	8/5/11	8/3/2011	2-029L-09-049.00	Peg	N	
92	8/5/11	8/3/2011	2-029C-04-135.00	Terry	N	
93	8/5/11	8/3/2011	2-029C-04-136.00	Hazel Da	N	
94	8/5/11	8/3/2011	2-029C-04-137.00	Terry D Haz	N	
95	8/5/11	8/2/2011	2-028A-05-091.00	Ca	N	
96	8/5/11	8/2/2011	2-029B-03-079.00	Ora	N	
97	8/5/11	8/2/2011	2-029L-09-041.00	Del	Blank	
98	8/5/11	8/2/2011	2-028H-05-004.00	A.E.	N	
99	8/5/11	8/2/2011	2-028H-05-006.00	A.E.	N	
100	8/5/11	8/3/2011	2-029B-03-148.00	Alic	Blank	Not really sure haven't been tested yet.
101	8/5/11	8/2/2011	2-029B-03-081.00	Ora	N	
102	8/5/11	8/2/2011	2-029K-09-064.00	Ky	N	

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103	8/5/11	8/3/2011	2-029A-05-090.00	Sa	N	
104	8/5/11	8/3/2011	2-029C-04-031.00	Lora &	N	
105	8/8/11	8/2/2011	2-029E-04-025.00	Judy	N	
106	8/8/11	8/5/2011	2-028H-05-123.00	Debo	N	
107	8/8/11	8/5/2011	2-029K-09-032.00	Lin	N	
108	8/8/11	8/5/2011	2-029F-04-222.00	Willia Co	Y	I am aware of rumors.
109	8/8/11	7/6/2011	2-029F-04-172.00	C d when ucet.	N	
110	8/8/11	8/5/2011	2-028H-05-058.00	Ge	N	My father worked at Hercules.
111	8/8/11	8/4/2011	2-029E-04-063.00	Nancy A	N	
112	8/8/11	8/2/2011	2-029K-09-061.00	Rob	Y	Water plants grass.
113	8/8/11	8/4/2011	2-028H-05-018.00	B	Blank	Back yard smells like raw sewage.
114	8/8/11	8/4/2011	2-028H-05-020.00	B	Y	City ownes ditch that runs thru my property they do not keep up.
115	8/8/11	7/5/2011	2-029C-04-208.00	E tower on next door.	N	Some people in the community have died form lung problems.
116	8/8/11	8/3/2011	2-028H-05-096.00	Bre	N	There have always been questions about the water system from Hercules Inc.
117	8/8/11	8/4/2011	2-028A-05-095.00	Ri	Y	Erodsion
118	8/8/11	8/4/2011	2-029B-03-151.00	Fl	Y	Hercules Plant water in runn in my back year foms.
119	8/8/11	8/2/2011	2-029F-04-003.00	Mar	Y	City sewer station pump, water turn off value from a mell train tracks.
120	8/8/11	8/3/2011	2-029K-09-007.00	Rebec	Y	I believe chemical in the soil have prevented growth of my fruit trees and garden due to Hercules contamination.
121	8/8/11	8/3/2011	2-029K-09-001.00	Rebec	Y	I believe chemical in the soil have prevented growth of my fruit trees and garden due to Hercules contamination.
122	8/8/11	8/4/2011	2-029B-03-140.00	Ma	N	Possible contamination from ditch drainage running thru property.
123	8/8/11	8/2/2011	2-028G-05-005.00	Robei s a vacant	N	
124	8/8/11	8/3/2011	2-028A-05-106.00		Blank	No sure, there is a stream behind my house. Water stands there.
125	8/8/11	8/5/2011	2-029E-04-082.00	Mar L	Blank	Lived close to Hercules for most of my life. Not certain of anything
126	8/8/11	8/3/2011	2-029G-03-611.00	Rebec	N	I believe chemical in the soil have prevented growth of my fruit trees and garden due to Hercules contamination.
127	8/8/11	8/3/2011	2-029F-04-058.00	Rebec	N	I believe chemical in the soil have prevented growth of my fruit trees and garden due to Hercules contamination.

No.	Date Received	Date Postcard Signed	Parcel No.	Landmments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
128	8/8/11	8/3/2011	2-029K-09.002.00	Rebec	N	I believe chemical in the soil have prevented growth of my fruit trees and garden due to Hercules contamination.
129	8/8/11	8/4/2011	2-029B-03-139.00	Mi	Y	Possible contamination from ditch drainage running thru property.
130	8/8/11	8/4/2011	2-029G-03-311.00	ı two sides Doently been s total).	N	
131	8/8/11	8/5/2011	2-028A-05-012.00	Eloi: wells.	N	Smell.
132	8/8/11	8/5/2011	2-028A-05-028.00	Albe	N	Smell.
133	8/8/11	8/5/2011	2-028A-05-027.00	Albe	N	Smell.
134	8/8/11	8/3/2011	2-028H-05-013.01	Dawsc	N	Not aware of any outstanding environmental issues related to Hercules Zeon Chemicals Plant activities.
135	8/8/11	8/5/2011	2-029L-09-054.00	Sta	Y	My frith trac will not grow tomato plants. Will no make anything.
136	8/8/11	8/5/2011	2-029L-09-050.00	Willia Cor	Y	I am aware of rumors.
137	8/8/11	8/4/2011	2-029K-09-186.00	Eric	Y	Occasionally my water comes out an orange, rusty color it until it clears we can't bathe or drink the water.
138	8/8/11	8/3/2011	2-029F-04-176.00	Ba	N	Sometimes water appears dirty or brownish looking.
139	8/8/11	8/3/2011	2-029F-04-175.00	Ba	N	Sometimes water appears dirty or brownish looking.
140	8/8/11	8/4/2011	2-028H-05-253.00	Quincy	N	We have a garden.
141	8/8/11	8/4/2011	2-029E-04-049.00	Glynier.	N	
142	8/8/11	8/6/2011	2-029K-09-049.00	Ches	Y	Air polution from Hercules adolus the chemicals under ground.
143	8/8/11	8/4/2011	2-029K-09-103.00	Ro	Y	When it rain, the ditch appears to have a greasy apperance.
144	8/8/11	8/3/2011	2-029F-04-174.00	Li	N	Sometimes water appears dirty/brownish looking.
145	8/8/11	8/4/2011	2-029K-09-046.00	Rob	Y	Water plants grass.
146	8/8/11	8/4/2011	2-029K-09-062.00	Rob	Y	Water plants grass.
147	8/8/11	8/5/2011	2-028H-05-258.00	Brei	N	
148	8/8/11	8/6/2011	2-029C-04-027.00	Gl	N	
149	8/8/11	8/6/2011	2-029D-04-019.00	Ke	N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Landnments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
150	8/8/11	8/4/2011	2-029K-09-170.00	M	N	
151	8/8/11	Blank	2-028H-05-007.00	Ja	N	
152	8/8/11	8/4/2011	2-029F-04-094.00	Li	N	
153	8/8/11	8/3/2011	2-029K-09-189.00	Cy	N	
154	8/8/11	8/4/2011	2-028B-05-113.00	(	N	
155	8/8/11	Blank	2-028B-05-122.00	H	Blank	
156	8/8/11	8/2/2011	2-028H-05-069.00	Jo	N	
157	8/8/11	8/3/2011	2-029K-09-044.00	J	N	
158	8/8/11	8/5/2011	2-029L-122.00	Ella	N	
159	8/8/11	Blank	2-029F-04-113.00		N	
160	8/8/11	8/5/2011	2-028H-05-283.00	E	N	
161	8/8/11	8/4/2011	2-028H-05-079.00	Nancy A	N	
162	8/8/11	8/4/2011	2-028B-05-117.00	Frankl	N	
163	8/8/11	8/4/2011	2-029E-04-034.00	Nancy A	N	
164	8/8/11	8/4/2011	2-029E-04-042.00	Nancy A	N	
165	8/8/11	8/4/2011	2-028H-05-108.00	Nancy A	N	
166	8/8/11	8/4/2011	2-028H-05-263.00	Nancy A	N	
167	8/8/11	8/3/2011	2-029C-04-008.00	D	N	
168	8/8/11	8/5/2011	2-028H-05-112.00	Dudle	N	
169	8/8/11	8/4/2011	2-029E-04-089.00	Paul	N	
170	8/8/11	8/5/2011	2-028H-05-110.00	Dudle	N	
171	8/8/11	8/4/2011	2-029E-04-057.00	Eric	N	
172	8/8/11	8/3/2011	2-028B-05-139.00	Ma	N	
173	8/8/11	Blank	2-028H-05-026.00	E	Blank	
174	8/8/11	8/3/2011	2-029E-04-111.00	Je	N	
175	8/8/11	8/3/2011	2-029E-04-109.00	Je	Blank	
176	8/8/11	8/5/2011	2-029F-04-133.00	Callie	N	
177	8/8/11	8/5/2011	2-029C-04-015.00	Robe	N	
178	8/8/11	8/2/2011	2-029E-04-059.00		N	
179	8/8/11	8/4/2011	2-029F-04-086.00	Stella	N	
180	8/8/11	8/2/2011	2-028B-05-014.00	Robe	N	
181	8/8/11	8/4/2011	2-028A-05-006.00	F	N	
182	8/8/11	8/4/2011	2-028A-05-011.00	F	N	
183	8/8/11	8/4/2011	2-028A-05-007.00	F	N	
184	8/8/11	7/31/2011	2-029C-04-201.00	Ch	N	
185	8/8/11	8/3/2011	2-029K-09-037.00	L	N	
186	8/8/11	8/2/2011	2-029E-04-073.00	Walte	N	
187	8/8/11	8/4/2011	2-029K-09-129.00	A	N	
188	8/8/11	8/3/2011	2-029L-09-092.00	U	N	
189	8/8/11	8/4/2011	2-029D-04-005.00	Erast	N	
190	8/8/11	8/4/2011	2-029C-04-125.00	F	N	
191	8/8/11	8/3/2011	2-029F-04-289.00	Vick	N	
192	8/8/11	8/3/2011	2-028H-05-161.00	Ta	N	
193	8/8/11	8/3/2011	2-029D-04-009.00	Wa	N	
194	8/8/11	8/2/2011	2-029C-04-148.00	M.	N	
195	8/8/11	8/2/2011	2-028B-05-132.00	Me	N	
196	8/8/11	8/4/2011	2-029D-04-011.00	Erast	N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Landcomments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
197	8/8/11	Blank	2-029D-04-008.00	Erastor	N	
198	8/8/11	8/4/2011	2-029C-04-102.00	Erastor	N	
199	8/8/11	8/4/2011	2-029D-04-007.00	Erastor	N	
200	8/8/11	8/5/2011	2-029K-09-022.00	Willi	N	
201	8/8/11	8/2/2011	2-029E-04-087.00	Geraldi	N	
202	8/8/11	8/3/2011	2-029D-04-039.00	Hatties Go	N	
203	8/8/11	8/3/2011	2-029K-09-012.00	Ror	N	
204	8/8/11	8/4/2011	2-029B-03-077.00	Anthc	N	
205	8/8/11	8/2/2011	2-029F-04-316.00	Sh	N	
206	8/8/11	8/3/2011	2-028B-05-104.00	Teddy D.	N	
207	8/8/11	8/5/2011	2-029B-03-099.00	Lu	Blank	Don't know.
208	8/8/11	8/3/2011	2-029L-09-047.00	Jes	N	
209	8/8/11	7/31/2011	2-029C-04-205.00	Cha	N	
210	8/8/11	8/4/2011	2-028A-05-079.00	Deb	Blank	
211	8/8/11	8/3/2011	2-028A-05-005.00	Hen	N	
212	8/10/11	8/3/2011	2-029F-04-307.00	M	Y	There is sometime water comes from under the house and water in sink is brown color.
213	8/10/11	8/2/2011	2-029F-04-170.00	the street Erashonas one use.	Y	The smell is terrible. Also I was diagnosed with multiple slerosis about 3 yrs ago. I think it has everything to do with my environment. We need water drain to get rid of this water that's left in our yard after it
214	8/10/11	8/8/2011	2-029K-09-169.00	Sanc	Y	Water comes out dirty looking at times, cloudy with particules in it.
215	8/10/11	8/2/2011	2-029F-04-128.00	erty after Debo could be use it.	Blank	There may be because water use to stand on this property. I had to bring in three load of dirt in the front yard alone.
216	8/10/11	7/29/2011	2-024P-32-013.00	Rosez	N	
217	8/10/11	8/7/2011	2-029F-04-274.00	David O	N	
218	8/10/11	8/7/2011	2-029F-04-281.00	[	N	
219	8/10/11	8/8/2011	2-029C-04-134.00	Jerr	N	
220	8/10/11	8/8/2011	2-029C-04-132.00	Jerr	N	
221	8/10/11	8/8/2011	2-029C-04-131.00	Jerr	N	
222	8/10/11	8/8/2011	2-028A-05-061.00	Pam Bo Touc	N	
223	8/10/11	8/6/2011	2-029F-04-240.00	Mt. (Church/R	N	
224	8/10/11	8/2/2011	2-029F-04-300.00	Dorot	N	
225	8/10/11	8/6/2011	2-029K-09-027.00	William T Zion B	N	
226	8/10/11	8/8/2011	2-029C-04-119.00	Jerr	N	
227	8/10/11	Blank	2-028H-05-027.00	Carl	N	
228	8/10/11	8/5/2011	2-028I-08-008.00	Carolin	N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Lanc	nments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
229	8/10/11	8/4/2011	2-029F-04-169.00	Des		Blank	unknown
230	8/10/11	8/6/2011	2-029K-09-041.00	William Zion		N	
231	8/10/11	8/7/2011	2-028H-05-094.00	M		N	
232	8/10/11	8/6/2011	2-028A-05-029.00	Verno		N	
233	8/10/11	8/6/2011	2-029K-09-026.00	William Zion		N	
234	8/10/11	8/3/2011	2-029E-04-052.00	Lillian		N	
235	8/10/11	8/8/2011	2-028H-05-164.00	C		N	
236	8/10/11	8/8/2011	2-028A-05-033.00	J		N	
237	8/10/11	8/3/2011	2-029C-04-165.00	D	vidence of	N	
238	8/10/11	8/2/2011	2-029F-04-266.00	J		Blank	
239	8/10/11	8/5/2011	2-029E-04-131.00	S		N	
240	8/10/11	8/6/2011	2-029K-09-120.00	Bra		N	
241	8/10/11	8/4/2011	2-028G-05-035.00	Elb		N	
242	8/10/11	8/8/2011	2-029C-04-129.00	Je		N	
243	8/10/11	8/8/2011	2-029K-09-025.00	William Zion		N	
244	8/10/11	8/8/2011	2-029K-09-132.00	Willie		N	
245	8/10/11	8/3/2011	2-029K-09-184.00	Sab		N	
246	8/10/11	8/7/2011	2-028B-05-012.00	D		N	
247	8/10/11	8/7/2011	2-029L-09-109.00	B		N	
248	8/10/11	8/8/2011	2-029C-04-130.00	Je		N	
249	8/10/11	8/8/2011	2-029C-04-122.00	Je		N	
250	8/10/11	8/3/2011	2-029C-04-166.00	D	vidence of	N	
251	8/10/11	8/7/2011	2-028B-05-013.00	Will		N	
252	8/10/11	8/5/2011	2-028A-05-115.00	Ga		N	
253	8/10/11	8/8/2011	2-028H-05-041.00	Luther		N	
254	8/10/11	8/4/2011	2-028H-05-154.00	P		N	
255	8/11/11	8/9/2011	2-023M-33-013.00	Mich		Blank	Unaware at this time.
256	8/11/11	8/9/2011	2-028A-05-024.00	E		N	
257	8/11/11	8/9/2011	2-029B-03-101.00	Mi		N	
258	8/11/11	8/8/2011	2-029B-03-102.00	Ro		N	
259	8/11/11	8/8/2011	2-029B-03-146.00			N	
260	8/11/11	8/9/2011	2-028B-05-138.00	Larry J		N	
261	8/11/11	8/8/2011	2-029C-04-152.00	David exec Ch		N	Lost sale to potential buyer because buyers lendor wanted a soil survey and buyer wouldn't pay for it.
262	8/11/11	8/9/2011	2-029C-04-153.00	E		N	
263	8/11/11	8/4/2011	2-029E-04-013.00	Sa		Blank	
264	8/11/11	8/4/2011	2-029E-04-026.00	C. V		N	
265	8/11/11	8/8/2011	2-029E-04-114.00	J		N	
266	8/11/11	8/8/2011	2-029E-04-115.00	J		N	
267	8/11/11	8/8/2011	2-029E-04-116.00	J		N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Lanc nments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
268	8/11/11	8/8/2011	2-029E-04-117.00	J	N	
269	8/11/11	8/9/2011	2-029F-04-031.00	M	Y	Water taste funny and different color.
270	8/11/11	8/9/2011	2-029F-04-032.00	M	Y	Water taste funny and different color.
271	8/11/11	8/8/2011	2-029F-04-144.00	David exec Ch	N	
272	8/11/11	7/31/2011	2-029F-04-212.00	Ve	Blank	The report on T.V. about living near Hercules.
273	8/11/11	8/8/2011	2-029F-04-264.00	De	Y	Grass stay brown and nald spots in the yard. I got fertlize and seeds to help more soil dirt. I been sick since I move there with breathing problems.
274	8/11/11	8/7/2011	2-029F-04-303.00	Mary	N	
275	8/11/11	8/8/2011	2-028G-05-028.00	Ja H	N	
276	8/11/11	8/8/2011	2-028G-05-031.00	Warr	N	
277	8/11/11	8/2/2011	2-028H-05-019.00	J	N	
278	8/11/11	8/8/2011	2-028H-05-080.00	Le	N	
279	8/11/11	8/2/2011	2-028H-05-140.00	F	Y	Frequent smell of natural gas.
280	8/11/11	8/2/2011	2-028H-05-207.00	N	N	
281	8/11/11	8/4/2011	2-029K-09-0240.00	E rning of any property.	Blank	I recently purched property at 406 Broad St. I am unaware of any potential hazards or environmental issues.
282	8/11/11	8/9/2011	2-029K-09-047.00	M	Y	Water taste funny and different color.
283	8/11/11	8/8/2011	2-029K-098.00	David exec Ch	N	
284	8/11/11	8/8/2011	2-029L-09-021.00	J	N	
285	8/11/11	8/8/2011	2-029L-09-023.00	J	N	
286	8/12/11	8/10/2011	2-029B-03-153.00	D behind my Hercules.	Y	The contamination that is running from Hercules into the ditch behind my home.
287	8/12/11	8/3/2011	2-029F-04-219.00	Roy Sp	N	I would like for someone to come out and check.
288	8/12/11	8/11/2011	2-029B-03-125.00	G	N	
289	8/12/11	Blank	2-029L-09-070.00		N	
290	8/12/11	8/10/2011	2-028I-08-120.00	Jar	N	
291	8/12/11	8/7/2011	2-028H-05-032.00	Lar	Y	Can not get grass to grow.
292	8/12/11	8/8/2011	2-029C-04-133.00	Je	N	
293	8/15/11	8/11/2011	2-029F-04-049.00	Mary	Y	The old Hercules run off ditch runs across our property.
294	8/15/11	8/6/2011	2-029G-03-313.00	Jo east old property.	N	Phase II study recently completed.

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No.	Date Received	Date Postcard Signed	Parcel No.	Lan[illegible]mments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
295	8/15/11	8/12/2011	2-028A-05-008.00	Ra	Y	Drinking water from faucets turns brown @ every 2-3 wks & lasts @ 1/2 of a day.
296	8/15/11	8/2/2011	2-029F-04-171.00	Alrick	N	
297	8/15/11	8/11/2011	2-029L-09-061.00		N	
298	8/15/11	Blank	2-029C-04-203.00		N	
299	8/15/11	8/8/2011	2-028H-05-049.00	Ste	N	
300	8/15/11	8/12/2011	2-028B-05-120.00	Glori	N	
301	8/15/11	8/2/2011	2-029K-09-234.00	Br	N	
302	8/15/11	8/10/2011	2-028A-05-034.00	Jer	N	
303	8/15/11	8/11/2011	2-029F-04-054.00	C	Blank	Don't know.
304	8/15/11	8/11/2011	2-028B-05-007.00	Ji	N	
305	8/15/11	8/11/2011	2-029L-09-031.00		N	
306	8/15/11	8/2/2011	2-029L-09-114.00	Paulin	N	
307	8/15/11	8/11/2011	2-029L-09-059.00		N	
308	8/15/11	8/11/2011	2-028H-05-099.00	Dai	N	
309	8/15/11	8/8/2011	2-028H-05-044.00	Fu	N	
310	8/15/11	8/11/2011	2-029F-04-002.00	E.	N	
311	8/15/11	8/9/2011	2-028G-05-030.00		N	
312	8/15/11	8/2/2011	2-029F-04-013.00	Br	N	
313	8/15/11	8/2/2011	2-029K-09-233.00	Br	N	
314	8/15/11	8/2/2011	2-029F-04-012.00	Br	N	
315	8/15/11	8/6/2011	2-028B-05-146.00	B	N	
316	8/15/11	8/2/2011	2-029F-04-014.00	Br	N	
317	8/15/11	8/10/2011	2-029L-09-015.00		N	
318	8/15/11	8/10/2011	2-029F-04-261.00	Sco	N	
319	8/15/11	8/11/2010	2-028G-05-027.00		N	
320	8/15/11	8/2/2011	2-029E-04-031.00	[illegible]ental I am Jaket	N	
321	8/15/11	8/11/2011	2-028A-05-017.00	J	N	
322	8/15/11	8/10/2011	2-029D-04-022.00	Cha	N	
323	8/15/11	8/11/2011	2-029B-03-122.00	G	N	
324	8/15/11	8/11/2011	2-029B-03-121.00	G	N	
325	8/15/11	8/11/2011	2-029F-04-103.00	C	N	
326	8/15/11	8/11/2011	2-029B-03-120.00	G	N	
327	8/15/11	8/11/2011	2-029B-03-123.00	G	N	
328	8/15/11	8/11/2011	2-029B-03-124.00	G	N	
329	8/16/11	9/10/2011	2-028A-05-118.00	L	N	
330	8/16/11	8/8/2011	2-028H-05-025.00	Da	Blank	
331	8/17/11	8/9/2011	2-029B-03-195.00	Linda	N	
332	8/17/11	8/9/2011	2-029B-03-189.00	Linda	N	
333	8/17/11	8/14/2011	2-028A-05-114.00	E	Y	Grass wunt grown in certain spots since 2002.
334	8/17/11	8/15/2011	2-028B-05-123.00	L	N	
335	8/17/11	8/15/2011	2-023M-33-011.00		N	
336	8/17/11	8/14/2011	2-029B-03-126.00	K	N	

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No.	Date Received	Date Postcard Signed	Parcel No.	Landoiments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
337	8/17/11	8/9/2011	2-029B-03-187.00	Linda B	N	
338	8/17/11	8/14/2011	2-029B-03-128.00	Ker	N	
339	8/18/11	8/13/2011	2-029F-04-286.00	Raymo	Blank	
340	8/18/11	Blank	2-029D-04-054.00		Blank	
341	8/18/11	8/12/2011	2-023M-33-012.00	Lov	N	
342	8/19/11	8/3/2011	2-029F-04-114.00	Cla	N	
343	8/19/11	8/16/2011	2-029F-04-076.00	Mar	N	
344	8/22/11	8/2/2011	2-028B-05-003.00	Ir	N	
345	8/22/11	8/1/2011	2-029B-03-196.00	Dwight	Blank	Don't know.
346	8/22/11	8/19/2011	2-029E-04-160.00	Teamste	N	
347	8/22/11	8/18/2011	2-029D-04-124.00	Fern	N	
348	8/22/11	8/17/2011	2-029L-09-089.00	Paul M Har	N	
349	8/22/11	8/17/2011	2-029B-03-186.00	Day	N	
350	8/22/11	8/18/2011	2-029C-04-174.00	Ela	N	
351	8/22/11	8/17/2011	2-029B-03-185.00	Day	N	
352	8/22/11	8/17/2011	2-029B-03-184.00	Day	N	
353	8/22/11	8/18/2011	2-029C-04-200.00	Ela	N	
354	8/22/11	8/17/2011	2-029B-03-183.00	Day	N	
355	8/22/11	8/18/2011	2-029C-04-169.00	Ela	N	
356	8/22/11	8/3/2011	2-028H-05-113.00	Rev	N	
357	8/22/11	8/18/2011	2-029C-04-199.00	Ela	N	
358	8/22/11	8/11/2011	2-029K-09-188.00	Ma	Y	Possible soil contamination and water contamination.
359	8/25/11	8/22/2011	2-024P-32-021.00	Edd ad pump 940.	N	
360	8/25/11	8/13/2011	2-029L-09-100.00	Tam	Y	Underground water lines.
361	8/25/11	Blank	2-028H-05-221.00	Sheri	N	As far as I know, this property is undeveloped.
362	8/25/11	8/5/2011	2-029K-09-230.00	Anni	N	
363	8/25/11	Blank	2-028H-05-043.00	Cadn	N	
364	8/25/11	8/22/2011	2-029F-04-294.00	Le	N	
365	8/26/11	Blank	2-028A-05-039.00	Gra	Blank	Cannont get plants or flowers to do good in garden.
366	8/26/11	8/22/2011	2-029L-09-012.00	Willie	N	
367	8/29/11	8/8/2011	2-028B-05-106.00	Mattie L.	N	
368	8/29/11	8/10/2011	2-028H-05-211.00	Ter	Y	Black soot on screens and window sills all my childhood years every morning. Awful smells.
369	8/29/11	Blank	2-028A-05-058.00		N	
370	8/29/11	8/5/2011	2-028H-05-278.00	Pe	Y	Mosquito infestation on street behind Delks Tire.
371	8/29/11	7/31/2011	2-029B-03-194.00	Juanit	N	
372	8/29/11	8/12/2011	2-029F-04-105.00	Gle	N	
373	8/29/11	8/2/2011	2-029G-03-331.00	Andre	N	
374	8/29/11	8/23/2011	2-028H-05-269.00	Sar	Blank	

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No.	Date Received	Date Postcard Signed	Parcel No.	Land	nments	Question 5 Aware of Environmental Issues on Your Property? (Y / N)	Questions 5 Comments
375	8/29/11	8/16/2011	2-028H-05-117.00	Terry L		N	
376	8/30/11	8/2/2011	2-028A-05-088.00	E	wells.	N	Uncertain about any issues.
377	8/30/11	8/28/2011	2-028I-08-077.00	J.C		N	Not sure about that.
378	9/1/11	8/28/2011	2-029F-04-034.00	Jessie C		N	
379	9/1/11	8/28/2011	2-029F-04-026.00	L		N	
380	9/1/11	Blank	2-029F-04-027.00	L		N	
381	9/7/11	Blank	2-029E-04-081.00	J. F		N	
382	9/7/11	8/26/2011	2-28H-05-274.00	Be		N	
383	9/8/11	9/2/2011	2-028G-05-012.00	Jimr		N	
384	9/9/11	Blank	2-028H-05-256.00	Rob		Blank	
385	9/9/11	8/11/2011	2-028A-05-107.00	Tiff		N	
386	9/9/11	9/7/2011	2-029C-04-041.00	Ja		N	
387	9/9/11	Blank	2-029F-04-186.00	Y		N	
388	9/9/11	8/5/2011	2-029C-04-163.00	Ste		Blank	
389	9/12/11	9/5/2011	2-029K-09-236.00			N	

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Appendix H

Well Owner/Operator Interview Form

Water Well Survey
Hercules Facility
USEPA RCRA 3013(a) Administrative Order
Hattiesburg, Mississippi

Well Survey: Project Overview
An initial evaluation of public records has already been performed as described above to identify public and private drinking water wells within the search radii specified in the Order. Site records indicated that historical well surveys including the 1993 B&V Waste Science and Technology Corporation report (B&V 1993) have also been performed and five municipal suppliers of potable water having wells within 4 miles of the Site existed at that time.

Initial response actions performed by Hercules shortly after receiving the AO included performing a public records search of registered wells that exist within a 4-mile radius of the Site. This initial well inventory identified a total of 806 well records within the search radius. The well inventory search radius was refined to show only the registered wells that exist on or within a 0.5 mile radius of the Site and 20 wells exist were identified within a 0.5-mile radius of the Site. However, there may be other wells within this radius that are not listed in public records. Further investigation into the existence of wells in the area will be performed and information collected from individual well owners will be recorded on the attached survey form.

Hercules will perform a neighborhood survey of residents and businesses located within a 0.5-mile radius of the Site by distributing a questionnaire to collect information on the presence and use of public and private wells. The survey will be further supported by performing a windshield survey of properties within the 0.5-mile radius to look for signs typically associated with private water well use (staining on structures and sidewalks, small enclosures or well houses, etc.). Well verification may be performed using a door-to-door follow-up survey to further support either a questionable windshield survey observation or a response from the questionnaire that requires clarification.

Hercules will pursue access to properties where wells exist within the 0.5-mile radius and where sampling is advised to conform to requirements of the Administrative Order. Access agreements will be presented to each well owner for review and approval. The sampling event will be scheduled with the well owner once the access agreement is signed.

The sampling team will perform a short interview with the owner during the sampling event to ascertain information regarding the well and water use at the property. Interviews will be conducted with the owners (or their current tenants) using the attached form to record specific information on the well and each form will be added to the data record for the investigation.

Hercules Facility Water Well Survey

This information is being collected for research purposes and to evaluate if testing of groundwater samples from an identified well is recommended. The results of this survey will be reported only in anonymous summary form, and individual surveys will not become part of public record. Thank you for taking time to help us compile this important information.

We realize you may not have the information available to answer all of these questions.
Please answer whatever questions you can.
If you have your well records, these will be helpful for answering the questions below

PLEASE CHECK (√) OR PROVIDE YOUR MOST APPROPRIATE RESPONSE FOR EACH QUESTION YOU CAN ANSWER.

A survey technician will collect information from you during a brief visit to gain information on the well constructed on your property. If you choose to complete this survey and mail it to the address provided at the close of the questionnaire, please return your survey using the enclosed pre-addressed, stamped envelope, ***by October 21, 2011.***

Last Name: _____ **First Name:** _____
(optional) *(optional)*
Street Address _____

Town: _____ **Tax map & Parcel Number:** _____

Phone: _____ **e-mail address:** _____

Number of Wells at this Address _____ **Lot size** _____ **acres**
Number of Full-Time Residents _____

Please provide descriptive information (if known) for each well on your property, in the space provided below:

		Well #1	Well #2	Well #3
Use of Well *(check all that apply)*	Residential	☐	☐	☐
	Commercial/Industrial	☐	☐	☐
	Shared Water Supply	☐	☐	☐
	Agricultural	☐	☐	☐
	Irrigation (lawn & garden)	☐	☐	☐
	Irrigation (commercial/farm)	☐	☐	☐
	Out of service *(Why?)*	☐	☐	☐
	Other *(Describe)* _____	☐	☐	☐
Type of Well Construction	Drilled in Bedrock	☐	☐	☐
	Drilled in sand/Gravel	☐	☐	☐
	Driven Point	☐	☐	☐
	Dug	☐	☐	☐
	Other *(Describe)* _____	☐	☐	☐
Total Depth of Well (in feet)				
Depth to Bedrock (in feet)				
Length of Casing Installed in Well (in feet)				
Length of Screened Section or open hole in Well (in feet)				
Well Casing extends above ground (inches)				
Well Yield (in gallons per minute)				
Date the well was drilled (or approximate age of well in years)				
Date well was abandoned (if known)				
Abandonment method (if known)				

What type of residence occupies your property?

☐ Single family house ☐ <2000 ft^2 ☐ 2000 -4000 ft^2 ☐ >4000 ft^2	☐ "Attached house" (shared walls between units) (e.g. Condominium or townhouse)	☐ Mobile home ☐ Apartment

What are the primary activities if the property is non-residential?

☐ Commercial (type of business): _____ ☐ Industrial (type of business): _____	☐ Farm (describe) _____ ☐ Nursery ☐ Livestock ☐ OTHER (describe) _____

WATER QUANTITY ISSUES:

How have you been affected by droughts during the past 10 years?

	Well #1	Well #2	Well #3
No problem	☐	☐	☐
Had to limit household use	☐	☐	☐
Not enough water to irrigate as much as I wanted	☐	☐	☐
Couldn't irrigate at all	☐	☐	☐
Well(s) went completely dry	☐	☐	☐

Have you run out of water during the past five years for reasons other than mechanical pump failure?

Never	☐	☐	☐
Once *(state which year and month)*_____	☐	☐	☐
More than once *(state how often)*_____	☐	☐	☐
Regularly	☐	☐	☐

WATER QUALITY ISSUES:

Do you have a point-of –entry water treatment system in your home or business?

☐ Yes	☐ No

Do you have any of the following color stains in your water fixtures (toilet bowl, etc.)

☐ Green ☐ Rust/brown/orange	☐ Black ☐ Blue	☐ Other (describe)

Are you aware of any seasonal variations in your water quality?

	Well #1	Well #2	Well #3
No seasonal variations	☐	☐	☐
Yes, there have been seasonal variations	☐	☐	☐

Have you tested your water for quality, and were any problems identified?

	Well #1	Well #2	Well #3
Never tested	☐	☐	☐
Yes, I have tested it	☐	☐	☐
Describe any water quality problems identified:			

Are you concerned about the following contaminants affecting your well/s?

☐ MTBE (gasoline)	☐ Bacteria	☐ Nitrates	☐ Fluoride
☐ Road salt	☐ Arsenic	☐ Radon	

Would you be willing to have your water tested at no cost to you (and be willing to share the results)?

☐ Yes	☐ No

Please provide any other comments or questions that you may have regarding the well in the space provided on this form below.

Thank you! Your participation in this survey is greatly appreciated!

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Appendix I

Surface Water Sampling Standard Operating Procedures

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Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Surface Water Sampling**

Effective Date: November 1, 2007 | **Number:** SESDPROC-201-R1

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Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Field Quality Manager.

History	Effective Date
SESDPROC-201-R1, *Surface Water Sampling*, replaces SESDPROC-201-R0. **General** Corrected any typographical, grammatical and/or editorial errors. **Title Page** Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove's title from Acting Chief to Chief. **Section 1.3** Updated information to reflect that the procedure is located on the H: drive of the LAN. Clarified Field Quality Manager (FQM) responsibilities. **Section 1.4** Updated referenced operating procedures due to changes in title names. Alphabetized and revised the referencing style for consistency. Added two references (49 CFR and SESDPROC-206). **Section 1.5.1** Corrected the title of the Safety, Health, and Environmental Management Program Procedures and Policy Manual. **Section 1.5.2, 4th bullet** Added references to the CFR and IATA's Dangerous Goods Regulations. **Section 2.2, 5th bullet** Added reference to SESDPROC-206. **Section 2.5** Updated referenced operating procedures due to changes in title names.	November 1, 2007
SESDPROC-201-R0, *Surface Water Sampling*, Original Issue	February 05, 2007

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Contents

1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting surface water samples for field screening or laboratory analysis.

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling surface water samples in the field. On the occasion that SESD field personnel determine that any of the procedures described in this section are either inappropriate, inadequate or impractical and that another procedure must be used to obtain a surface water sample, the variant procedure will be documented in the field log book, along with a description of the circumstances requiring its use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the H: drive of the SESD local area network. The Field Quality Manager (FQM) is responsible for ensuring the most recent version of the procedure is placed on the H: drive and for maintaining records of review conducted prior to its issuance.

1.4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

SESD Operating Procedure for Control of Records, SESDPROC-002, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Field pH Measurement, SESDPROC-100, Most Recent Version

SESD Operating Procedure for Field Specific Conductance Measurement, SESDPROC-101, Most Recent Version

SESD Operating Procedure for Field Turbidity Measurement, SESDPROC-103, Most Recent Version

SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

SESD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples, SESDPROC-209, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

United States Environmental Protection Agency (US EPA). 1981. "Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples," Memo from David Weitzman, Work Group Chairman, Office of Occupational Health and Safety (PM-273), April 13, 1981.

US EPA. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Analytical Support Branch Laboratory Operations and Quality Assurance Manual. Region 4 SESD, Athens, GA, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when collecting surface water samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines should be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when collecting surface water samples.

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader and stored in a secure place.

2 Special Sampling Considerations

2.1 Volatile Organic Compounds (VOC) Analysis

Surface water samples for VOC analysis must be collected in 40 ml glass vials with Teflon® septa. The vial may be either preserved with concentrated hydrochloric acid or they may be unpreserved. Preserved samples have a two week holding time, whereas, unpreserved samples have only a seven day holding time. In the great majority of cases, the preserved vials are used to take advantage of the extended holding time. In some situations, however, it may be necessary to use the unpreserved vials. For example, if the surface water sample contains a high concentration of dissolved calcium carbonate, there may be an effervescent reaction between the hydrochloric acid and the water, producing large numbers of fine bubbles. This will render the sample unacceptable. In this case, unpreserved vials should be used and arrangements must be confirmed with the laboratory to ensure that they can accept the unpreserved vials and meet the shorter sample holding times.

The samples should be collected with as little agitation or disturbance as possible. The vial should be filled so that there is a reverse or convex meniscus at the top of the vial and absolutely no bubbles or headspace should be present in the vial after it is capped. After the cap is securely tightened, the vial should be inverted and tapped on the palm of one hand to see if any undetected bubbles are dislodged. If a bubble or bubbles are present, the vial should be topped off using a minimal amount of sample to re-establish the meniscus. Care should be taken not to flush any preservative out of the vial during topping off. If, after topping off and capping the vial, bubbles are still present, a new vial should be obtained and the sample re-collected.

Samples for VOC analysis must be collected using either stainless steel or Teflon® equipment.

2.2 Special Precautions for Trace Contaminant Surface Water Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately.
- All background or control samples shall be collected and placed in separate ice chests or shipping containers. Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area. Samples of waste or highly contaminated media must not be placed in the same ice chest as

environmental (i.e., containing low contaminant levels) or background samples.

- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.
- Samplers must use new, verified and certified-clean disposable or non-disposable equipment cleaned according to procedures contained in SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, or SESD Operating Procedure for Field Cleaning and Decontamination at the FEC, SESDPROC-206, for collection of samples for trace metals or organic compound analyses.

2.3 Sample Handling and Preservation Requirements

1. Surface water samples will typically be collected either by directly filling the container from the surface water body being sampled or by decanting the water from a collection device such as a stainless steel scoop or other device.
2. During sample collection, if transferring the sample from a collection device, make sure that the device does not come in contact with the sample containers.
3. Place the sample into appropriate, labeled containers. Samples collected for VOC analysis must not have any headspace (see Section 2.1, Volatile Organic Compound Analysis). All other sample containers must be filled with an allowance for ullage.
4. All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection. If preserved VOC vials are used, these will be preserved with concentrated hydrochloric acid by ASB personnel prior to departure for the field investigation. All other chemical preservatives required for the remaining suite of analytes will be supplied by ASB personnel and will be added to the samples by SESD field personnel or other authorized persons. The adequacy of sample preservation will be checked after the addition of the preservative for all samples, except for the samples collected for VOC analysis. If it is determined that a sample is not adequately preserved, additional preservative should be added to achieve adequate preservation. Preservation requirements for surface water samples are found in the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM), Most Recent Version.
5. All samples preserved using a pH adjustment (except VOCs) must be checked, using pH strips, to ensure that they were adequately preserved. This is done by pouring a small volume of sample over the strip. Do not place the strip in the sample. Samples requiring reduced temperature storage should be placed on ice immediately.

2.4 Quality Control

If possible, a control sample should be collected from a location not affected by the possible contaminants of concern and submitted with the other samples. In streams or other bodies of moving water, the control sample should be collected upstream of the sampled area. For impounded bodies of water, particularly small lakes or ponds, it may be difficult or inappropriate to obtain an unbiased control from the same body of water from which the samples are collected. In these cases, it may be appropriate to collect a background sample from a similar impoundment located near the sampled body of water if there is a reasonable certainty that the background location has not been impacted. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by pumps, bailers or other sampling equipment.

2.5 Records

Information generated or obtained by SESD personnel will be organized and accounted for in accordance with SESD records management procedures found in SESD Operating Procedure for Control of Records, SESDPROC-002. Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation in accordance with SESD Operating Procedure for Logbooks, SESDPROC-010 and SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005.

3 General Considerations

3.1 General

The surface water sampling techniques and equipment described in the following Sections 4, 5 and 6 of this procedure document are designed to minimize effects on the chemical and physical integrity of the sample. If the procedures in this section are followed, a representative sample of the surface water should be obtained.

3.2 Equipment Selection Considerations

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. Collecting samples in this manner is possible when sampling from accessible locations such as stream banks or by wading or from low platforms, such as small boats or piers. Wading or streamside sampling from banks, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or if the sample must be collected from an elevated platform (bridge, pier, etc.), supplemental sampling equipment must be used.

To collect a surface water sample from a water body or other surface water conveyance, a variety of methods can be used:

- Dipping Using Sample Container
- Scoops
- Peristaltic Pumps
- Submersible Pumps
- Discrete Depth Samplers
- Bailers
- Buckets

Regardless of the method used, precautions should be taken to insure that the sample collected is representative of the water body or conveyance. These methods are discussed in the following sections.

4 Dipping Using Sample Container

A sample may be collected directly into the sample container when the surface water source is accessible by wading or other means. The sampler should face upstream if there is a current and collect the sample without disturbing the bottom sediment. The surface water sample should always be collected prior to the collection of a sediment sample at the same location. The sampler should be careful not to displace the preservative from a pre-preserved sample container, such as the 40-ml VOC vial.

5 Scoops

Stainless steel scoops provide a means of collecting surface water samples from surface water bodies that are too deep to access by wading. They have a limited reach of about eight feet and if samples from distances too far to access using this method are needed, a mobile platform, such as a boat may be required.

Stainless steel scoops are useful for reaching out into a body of water to collect a surface water sample. The scoop may be used directly to collect and transfer a surface water sample to the sample container, or it may be attached to an extension in order to access the selected sampling location.

6 Peristaltic Pumps

Another device that can be effectively used to sample a water column, such as a shallow pond or stream, is the peristaltic pump/vacuum jug system. The peristaltic pump can be used to collect a water sample from any depth if the pump is located at or near the surface water elevation. There is no suction limit for these applications. The use of a metal conduit to which the tubing is attached, allows for the collection of a vertical sample (to about a 25 foot depth) which is representative of the water column. The tubing intake is positioned in the water column at the desired depth by means of the conduit. Using this method, discrete samples may be collected by positioning the tubing intake at one depth or a vertical composite may be collected by moving the tubing intake at a constant rate vertically up and down the water column over the interval to be composited.

Samples for VOC analysis cannot be collected directly from the peristaltic pump discharge or from the vacuum jug. If a peristaltic pump is used for sample collection and VOC analysis is required, the VOC sample must be collected using one of the "soda straw" variations. Ideally, the tubing intake will be placed at the depth from which the sample is to be collected and the pump will be ran for several minutes to fill the tubing with water representative of that interval. After several minutes, the pump is turned off and the tubing string is retrieved. The pump speed is then reduced to a slow pumping rate and the pump direction is reversed. After turning the pump back on, the sample stream is collected into the VOC vials as it is pushed from the tubing by the pump. Care must be taken to prevent any water that was in contact with the silastic pump head tubing from being incorporated into the sample.

7 Discrete Depth Samplers

When discrete samples are desired from a specific depth, and the parameters to be measured do not require a Teflon®-coated sampler, a standard Kemmerer or Van Dorn sampler may be used. The Kemmerer sampler is a brass cylinder with rubber stoppers that leave the ends of the sampler open while being lowered in a vertical position, thus allowing free passage of water through the cylinder. The Van Dorn sampler is plastic and is lowered in a horizontal position. In each case, a messenger is sent down a rope when the sampler is at the designated depth, to cause the stoppers to close the cylinder, which is then raised. Water is removed through a valve to fill respective sample containers. With a rubber tube attached to the valve, dissolved oxygen sample bottles can be properly filled by allowing an overflow of the water being collected. With multiple depth samples, care should be taken not to disturb the bottom sediment, thus biasing the sample.

When metals and organic compounds parameters are of concern, then a double-check valve, stainless steel bailer or Kemmerer sampler should be used to collect the sample.

8 Bailers

Teflon® bailers may also be used for surface water sampling if the study objectives do not necessitate a sample from a discrete interval in the water column. A closed-top bailer with a bottom check-valve is sufficient for many studies. As the bailer is lowered through the water column, water is continually displaced through the bailer until the desired depth is reached, at which point the bailer is retrieved. This technique may not be successful where strong currents are found.

9 Buckets

A plastic bucket can be used to collect samples for measurement of water quality parameters such as pH, temperature, and conductivity. Samples collected for analysis of classical water quality parameters including but not limited to ammonia, nitrate-nitrite, phosphorus, and total organic carbon may also be collected with a bucket. Typically, a bucket is used to collect a sample when the water depth is too great for wading, it is not possible to deploy a boat, or access is not possible (excessive vegetation or steep embankments) and the water column is well mixed. The water body is usually accessed from a bridge. The bucket is normally lowered by rope over the side of the bridge. Upon retrieval, the water is poured into the appropriate sample containers

Caution should be exercised whenever working from a bridge. Appropriate measures should be taken to insure the safety of sampling personnel from traffic hazards.

10 Submersible Pumps

Submersible pumps can be used to collect surface water samples directly into a sample container. The constituents of interest should be taken into consideration when choosing the type of submersible pump and tubing to be used. If trace contaminant sampling of extractable organic compounds and/or inorganic analytes will be conducted, the submersible pump and all of its components should be constructed of inert materials such as stainless steel and Teflon®. The tubing should also be constructed of Teflon®. If re-using the same pump between sample locations, the pump should be decontaminated using SESD Operating Procedure for Field Equipment Cleaning and Decontamination, (SESDPROC-205). New tubing should be used at each sample location.

If the samples will be analyzed for classical parameters such as ammonia, nitrate-nitrite, phosphorus, or total organic carbon, the pump and tubing may be constructed of components other than stainless steel and Teflon®. The same pump and tubing may be re-used at each sampling station after rinsing with deionized water and then purging several volumes of sample water through the pump and tubing prior to filling the sample containers.

Either a grab or composite sample can be collected using a submersible pump. A composite sample can be collected by raising and lowering the pump throughout the water column. If a composite sample is collected, it may be necessary to pump the sample into a compositing vessel for mixing prior to dispensing into the sample containers. If a compositing vessel is required, it should be constructed of materials compatible with the constituents of concern and decontaminated between sample stations according to appropriate procedures, again depending on the constituents of concern.

11 Automatic Samplers

Where unattended sampling is required (e.g., storm-event sampling, time-of-travel studies) an automatic sampler may be used. The automatic sampling device may be used to collect grab samples based on time, in-stream flow or water level or used to collect composite samples as dictated by the study data needs. The automatic sampling device should be calibrated prior to deployment to insure the proper volume is collected. The manufacturer's instruction manual should be consulted for automatic sampler operation.

12 Trace-Level Mercury Sampling

In order to prevent contamination during sample collection, Region 4 has developed this sampling procedure for trace-level mercury analysis (< 1 part per trillion). This procedure is based on EPA Method 1669.

A vacuum chamber assembly is utilized to collect surface water samples for trace-level mercury analyses. The vacuum chamber assembly consists of the following: 1) an airtight acrylic, cylindrical chamber with an o-ring sealed lid to hold the sample bottle, 2) a Teflon® sample tubing that connects to a centered Teflon® compression fitting on top of the chamber. The other end of the tubing passes through a rigid Teflon® pole for stability and has a modified magnetic screen holder at the intake, and a hand vacuum pump. The chamber is designed to hold a 2-liter sample bottle; however, smaller sample containers may be utilized with a spacer inserted into the chamber. A two inch square of 100 □m Nitex® screen is used on the magnetic screen holder at the intake to prevent large pieces of debris from entering the sample. The screen does not prevent the passage of particulate organic matter which is often prevalent in surface water. The vacuum chamber has a second off-center compression fitting with a 4 inch piece of Teflon® tubing inserted in the fitting. A piece of clear Tygon® tubing approximately 18-24 inches long is placed over the small piece of Teflon®. The Teflon® adds stability to the tubing and keeps it from crimping. The Tygon® is attached to the hand pump and the chamber with electrical tape. The Nitex® screen intake is inserted into the water to be sampled and a vacuum is pulled on the chamber by means of the hand vacuum pump, thus drawing a water sample into a sample container placed directly beneath the intake tubing within the chamber.

Teflon® bottles or 300-Series glass bottles with single use Teflon®-lined caps may be used for sample collection. All sample containers used for collection of trace-level mercury water samples must be pre-cleaned in a laboratory as described in EPA Method 1631. Teflon® containers should also be etched on the outside of the bottle with a unique identification number for QA purposes. All bottles for trace-level sampling must be double bagged in re-sealable bags. Water samples collected for total, inorganic, methyl or ethyl mercury analyses are pumped into appropriately cleaned bottles. Preservation should be done in a clean room laboratory that has been specifically prepared for the preparation of trace level samples (positive pressure ventilation, sticky floor mats, etc.). Preservation must occur within 48 hours of sample collection, sooner if possible. Region 4 utilizes laboratory preservation of trace-level mercury samples in order to minimize the potential for contamination, and if split samples are required, they must be split in a trace-level clean room laboratory.

The following quality assurance/quality control (QA/QC) samples are collected in conjunction with low-level mercury samples:

- bottle blanks
- equipment blanks

- air deposition blanks
- trip blanks
- duplicates, and
- splits

A bottle blank is prepared in the lab with reagent-grade water to insure the cleanliness of the bottles prior to use in the field. After decontamination of the Teflon® tubing by pumping and discarding several sample container volumes of reagent-grade water through the tubing, (using the same amount of water used for sample collection in the field) an equipment blank sample is collected into an appropriately pre-cleaned sample container. Equipment blanks are collected at the beginning of each field trip and at the end of each day. The bottle blank and the equipment blank do not go out into the field and are preserved at the end of the day with the regular field samples.

Air deposition blanks are collected to determine if airborne mercury is present at the time of sample collection. The air deposition blanks consist of a pre-cleaned mercury sample container, filled with reagent-grade water by the laboratory that prepared the containers, and is shipped with the containers to the field. The air deposition blank is uncapped using "clean hands"/ "dirty hands" procedures (see below) and set near the sampling location throughout the duration of the mercury sample collection for that particular station. Once the mercury sample is collected, the air deposition blank is recapped and handled and processed with the other mercury samples. One air deposition blank is collected each day by each field crew unless atmospheric conditions or site conditions warrant additional blanks.

Trip blanks are utilized to determine if any contaminants of interest to the study are potentially introduced to the samples during storage and transport to the laboratory. Trip blanks are prepared by the laboratory which supplies the mercury sample containers. The trip blanks consist of cleaned bottles which are filled with reagent-grade water by the laboratory and shipped with the other clean sample containers. A dark plastic bag is placed in each cooler that will hold the trace-level water samples. One trip blank is placed in each trace-level cooler of samples and returned to the laboratory with the ambient trace-level water samples. All trace-level samples should be kept in the dark until they are preserved. The trip blanks are never opened in the field. Trip blanks are preserved in the clean room.

Duplicate samples are discrete samples collected at the same site and time to measure variability of collected samples and to assess sample collection consistency. Sample splits are aliquots of a minimum 500 ml poured from a single ambient sample. They must be split in a trace-level clean room laboratory.

In order to prevent cross contamination in samples analyzed for trace-level mercury in ambient surface waters, clean sampling protocols must be employed throughout the sampling effort. For each sampling event, one sampling team member is designated as "clean hands" and one as "dirty hands" (see below). All operations involving contact

with the sample bottle and transfer of the sample from the sample collection device to the sample bottle are handled by the individual designated as "clean hands". "Dirty hands" is responsible for preparation of the sampling device (except the sample container) and for all other activities that do not involve direct contact with the sample.

Prior to sample collection with the vacuum chamber assembly, the Teflon® line is cleaned at each station by rinsing with ambient water as follows: A 2-liter poly bottle is placed into the chamber and filled half full with ambient water. The bottle is swirled to rinse it and the water is discarded downstream of sampling area. The same 2-liter poly bottle can be used at each station. Additional cleaning measures are not recommended as long as the chamber assembly is only used to collect ambient surface water samples. Detergent washes and acid rinses are not conducted due to potential mercury contamination from these solutions. If applicable, samples for other analyses can be collected in a poly bottle with the vacuum chamber assembly but should be collected before the trace-level sample as an additional means of flushing the sampling line prior to collection of the trace-level samples. It is not necessary to implement the "clean hands"/ "dirty hands" method for collection of non-mercury samples, but latex or vinyl gloves should be worn when any samples are collected.

Following are procedures for cleaning the vacuum chamber tubing and collection of ancillary water quality samples, if applicable:

1. Carefully approach the sampling station from downstream and downwind if possible.

2. While wearing latex or vinyl gloves, place an uncapped 2-liter poly bottle into the chamber and secure the chamber lid by attaching the spring-loaded clamps.

3. Place a new square of 100 µm Nitex® screen in the magnetic screen holder. Place the intake beneath the surface of the water (mid-depth or six inches, which ever is less) and hold firmly in place. Care should be taken not to disturb sediment particles in very shallow waters (< 4 inches deep).

4. Squeeze the hand pump until liquid starts to fill the bottle in the chamber. When the bottle is approximately half full, release the vacuum on the chamber, remove the bottle, swirl the contents and discard the water downstream. Repeat this rinse. If ancillary water quality samples are to be collected, return the 2-liter poly bottle to the chamber and pump the required volume of water to fill the appropriate ancillary sample containers. Remove the 2-liter bottle from the chamber and cap. Fill the ancillary sample bottles upon completion of the mercury sample collection.

Water samples for trace level mercury analyses should be collected immediately after the ancillary water samples have been collected according to the following procedures:

1. "Clean hands" should put on a pair of latex or vinyl gloves, then a pair of shoulder length polyethylene gloves.

2. "Dirty hands" should put on a pair of latex or vinyl gloves, retrieve the double bagged trace level sample bottle from the cooler, and open the outer bag. "Clean hands" should open the inner bag and remove the pre-cleaned Teflon® or glass bottle.

3. "Dirty hands" should open the lid on the chamber. "Clean hands" should place the sample bottle in the chamber, remove the bottle top and place it inside the chamber with the bottle.

4. "Dirty hands" should close and secure the chamber lid and using the hand pump, fill the container. The sample container should be filled to overflowing. "Dirty hands" should then release the vacuum and open the lid on the chamber.

5. "Clean hands" should place the top on the sample bottle, remove it from the chamber and place it in the inner bag and seal the bag. "Dirty hands" should seal the outer bag and place the sample in the black bag in the dark cooler. Only coolers dedicated to storage and transport of trace-level mercury samples should be used.

1.0 OVERVIEW

This policy provides guidance on the proper procedures associated with shallow (less than 3 ft deep) surface water sample collection.

2.0 HEALTH AND SAFETY

The following health and safety policies are applicable to this policy:

- SWP HSP-1.3, "Hazard Communication;"
- SWP HSP-1.11, "Field Readiness Assessment Process;"
- SWP-HSP-2.2, "Lifting and Materials Handling;"
- SWP HSP-3.4, "Personal Protective Equipment;" and
- **SWP HSP-3.13, "Groundwater and Surface Water Sampling."**

The policy in **BOLD** contains specific safety information related to procedures described in this policy.

3.0 PROCEDURE/POLICY

3.1 General Requirements

The following requirements are applicable to the collection of shallow surface water samples:

- Wear personal protective equipment required by the task/project Task Hazard Analysis.
- Sampling equipment and supplies to be used for surface water sampling will be determined during the task/project Field Readiness Assessment.
- All sampling equipment will be decontaminated in accordance with SWP FSP-7.5, "Decontamination Procedures."
- All sampling devices will be constructed from glass, Teflon®, or stainless steel materials.
- Once collected, all surface water samples will be prepared, packaged and shipped in accordance with SWP FSP-3.5, "Preparation of Water Samples for Environmental Analysis."
- All equipment and procedures used to collect surface water samples will be documented in accordance with SWP FSP-7.1, "Field Documentation." Physical parameters and field analysis results should be recorded on the Water Sampling Log (Exhibit 1).

3.2 Shallow Surface Water Sampling Procedure

The following general procedure is applicable to collection of shallow surface water samples:

1. Prepare sample containers and mobilize to the sample location. If wading to the location, approach the sample location from the downstream direction.
2. Facing the upstream direction, open the sample container and gently place the container in the water at a slight angle with the mouth of the container in the elevated position. As good sampling practice, collect the sample in the following order:
   - Volatile organic compounds;
   - Total organic carbon;
   - Extractable organics;
   - Total metals (see note below);
   - Dissolved metals;
   - Cyanide;
   - Sulfate and chloride;
   - Turbidity; and
   - Nitrate and ammonia.
3. Allow the container to fill by letting water flow down the inner wall of the container.
4. Fill container to approximately 90% capacity. For volatile organic compounds (VOCs) fill the vial nearly full and remove from the water. Use the cap of the vial to retrieve additional water and gently pour the water into the vial until the meniscus forms. For all containers containing preservatives, avoid overfilling the container and losing preservative.
5. Promptly cap the container(s), collect additional sample for field test kit analysis in an unpreserved sample bottle or other suitable container.
6. Collect physical parameters in accordance with task/project data quality objectives.

Note: When surface water and sediment samples are being collected at the same location, always collect the surface water samples first.

If the surface water location has good flow but is so shallow that the sample container can not be filled without creating a lot of sediment disturbance, use the following procedures:

1. Using a decontaminated stainless steel spoon/scoop/shovel and dig out a hole in the bottom of the surface water sampling location of sufficient size to allow the container to be safely dipped into the water.
2. Wait a minimum of 24 hours for the area to return to equilibrium before sampling using the procedure above.
3. If rock prevents digging out a location to sample by dipping, use a stainless steel ladle to collect and transfer the sample appropriate container. The sample order should follow the sampling sequence described above.

4.0 REFERENCES AND GUIDANCE

United States Army Corps of Engineers. 2001. Requirements for the Preparation of Sampling and Analysis Plans. EM 200-1-3. February 1, 2001.

United States Environmental Protection Agency. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. United States Environmental Protection Agency Region IV. November, 2001.

Exhibit 1. Example Water Sampling Log

ARCADIS **Water Sampling Log**

Project _____ Project No. _____ Page ____ of ____

Site Location _____ Date _____

Site/Well No. _____ Replicate No. _____ Code No. _____

Weather _____ Sampling Time: Begin _____ End _____

Evacuation Data

MP Elevation (ft) _____

Land Surface Elevation (ft) _____

Sounded Well Depth (ft bmp) _____

Depth to Water (ft bmp) _____

Water-Level Elevation (ft) _____

Water Column in Well (ft) _____

Casing Diameter/Type _____

Gallons in Well _____

Gallons Pumped/Bailed Prior to Sampling _____

Sample Pump Intake Setting (ft bmp) _____

Purge Time begin _____ end _____

Pumping Rate (gpm) _____

Evacuation Method _____

Field Parameters

Color _____

Odor _____

Appearance _____

pH (s.u.) _____

Conductivity (mS/cm) _____

Turbidity (NTU) _____

Temperature (°C) _____

Dissolved Oxygen (mg/L) _____

ORP (mV) _____

TDS (g/L) _____

Alkalinity (mg/L) _____

Ferrous Iron (mg/L) _____

Sulfide (mg/L) _____

Sample Method _____

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel _____

Well Casing Volumes

Gal./Ft.					
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-½" = 0.09	2 ½" = 0.26	3-½" = 0.50	6" = 1.47	

bmp	below measuring point	ml	milliliter	ORP	Oxidation Reduction Potential
°C	Degrees Celsius	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	TDS	Total Dissolved Solids
g/L	Grams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds
mg/L	Milligrams per liter	NTU	Nephelometric Turbidity Units		

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Field Equipment Decontamination

Rev. #: 3

Rev Date: April 26, 2010

Approval Signatures

Prepared by: _____ Date: 4/26/2010
Keith Shepherd

Reviewed by: _____ Date: 4/26/2010
Richard Murphy (Technical Expert)

I. Scope and Application

Equipment decontamination is performed to ensure that sampling equipment that contacts a sample, or monitoring equipment that is brought into contact with environmental media to be sampled, is free from analytes of interest and/or constituents that would interfere with laboratory analysis for analytes of interest. Equipment must be cleaned prior to use for sampling or contact with environmental media to be sampled, and prior to shipment or storage. The effectiveness of the decontamination procedure should be verified by collecting and analyzing equipment blank samples.

The equipment cleaning procedures described herein includes pre-field, in the field, and post-field cleaning of sampling tools which will be conducted at an established equipment decontamination area (EDA) on site (as appropriate). Equipment that may require decontamination at a given site includes: soil sampling tools; groundwater, sediment, and surface-water sampling devices; water testing instruments; down-hole instruments; and other activity-specific sampling equipment. Non-disposable equipment will be cleaned before collecting each sample, between sampling events, and prior to leaving the site. Cleaning procedures for sampling equipment will be monitored by collecting equipment blank samples as specified in the applicable work plan or field sampling plan. Dedicated and/or disposable (not to be re-used) sampling equipment will not require decontamination.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, and site-specific training, as needed. In addition, ARCADIS field sampling personnel will be versed in the relevant SOPs and possess the skills and experience necessary to successfully complete the desired fieldwork. The project HASP and other documents will identify any other training requirements such as site specific safety training or access control requirements.

III. Equipment List

- health and safety equipment, as required in the site Health and Safety Plan (HASP)
- distilled water

- Non-phosphate detergent such as Alconox or, if sampling for phosphorus phosphorus-containing compounds, Luminox (or equivalent).
- tap water
- rinsate collection plastic containers
- DOT-approved waste shipping container(s), as specified in the work plan or field sampling plan (if decontamination waste is to be shipped for disposal)
- brushes
- large heavy-duty garbage bags
- spray bottles
- (Optional) – Isoprophyl alcohol (free of ketones) or methanol
- Ziploc-type bags
- plastic sheeting

IV. Cautions

Rinse equipment thoroughly and allow the equipment to dry before re-use or storage to prevent introducing solvent into sample medium. If manual drying of equipment is required, use clean lint-free material to wipe the equipment dry.

Store decontaminated equipment in a clean, dry environment. Do not store near combustion engine exhausts.

If equipment is damaged to the extent that decontamination is uncertain due to cracks or dents, the equipment should not be used and should be discarded or submitted for repair prior to use for sample collection.

A proper shipping determination will be performed by a DOT-trained individual for cleaning materials shipped by ARCADIS.

V. Health and Safety Considerations

Review the material safety data sheets (MSDS) for the cleaning materials used in decontamination. If solvent is used during decontamination, work in a well-ventilated area and stand upwind while applying solvent to equipment. Apply solvent in a manner that minimizes potential for exposure to workers. Follow health and safety procedures outlined in the HASP.

VI. Procedure

A designated area will be established to clean sampling equipment in the field prior to sample collection. Equipment cleaning areas will be set up within or adjacent to the specific work area, but not at a location exposed to combustion engine exhaust. Detergent solutions will be prepared in clean containers for use in equipment decontamination.

Cleaning Sampling Equipment

1. Wash the equipment/pump with potable water.

2. Wash with detergent solution (Alconox, Liquinox or equivalent) to remove all visible particulate matter and any residual oils or grease.

3. If equipment is very dirty, precleaning with a brush and tap water may be necessary.

4. (Optional) – Flush with isopropyl alcohol (free of ketones) or with methanol. This step is optional but should be considered when sampling in highly impacted media such as non-aqueous phase liquids or if equipment blanks from previous sampling events showed the potential for cross contamination of organics.

5. Rinse with distilled/deionized water.

Decontaminating Submersible Pumps

Submersible pumps may be used during well development, groundwater sampling, or other investigative activities. The pumps will be cleaned and flushed before and between uses. This cleaning process will consist of an external detergent solution wash and tap water rinse, a flush of detergent solution through the pump, followed

by a flush of potable water through the pump. Flushing will be accomplished by using an appropriate container filled with detergent solution and another contained filled with potable water. The pump will run long enough to effectively flush the pump housing and hose (unless new, disposable hose is used). Caution should be exercised to avoid contact with the pump casing and water in the container while the pump is running (do not use metal drums or garbage cans) to avoid electric shock. Disconnect the pump from the power source before handling. The pump and hose should be placed on or in clean polyethylene sheeting to avoid contact with the ground surface.

VII. Waste Management

Equipment decontamination rinsate will be managed in conjunction with all other waste produced during the field sampling effort. Waste management procedures are outlined in the work plan or Waste Management Plan (WMP).

VIII. Data Recording and Management

Equipment cleaning and decontamination will be noted in the field notebook. Information will include the type of equipment cleaned, the decontamination location and any deviations from this SOP. Specific factors that should be noted include solvent used (if any), and source of water.

Any unusual field conditions should be noted if there is potential to impact the efficiency of the decontamination or subsequent sample collection.

An inventory of the solvents brought on site and used and removed from the site will be maintained in the files. Records will be maintained for any solvents used in decontamination, including lot number and expiration date.

Containers with decontamination fluids will be labeled.

IX. Quality Assurance

Equipment blanks should be collected to verify that the decontamination procedures are effective in minimizing potential for cross contamination. The equipment blank is prepared by pouring deionized water over the clean and dry tools and collecting the deionized water into appropriate sample containers. Equipment blanks should be analyzed for the same set of parameters that are performed on the field samples collected with the equipment that was cleaned. Equipment blanks are collected per equipment set, which represents all of the tools needed to collect a specific sample.

X. References

USEPA Region 9, Field Sampling Guidance #1230, Sampling Equipment Decontamination.

USEPA Region 1, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells.

ARCADIS

Appendix J

Sediment Sampling Standard Operating Procedures

COPY

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Sediment Sampling**

Effective Date: September 8, 2010 | **Number:** SESDPROC-200-R2

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Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Document Control Coordinator.

History	Effective Date
SESDPROC-200-R2, *Sediment Sampling*, replaces SESDPROC-200-R1. **Cover Page:** The Enforcement and Investigations Branch Chief was changed from Antonio Quinones to Archie Lee. The FQM was changed from Laura Ackerman to Liza Montalvo. **Revision History:** Changed Field Quality Manager to Document Control Coordinator. **Section 1.2:** Added the following statement: "Mention of trade names or commercial products does not constitute endorsement or recommendation for use." **Section 1.3:** Omitted reference to the H: drive of the LAN. Changed Field Quality Manager to Document Control Coordinator.	September 8, 2010
SESDPROC-200-R1, *Sediment Sampling*, replaces SESDPROC-200-R0. **General** Corrected any typographical, grammatical and/or editorial errors. **Title Page** Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove's title from Acting Chief to Chief. **Section 1.3** Updated information to reflect that the procedure is located on the H: drive of the LAN. Clarified Field Quality Manager (FQM) responsibilities. **Section 1.4** Updated referenced operating procedures due to changes in title names. Alphabetized and revised the referencing style for consistency. **Section 1.5.1** Corrected the title of the Safety, Health, and Environmental Management Program Procedures and Policy Manual.	November 1, 2007

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Section 1.5.2, 4th bullet Added references to the CFR and IATA's Dangerous Goods Regulations. **Section 2.6** Updated referenced operating procedures due to changes in title names.	
SESDPROC-200-R0, *Sediment Sampling*, Original Issue	February 05, 2007

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Contents

1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting sediment samples for field screening or laboratory analysis.

1.2 Scope/Application

The procedures contained in this document are to be used by field investigators when collecting and handling sediment samples in the field. On the occasion that SESD field investigators determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to obtain a sediment sample, the variant procedure will be documented in the field log book, along with a description of the circumstances requiring its use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

SESD Operating Procedure for Control of Records, SESDPROC-004, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-104, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

SESD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples, SESDPROC-209, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

United States Environmental Protection Agency (US EPA). 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Analytical Support Branch Laboratory Operations and Quality Assurance Manual. Region 4 SESD, Athens, GA, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

United States Office of Occupational Health and Safety (US OSHA). 1981. Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples (PM-273), Memo from David Weitzman, Work Group Chairman, US EPA. April 13, 1981.

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when collecting sediment samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines should be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when collecting sediment samples.

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader and stored in a secure place.

2 Special Sampling Considerations

2.1 Sediment Samples for Volatile Organic Compounds Analysis

If samples are to be analyzed for volatile organic compounds (VOCs), they should be collected in a manner that minimizes disturbance of the sample. The sample for VOC analysis should be collected directly from the sample device, if possible, before it is emptied into the pan. It may not be possible to do this with certain types of sediment sampling equipment, such as the Ponar dredge. In cases such as these, the VOC aliquots should be collected from the dredge contents immediately after they have been deposited in the pan and prior to any mixing. The sample shall be placed in the appropriate container (En Core® Sampler or other Method 5035 compatible container) with no headspace. ***Samples for VOC analysis are not homogenized.*** Preservatives may be required for some samples with certain variations of Method 5035. Consult the method description below in Section 2.2, Sediment Sampling (Method 5035) or the principal analytical chemist to determine if preservatives are necessary.

In some cases, the sediment may be soft and not lend itself to collection by plunging En Core® Samplers or syringe samplers into the sample matrix. In these cases, it is appropriate to open the sample device, i.e., the En Core® Sampler barrel or syringe, prior to sample collection, and to carefully place the sediment in the device, filling it fully with the required volume of sample.

2.2 Sediment Sampling (Method 5035)

The following sampling protocol is recommended for site investigators assessing the extent of VOCs in sediments at a project site. Because of the large number of options available, careful coordination between field and laboratory personnel is needed. The specific sampling containers and sampling tools required will depend upon the detection levels and intended data use. Once this information has been established, selection of the appropriate sampling procedure and preservation method best applicable to the investigation can be made.

2.2.1 Equipment

Sediment for VOC analyses may be retrieved using any of the SESD sediment sampling methods described in Sections 3 through 6 of this procedure. Once the sediment has been obtained, the En Core® Sampler, syringes, stainless steel spatula, standard 2-oz. sediment VOC container, or pre-prepared 40 ml vials may be used/required for sub-sampling. The specific sample containers and the sampling tools required will depend upon the data quality objectives established for the site or sampling investigation. The various sub-sampling methods are described below.

2.2.2 Sampling Methodology - Low Concentrations

When the total VOC concentration in the sediment is expected to be less than 200 µg/kg, the samples may be collected directly with the En Core® Sampler or syringe. If using the syringes, the sample must be placed in the sample container (40 ml pre-prepared vial) immediately to reduce volatilization losses. The 40 ml vials should contain 10 ml of organic-free water for an un-preserved sample or approximately 10 ml of organic-free water and a preservative. It is recommended that the 40 ml vials be prepared and weighed by the laboratory (commercial sources are available which supply preserved and tared vials). When sampling directly with the En Core® Sampler, the vial must be immediately capped and locked.

A sediment sample for VOC analysis may also be collected with conventional sampling equipment. A sample collected in this fashion must either be placed in the final sample container (En Core® Sampler or 40 ml pre-prepared vial) immediately or the sample may be immediately placed into an intermediate sample container with no head space. If an intermediate container (usually 2-oz. sediment jar) is used, the sample must be transferred to the final sample container (En Core® Sampler or 40 ml pre-prepared vial) as soon as possible, not to exceed 30 minutes.

NOTE: After collection of the sample into either the En Core® Sampler or other container, the sample must immediately be stored in an ice chest and cooled.

Sediment samples may be prepared for shipping and analysis as follows:

En Core® Sampler - the sample shall be capped, locked, and secured in a plastic bag.

Syringe - Add about 3.7 cc (approximately 5 grams) of sample material to 40-ml pre-prepared containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag. Note: When using the syringes, it is important that no air is allowed to become trapped behind the sample prior to extrusion, as this will adversely affect the sample.

Stainless Steel Laboratory Spatulas - Add between 4.5 and 5.5 grams (approximate) of sample material to 40 ml containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag.

2.2.3 Sampling Methodology - High Concentrations

Based upon the data quality objectives and the detection level requirements, this high level method may also be used. Specifically, the sample may be packed into

a single 2-oz. glass container with a screw cap and septum seal. The sample container must be filled quickly and completely to eliminate head space. Sediments containing high total VOC concentrations may also be collected as described in Section 2.2.2, Sampling Methodology - Low Concentrations, and preserved using 10 ml methanol.

2.2.4 Special Techniques and Considerations for Method 5035

Effervescence

If low concentration samples effervesce from contact with the acid preservative, then either a test for effervescence must be performed prior to sampling, or the investigators must be prepared to collect each sample both preserved or un-preserved as needed, or all samples must be collected unpreserved.

To check for effervescence, collect a test sample and add to a pre-preserved vial. If preservation (acidification) of the sample results in effervescence (rapid formation of bubbles) then preservation by acidification is not acceptable, and the sample must be collected un-preserved.

If effervescence occurs and only pre-preserved sample vials are available, the preservative solution may placed into an appropriate hazardous waste container and the vials triple rinsed with organic-free water. An appropriate amount of organic-free water, equal to the amount of preservative solution, should be placed into the vial. The sample may then be collected as an un-preserved sample. Note that the amount of organic free water placed into the vials will have to be accurately measured.

Sample Size

While this method is an improvement over earlier ones, field investigators must be aware of an inherent limitation. Because of the extremely small sample size, sample representativeness for VOCs may be reduced compared to samples with larger volumes collected for other constituents. The sampling design and objectives of the investigation should take this into consideration.

Holding Times

Sample holding times are specified in the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM), Most Recent Version. Field investigators should note that the holding time for an un-preserved VOC sediment sample is 48 hours. Arrangements should be made to ship the sediment VOC samples to the laboratory by overnight delivery the day they are collected so the laboratory may preserve and/or analyze the sample within 48 hours of collection.

Percent Moisture

Samplers must ensure that the laboratory has sufficient material to determine percent moisture in the VOC sediment sample to correct the analytical results to dry weight. If other analyses requiring percent moisture determination are being performed upon the sample, these results may be used. If not, a separate sample (minimum of 2 oz.) for percent moisture determination will be required.

Safety

Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all required safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials should be opened and closed quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Use protective gloves when handling the methanol vials. Store methanol away from sources of ignition such as extreme heat or open flames. The vials of methanol should be stored in a cooler with ice at all times.

Shipping

Methanol and sodium bisulfate are considered dangerous goods, therefore shipment of samples preserved with these materials by common carrier is regulated by the U.S. Department of Transportation and the International Air Transport Association (IATA). The rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the current edition of the IATA Dangerous Goods Regulations must be followed when shipping methanol and sodium bisulfate. Consult the above documents or the carrier for additional information. Shipment of the quantities of methanol and sodium bisulfate used for sample preservation falls under the exemption for small quantities. A summary of the requirements for shipping samples follows. Refer to the code for a complete review of the requirements.

1. The maximum volume of methanol or sodium bisulfate in a sample container is limited to thirty (30) ml.

2. The sample container must not be full of methanol.

3. The sample container must be stored upright and have the lid held securely in place. Note that the mechanism used to hold the cap in place must be able to be completely removed so weight is not added to the sample container, as specified in Method 5035.

4. Sample containers must be packed in an absorbent material capable of absorbing spills from leaks or breakage of the sample containers.

5. The maximum sample shuttle weight must not exceed 64 pounds.

6 The maximum volume of methanol or sodium bisulfate per shipping container is 500 ml.

7 The shipper must mark the sample shuttle in accordance with shipping dangerous goods in acceptable quantities.

8. The package must not be opened or altered until no longer in commerce.

The following summary table lists the options available for compliance with SW846 Method 5035. The advantages and disadvantages are noted for each option. SESD's goal is to minimize the use of hazardous material (methanol and sodium bisulfate) and minimize the generation of hazardous waste during sample collection.

OPTION	PROCEDURE	ADVANTAGES	DISADVANTAGES
1	Collect 2 – 40 ml vials with ~5 grams of sample and 1 – 2 oz. glass w/septum lid for screening and % moisture	Screening conducted by lab	Presently a 48 hour holding time for unpreserved samples
2	Collect 3 EnCore® Samplers and 1 – 2oz. glass w/septum lid for screening and % moisture	Lab conducts all preservation/preparation procedures	Presently a 48 hour holding time for preparation of samples
3	Collect 2 – 40 ml vials with 5 grams of sample and preserve w/methanol or sodium bisulfate, and 1 – 2 oz. glass w/septum lid for screening and % moisture	High level VOC samples may be composited Longer holding time	Hazardous materials used in field
4	Collect 1 – 2 oz. glass w/septum lid for analysis and % moisture	Lab conducts all preservation/preparation procedures	May have significant VOC loss

2.3 Special Precautions for Trace Contaminant Sediment Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately. All background

samples shall be collected and placed in separate ice chests or shipping containers. Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area if sampling devices are to be reused. Samples of waste or highly contaminated media must not be placed in the same ice chest as environmental (i.e., containing low contaminant levels) or background samples.

- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.
- Samplers must use new, verified and certified-clean disposable or non-disposable equipment cleaned according to procedures contained in SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, or SESD Operating Procedure for Field Cleaning and Decontamination at the FEC, SESDPROC-206, for collection of samples for trace metals or organic compound analyses.

2.4 Sample Homogenization

1. If sub-sampling of the primary sample is to be performed in the laboratory, transfer the entire primary sample directly into an appropriate, labeled sample container(s). Proceed to step 5

2. If sub-sampling the primary sample in the field or compositing multiple primary samples in the field, place the sample into a glass or stainless steel homogenization container and mix thoroughly. Each aliquot of a composite sample should be of the same volume.

3. All sediment samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media. ***Samples for VOC analysis are not homogenized.*** The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

    - The material in the sample pan should be divided into quarters and each quarter should be mixed individually.
    - Two quarters should then be mixed to form halves.
    - The two halves should be mixed to form a homogenous matrix.

    This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over.

3. Place the sample into an appropriate, labeled container(s) using the alternate shoveling method and secure the cap(s) tightly. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

4. Return any unused sample material back to the location from which the sample was collected.

2.5 Quality Control

If possible, a control sample should be collected from an area not affected by the possible contaminants of concern and submitted with the other samples. The control sample should be collected at an upstream location in the same stream or conveyance from which the primary samples area collected. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by sampling tools.

2.6 Records

Information generated or obtained by SESD personnel will be organized and accounted for in accordance with SESD records management procedures found in SESD Operating Procedure for Control of Records, SESDPROC-004. Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation in accordance with SESD Operating Procedure for Logbooks, SESDPROC-010 and SESD Procedure for Sample and Evidence Management, SESDPROC-005.

3 General Considerations

3.1 General

The sediment sampling techniques and equipment described in the following Sections 4, 5 and 6 of this procedure document are designed to minimize effects on the chemical and physical integrity of the sample. If the procedures in this section are followed, a representative sample of the sediment should be obtained.

3.2 Equipment Selection Considerations

The physical location of the investigator when collecting a sample may dictate the equipment to be used. Wading is the preferred method for reaching the sampling location, particularly if the stream has a noticeable current (is not impounded). However, wading may disrupt bottom sediments causing biased results; therefore, the samples should be collected facing upstream. If the stream is too deep to wade, the sediment sample may be collected from a platform such as a boat or a bridge.

To collect a sediment sample from a water body or other surface water conveyance, a variety of methods can be used:

- Scoops and spoons
- Dredges (Ponar, Young)
- Coring Devices (tubes, Shelby tubes, Ogeechee Sand Pounders®, and augers)
- Vibracore® (Electronic Vibratory Core Tube Driver)

Regardless of the method used, precautions should be taken to insure that the sample collected is representative of the water body or conveyance. These methods are discussed in the following paragraphs.

4 Stainless Steel Scoops and Spoons

4.1 Wading

If the conveyance is dry or is a wadeable surface water body, the easiest way to collect a sediment sample is by using a stainless steel scoop or spoon. If the conveyance is dry, the sediment is accessed directly and is collected using either the stainless steel scoop or spoon. If the conveyance is a wadeable stream or other water body, the method is accomplished by wading into the surface water body and while facing upstream (into the current), scooping the sample along the bottom of the surface water body in the upstream direction. Excess water may be removed/drained from the scoop or spoon. However, this may result in the loss of some fine-grained particle size material associated with the substrate being sampled. Care should be taken to minimize the loss of this fine-grained material. Aliquots of the sample thus collected are then placed in a glass pan and homogenized according to the quartering method described in Section 2.4.

4.2 Bank/Platform Sampling

In surface water bodies that are too deep to wade, but less than eight feet deep, a stainless steel scoop or spoon attached to a piece of conduit can be used either from the banks, if the surface water body is narrow, or from a boat. Again, care should be taken to minimize the loss of the fine particle sizes. The sediment is placed into a glass pan and mixed according to the quartering method described in Section 2.4.

5 Dredges

5.1 General Considerations

Dredges provide a means of collecting sediment from surface water bodies that are too deep to access with a scoop and conduit. They are most useful when collecting softer, finer-grained substrates comprised of silts and clays but can also be used to collect sediments comprised of sands and gravel, although sample recovery in these materials may be less than complete.

Free, vertical clearance is required to use any of the dredges. Dredges, attached to ropes, are lowered vertically from the sampling platform (boat, bridge, etc.) to the substrate being sampled beneath the deployment point.

5.2 Ponar Dredge

The Ponar dredge has side plates and a screen on the top of the sample compartment and samples a 0.05 m^2 surface area. The screen over the sample compartment permits water to pass through the sampler as it descends thus reducing turbulence around the dredge. The Ponar dredge is easily operated by one person and is one of the most effective samplers for general use on most types of substrates.

The Ponar dredge is deployed in its open configuration. It is lowered gently from the sampling platform to the substrate below the platform. After the dredge lands on the substrate, the rope is tugged upward, closing the dredge and capturing the sample. The dredge is then hauled to the surface, where it is opened to acquire the sample.

5.3 Mini-Ponar Dredge

The Mini-Ponar dredge is a smaller, much lighter version of the Ponar dredge and samples a 0.023 m^2 surface area. It is used to collect smaller sample volumes when working in industrial tanks, lagoons, ponds, and shallow water bodies. It is a good device to use when collecting sludge and sediment containing hazardous constituents because the size of the dredge makes it more amenable to field cleaning. Its use and operation are the same as described in Section 5.2, Ponar Dredge, above.

5.4 Young Grab

The Young grab sampler is a stainless steel clamshell-type grab sampler similar to a Ponar dredge. It is a clamshell-type sampler with a scissors closing action typically used for marine and estuarine sediment sampling. The Young grab sampler is one of the most consistently performing grab sampling devices for sediment sampling in both offshore marine sediments, as well as estuarine sediments. The Young sampler comes in two sizes, 0.1 m^2 and 0.04 m^2. The 0.1 m^2 is typically used when a larger volume of sediment is needed for chemistry and particle size. The 0.04 m^2 is typically used for marine

benthic macroinvertebrate sampling and has become the standard grab sampler used by NOAA, USGS and USEPA.

The Young sampler is lowered to the substrate to be sampled with a cable or rope that has a catch that is released when tension is taken off the cable or rope. When the sample device is pulled up, the scissors action of the arms close the clamshell and grabs the sample.

The major difference in the Young grab sampler and other grab samplers is a square or rectangular frame attached to the device which prevents it from penetrating too deeply into soft sediments. In harder substrates, weights may be added to the frame in order to hold the grab in place to prevent collection of a "shallow" sample. A tripod frame can also be attached to the frame surrounding the Young grab sampler. The wire or rope that the grab is raised and lowered with passes through an opening in the top of the tripod and prevents the device from landing sideways or at an angle when there are strong currents or there is lateral movement of the sampling vessel during grab sampling operations.

The draw back to the Young grab sampler is that due to the weight and size of the frame, a ship with an "A" frame or a boat with a davit is required in order to raise and lower the sampler.

6 Sediment Coring Devices

6.1 General

Core samplers are used to sample vertical columns of sediment. They are particularly useful when a historical picture of sediment deposition is desired since they preserve the sequential layering of the deposit. They are also particularly useful when it is desirable to minimize the loss of material at the sediment-water interface. Many types of coring devices have been developed, depending on the depth of water from which the sample is to be obtained, the nature of the bottom material and the length of core to be collected. They vary from hand-driven push tubes to electronic vibrational core tube drivers. These methods are described below in the following sections.

Coring devices are particularly useful in pollutant monitoring because turbulence created by descent through the water is minimal, thus the fines at the sediment-water interface are only minimally disturbed; the sample is withdrawn intact, permitting the removal of only those layers of interest; core liners manufactured of glass or Teflon® can be purchased, thus reducing possible sample interferences; and the samples are easily delivered to the lab for analysis in the tube in which they were collected.

The disadvantage of coring devices is that a relatively small surface area and sample size is obtained, often necessitating repetitive sampling in order to obtain the required amount of material for analysis. Because it is believed that this disadvantage is offset by the advantages, coring devices are recommended in sampling sediments for trace organic compounds or metals analyses.

6.2 Manually Deployed Push Tubes

In shallow, wadeable waters, or for diver-collected samples, the direct use of a core liner or tube manufactured of Teflon®, plastic, or glass is recommended for the collection of sediment samples. Plastic tubes are principally used for collection of samples for physical parameters such as particle size analysis and, in some instances, are acceptable when inorganic constituents are the only parameter of concern. Their use can also be extended to deep waters when SCUBA diving equipment is utilized. Teflon® or plastic is preferred to glass since they are unbreakable, reducing the possibility of sample loss or personal injury. Stainless steel push tubes are also acceptable and provide a better cutting edge and higher strength than Teflon®. The use of glass or Teflon® tubes eliminates any possible interference due to metals contamination from core barrels, cutting heads, and retainers. The tube should be approximately 12-inches in length if only recently deposited sediments (8 inches or less) are to be sampled. Longer tubes should be used when the depth of the substrate exceeds 8 inches. Soft or semi-consolidated sediments such as mud and clays have a greater adherence to the inside of the tube and thus can be sampled with larger diameter tubes. Because coarse or unconsolidated sediments, such as sands and gravel, tend to fall out of the tube, a smaller diameter push tube is normally required to obtain a sample. In extreme cases, where sample retention in the tube is

problematic, core-catchers or end caps made of Teflon® should be employed. A tube about two-inches in diameter is usually the best size. The wall thickness of the tube should be about 1/3-inch for Teflon® plastic, or glass. The inside wall may be filed down at the bottom of the tube to provide a cutting edge to facilitate entry of the liner into the substrate.

Caution should be exercised not to disturb the bottom sediments when the sample is obtained by wading in shallow water (always work facing upstream and working from downstream up). The core tube is pushed into the substrate until four inches or less of the tube is above the sediment-water interface. When sampling hard or coarse substrates, a gentle rotation of the tube while it is being pushed will facilitate greater penetration and decrease core compaction. The top of the tube is then capped to provide suction and reduce the chance of losing the sample. A Teflon® plug or end cap, or a sheet of Teflon® held in place by a rubber stopper or cork may be used. After capping, the tube is slowly extracted with the suction and adherence of the sediment keeping the sample in the tube. Before pulling the bottom part of the tube and core above the water surface, it too should be capped. An alternative to the coring device is the Shelby tube. The Shelby tube has a gravity check valve at the top of the tube where an auger handle attaches. This check valve allows air and water to escape as the tube is advanced. Once the tube is to the desired depth, the check valve will close automatically forming suction on the tube; thus, holding the sample inside.

When extensive core sampling is required, such as a cross-sectional examination of a streambed with the objective of profiling both the physical and chemical contents of the sediment, complete cores are desirable. A strong coring tube such as one made from aluminum, steel or stainless steel is needed to penetrate the sediment and underlying clay or sands. To facilitate complete core collection and retention, it is recommended that the corer (like a Shelby tube) have a check valve built into the driving head which allows water and air to escape from the cutting core, thus creating a partial vacuum, helping to hold the sediment core in the tube. The corer is attached to a standard auger extension and handle, allowing it to be corkscrewed into the sediment from a boat or while wading. The coring tube is easily detached and the intact sediment core is removed with an extraction device.

Before extracting the sediment from the coring tubes, the clear supernatant above the sediment-water interface in the core should be decanted from the tube. This is accomplished by simply turning the core tube to its side, and gently pouring the liquid out until fine sediment particles appear in the waste liquid. The loss of some of the fine sediments usually occurs with this technique.

6.3 Ogeechee Sand Pounders® and Gravity Cores

In deeper, non-wadeable water bodies, sediment cores may be collected from a bridge or a boat using different coring devices such as Ogeechee Sand Pounders®, gravity cores and vibrating coring devices. All three devices utilize a core barrel with a core liner tube

system. The core liner can be removed from the core barrel and replaced with a clean core liner, as needed, after each sample. Liners are made of stainless steel, Teflon® or plastic. The type of core liner and its composition should be based on the contaminants to be evaluated.

Ogeechee Sand Pounders® and gravity cores are hand-held devices that use a standard size 2-inch diameter core barrel. The core tube and liner are interchangeable between the two units. The Ogeechee® uses a slide-hammer mechanism attached to the core head that allows the sampler to pound the core tube into the sediment. The Ogeechee® is good for sandy, more consolidated sediments. The gravity core uses a guiding fin mechanism with a built-in gravity-type check valve. The gravity core is placed in the water and released at the surface to free fall to the bottom. The fin mechanism keeps the core tube upright and free from spinning in the water column as it descends. The core tube stabs the bottom, forcing the sediment into the tube. Both coring devices are equipped with removable nose pieces on the core barrel and disposable core catchers for the liner tubes. The core catchers are designed to cap the liner tube to avoid loss of the core when retrieved from the bottom. The gravity core can be modified to attach a slide hammer mechanism, similar to the Ogeechee®, to further pound the core into the sediment further if deemed necessary.

Sediment cores collected from most hand operated coring devices can suffer from either spreading or compaction when driven into the sediment, depending on the softness of the sediment. Spreading occurs when the sediment is pushed or moved to the side during the advancement of the core tube. Compaction occurs when the sediment is being pushed downward as the core tube is advanced. Both phenomena can affect the physical integrity of the core sample. For instance, the core tube may be advanced through the sediment to a depth of 36 inches, but upon examination of the recovered core, there is only 24 inches of sediment in the core tube.

6.4 Vibratory Core Tube Drivers (Vibracore®)

Vibratory Core Tube Drivers (Vibracore®) facilitate sampling of soft or loosely consolidated, saturated sediments, with minimal compaction or spreading, using lined or unlined core tubes. It is designed for use with core tubes having nominal diameters ranging from 2-inches to 4-inches OD. The Vibracore® uses an electric motor to create vibration ranges from approximately 6,000 RPM to 8,000 RPM (100 Hz to 133 Hz) depending on the resistance afforded by the sediment; the greater the resistance, the higher the frequency. The actual vibrational displacement of the Vibracore® is on the order of a few tens of thousandths of an inch, so essentially no mixing of the sediment within the tube occurs. The vibrational energy tends to re-orient the sediment particles at the lower end of the core tube, causing them to move out of the way of the advancing wall of the core tube and into a more efficient (i.e. denser) packing. This action advances the core tube with minimal compaction of the sediment.

7 Diving

7.1 General

Sediment samples can also be obtained from large streams and open water bodies such as ponds, lakes, estuarine bodies and open ocean environments by divers. Using a variety of the above mentioned methods, divers can directly access the substrate and collect sediment samples. Depending upon the sampling methods used and the required analyses, the samples may be collected directly into the containers from the substrate or they may be returned, in bulk, to the bank or other sampling platform for processing and sample container allocation.

1.0 OVERVIEW

This policy provides guidance on proper sediment sampling procedures (shallow and deep sample collection).

2.0 PROCEDURE/POLICY

2.1 General Requirements

The following requirements are applicable to the collection of sediment samples:

- Wear personal protective equipment required by the task/project Task Hazard Analysis.
- Sampling equipment and supplies to be used for sediment sampling will be determined during the task/project Field Readiness Assessment.
- All sampling and mixing equipment will be decontaminated in accordance with SWP FSP-7.5, "Decontamination Procedures."
- All sampling devices will be constructed from stainless steel materials. If liners are used for the collection of samples for environmental analysis, the liner will be new and sealed in factory supplied packaging upon arrival onto the site and will be composed of materials appropriate for task/project data quality objectives (DQOs) (generally Teflon® or stainless steel).
- Rope used to lower sediment collection devices in deep water will be new nylon or polyethylene rope with a minimum diameter of ½ inch. If the sediment sampling device is lowered on extension rods, the preferred rod material should be stainless steel.
- Once collected, all sediment samples will be prepared, packaged and shipped in accordance with SWP FSP-1.3, "Preparation of Soils for Environmental Analysis." Liners used as sample containers will be subject to similar requirements as soil containers except that the ends will be capped with Teflon® lined caps and taped with electrical tape.
- All equipment and procedures used to collect sediment samples will be documented in accordance with SWP FSP-7.1, "Field Documentation." An example Soil/Sediment Sampling Log is presented in Exhibit 1.

2.2 Scoop and Spoon Sampling Procedure

2.2.1 Shallow Water Sediment Collection

The following general procedure is applicable to sediment sampling with scoops and spoons:

1. Unwrap the spoon/scoop and sample collection bowl and mobilize to the sediment sample location. When wading to the location, approach the sampling point from the downstream direction. When sampling from the edge of the water body, use caution to avoid knocking soils from the bank into the water column.
2. Advance the spoon/scoop into the sediment, retrieve a sample and place into the collection bowl.
3. Repeat process until a sufficient volume of soil is collected.
4. Decant water from the collection bowl after sampling is complete.
5. Promptly return to the bank, scan the sample with the photoionization detector (PID) or other air monitoring device as applicable or required by the task/project DQOs.
6. Prepare the sediment sample for laboratory analysis (refer to SWP FSP-1.3, "Preparation of Soils for Environmental Analysis").

2.2.2 Deep Water Sediment Collection

For waters that are too deep to wade and less than eight feet deep, spoons/scoops may be used if the following general procedure is followed:

1. Attach the handle of a spoon/scoop to a piece of conduit using stainless steel hose clamps.
2. Mobile to the sample location by watercraft; or by accessing the location from a bridge, dock, or by standing on the bank.
3. Unwrap the spoon/scoop and collection bowl; lower the spoon/scoop through the water column and into the sediment.
4. Gently retrieve the sample. Take care to avoid rapid movement through the water column as sediment may be lost during the retrieval.
5. Repeat process until a sufficient volume of soil is collected.
6. Decant water from the collection bowl after sampling is complete.

7. Scan the sample with the photoionization detector (PID) or other air monitoring device as applicable or required by the task/project DQOs.
8. Prepare the sediment sample for laboratory analysis (refer to SWP FSP-1.3, "Preparation of Soils for Environmental Analysis").

2.3 Sediment Core Sampling

An example of a sediment coring device is presented in Exhibit 2. The following general procedure is applicable to sediment sampling using a manual sediment core device:

1. Unwrap a sediment core tube and insert a liner (if required as part of task/project DQOs). If the sediment is anticipated to be uncohesive, install a stainless steel catcher in the nose of the core tube.
2. Attach the core tube to the "T" handle and appropriate length of extension rods.
3. Mobilize to the sample location. If wading, approach the location from the downstream direction.
4. Insert the sediment core tube through the water column and into the sediment for the full length of the tube. If the sediment has hard substrate or has a high gravel content, gently rotate the core tube as it is inserted.
5. Once filled, carefully extract the core tube and return the tube to the surface. Since the core tube is usually subjected to suction forces during extraction, assistance may be required to extract the tube. Use proper lifting techniques. If on a watercraft equipped with a hoist, use the hoist to retrieve the core tube.
6. Once at the surface, discharge the contents of the tube into the collection bowl or remove liner and cap the ends.
7. For sediment in the collection bowl, decant any water to the extent practical and scan with the photoionization detector (PID) or other air monitoring device as required by the task/project DQOs.
8. Prepare the sample for analysis (refer to SWP FSP-1.3, "Preparation of Soils for Environmental Analysis").

Note: Sediment core tubes can be used in deep water (greater than 15 ft deep) with soft sediments by attaching the core tube to nylon rope and allowing the tube to free fall through the water column and into the sediment.

2.4 Dredge Sampling

The following general procedure is applicable to sediment sample collection with dredges [Ponar® Dredge procedure presented here (Exhibits 2 and 3)]:

1. Unwrap the dredge and attach to new rope.
2. Remove the pin that secures the release pin on the dredge. Apply pressure on the release pin to hold it in place by pulling up in the top of the scissor mechanism where the rope connects to the dredge. **CAUTION:** If the pin releases, the dredge will quickly close because of the upward pressure be exerted. The scissor mechanism will pinch fingers if they are in the mechanism (Exhibit 3).
3. Carefully place the dredge, while maintaining pressure on the pin/scissor mechanism, over the edge of the watercraft/bridge/dock and lower through the water column and into the sediment.
4. When the dredge impacts the sediment, the pin releases. Pull up the dredge (which forces it to close) and bring up to the surface.
5. Carefully retrieve dredge, allow water to drain, and discharge contents into the collection bowl.
6. Repeat process until sufficient volume of sediment is collected.
7. Scan with the photoionization detector (PID) or other air monitoring device as required by the task/project DQOs.
8. Prepare the sample for analysis (refer to SWP FSP-1.3, "Preparation of Soils for Environmental Analysis").

3.0 REFERENCES AND GUIDANCE

United States Army Corps of Engineers. 2001. Requirements for the Preparation of Sampling and Analysis Plans. EM 200-1-3. February 1, 2001.

United States Environmental Protection Agency. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. United States Environmental Protection Agency Region IV. November, 2001.

Exhibit 1. Example Soil/Sediment Sampling Log

ARCADIS

Soil/Sediment Sampling Log

Project _____ Project No. _____ Page ____ of ____

Site Location _____ Date _____

Boring No./Sample ID _____ Replicate No. _____ Code No. _____

Weather _____ Sampling Time: Begin _____ End _____

Sample Data

Collection Method: _____

Sample Depth: _____ Moisture Content: _____

Color: _____ Odor: _____

Description: _____

Refusal: _____ Driller: _____

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel _____

Remarks: _____

ARC_standards/forms/

Exhibit 2. Typical Sediment Sampling Devices

Hand Core Sediment Sampler	Ideal Use
	Good for collecting sediment and sludge samples at depth and obtaining an undisturbed sediment core

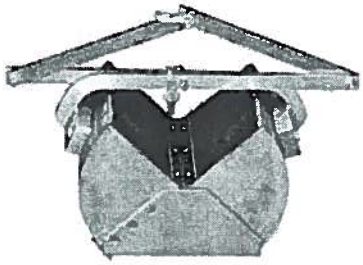
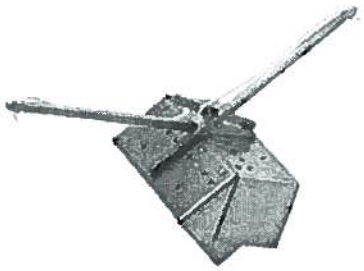
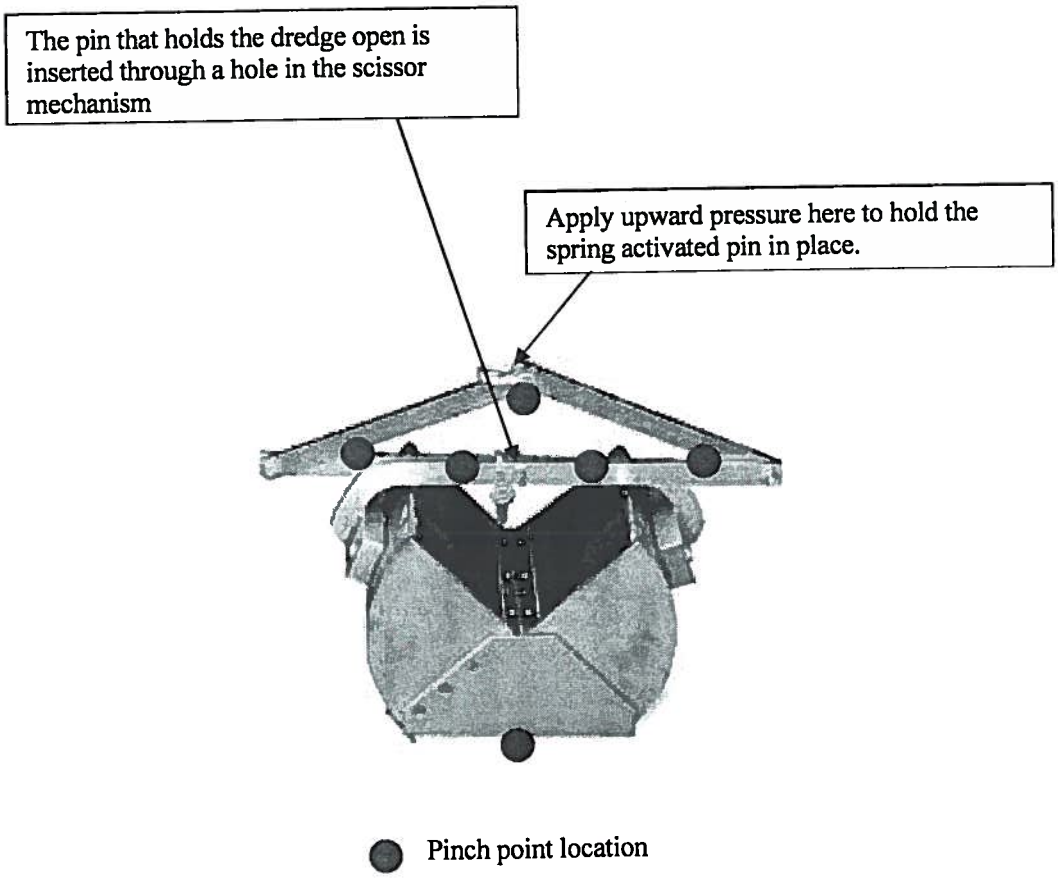
Dredges	Ideal Use
	**Heavyweight Deep Water Dredge** Good for collecting most types of surface sediment through deep water. *Weight 25 pounds*
	**Bottom Sampling Dredge** Lightweight and good for sampling silt and sand sediments. *Weight 4 pounds*

Exhibit 3. The Ponar® Dredge



Refer to SWP HSP-3.15, "Manual Soil, Sediment and Waste Sampling" for additional safety information.

ARCADIS
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Field Equipment Decontamination

Rev. #: 3

Rev Date: April 26, 2010

Approval Signatures

Prepared by: _____ Date: 4/26/2010
Keith Shepherd

Reviewed by: _____ Date: 4/26/2010
Richard Murphy (Technical Expert)

I. Scope and Application

Equipment decontamination is performed to ensure that sampling equipment that contacts a sample, or monitoring equipment that is brought into contact with environmental media to be sampled, is free from analytes of interest and/or constituents that would interfere with laboratory analysis for analytes of interest. Equipment must be cleaned prior to use for sampling or contact with environmental media to be sampled, and prior to shipment or storage. The effectiveness of the decontamination procedure should be verified by collecting and analyzing equipment blank samples.

The equipment cleaning procedures described herein includes pre-field, in the field, and post-field cleaning of sampling tools which will be conducted at an established equipment decontamination area (EDA) on site (as appropriate). Equipment that may require decontamination at a given site includes: soil sampling tools; groundwater, sediment, and surface-water sampling devices; water testing instruments; down-hole instruments; and other activity-specific sampling equipment. Non-disposable equipment will be cleaned before collecting each sample, between sampling events, and prior to leaving the site. Cleaning procedures for sampling equipment will be monitored by collecting equipment blank samples as specified in the applicable work plan or field sampling plan. Dedicated and/or disposable (not to be re-used) sampling equipment will not require decontamination.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, and site-specific training, as needed. In addition, ARCADIS field sampling personnel will be versed in the relevant SOPs and possess the skills and experience necessary to successfully complete the desired fieldwork. The project HASP and other documents will identify any other training requirements such as site specific safety training or access control requirements.

III. Equipment List

- health and safety equipment, as required in the site Health and Safety Plan (HASP)
- distilled water

- Non-phosphate detergent such as Alconox or, if sampling for phosphorus phosphorus-containing compounds, Luminox (or equivalent).
- tap water
- rinsate collection plastic containers
- DOT-approved waste shipping container(s), as specified in the work plan or field sampling plan (if decontamination waste is to be shipped for disposal)
- brushes
- large heavy-duty garbage bags
- spray bottles
- (Optional) – Isoprophyl alcohol (free of ketones) or methanol
- Ziploc-type bags
- plastic sheeting

IV. Cautions

Rinse equipment thoroughly and allow the equipment to dry before re-use or storage to prevent introducing solvent into sample medium. If manual drying of equipment is required, use clean lint-free material to wipe the equipment dry.

Store decontaminated equipment in a clean, dry environment. Do not store near combustion engine exhausts.

If equipment is damaged to the extent that decontamination is uncertain due to cracks or dents, the equipment should not be used and should be discarded or submitted for repair prior to use for sample collection.

A proper shipping determination will be performed by a DOT-trained individual for cleaning materials shipped by ARCADIS.

V. Health and Safety Considerations

Review the material safety data sheets (MSDS) for the cleaning materials used in decontamination. If solvent is used during decontamination, work in a well-ventilated area and stand upwind while applying solvent to equipment. Apply solvent in a manner that minimizes potential for exposure to workers. Follow health and safety procedures outlined in the HASP.

VI. Procedure

A designated area will be established to clean sampling equipment in the field prior to sample collection. Equipment cleaning areas will be set up within or adjacent to the specific work area, but not at a location exposed to combustion engine exhaust. Detergent solutions will be prepared in clean containers for use in equipment decontamination.

Cleaning Sampling Equipment

1. Wash the equipment/pump with potable water.

2. Wash with detergent solution (Alconox, Liquinox or equivalent) to remove all visible particulate matter and any residual oils or grease.

3. If equipment is very dirty, precleaning with a brush and tap water may be necessary.

4. (Optional) – Flush with isopropyl alcohol (free of ketones) or with methanol. This step is optional but should be considered when sampling in highly impacted media such as non-aqueous phase liquids or if equipment blanks from previous sampling events showed the potential for cross contamination of organics.

5. Rinse with distilled/deionized water.

Decontaminating Submersible Pumps

Submersible pumps may be used during well development, groundwater sampling, or other investigative activities. The pumps will be cleaned and flushed before and between uses. This cleaning process will consist of an external detergent solution wash and tap water rinse, a flush of detergent solution through the pump, followed

by a flush of potable water through the pump. Flushing will be accomplished by using an appropriate container filled with detergent solution and another contained filled with potable water. The pump will run long enough to effectively flush the pump housing and hose (unless new, disposable hose is used). Caution should be exercised to avoid contact with the pump casing and water in the container while the pump is running (do not use metal drums or garbage cans) to avoid electric shock. Disconnect the pump from the power source before handling. The pump and hose should be placed on or in clean polyethylene sheeting to avoid contact with the ground surface.

VII. Waste Management

Equipment decontamination rinsate will be managed in conjunction with all other waste produced during the field sampling effort. Waste management procedures are outlined in the work plan or Waste Management Plan (WMP).

VIII. Data Recording and Management

Equipment cleaning and decontamination will be noted in the field notebook. Information will include the type of equipment cleaned, the decontamination location and any deviations from this SOP. Specific factors that should be noted include solvent used (if any), and source of water.

Any unusual field conditions should be noted if there is potential to impact the efficiency of the decontamination or subsequent sample collection.

An inventory of the solvents brought on site and used and removed from the site will be maintained in the files. Records will be maintained for any solvents used in decontamination, including lot number and expiration date.

Containers with decontamination fluids will be labeled.

IX. Quality Assurance

Equipment blanks should be collected to verify that the decontamination procedures are effective in minimizing potential for cross contamination. The equipment blank is prepared by pouring deionized water over the clean and dry tools and collecting the deionized water into appropriate sample containers. Equipment blanks should be analyzed for the same set of parameters that are performed on the field samples collected with the equipment that was cleaned. Equipment blanks are collected per equipment set, which represents all of the tools needed to collect a specific sample.

X. References

USEPA Region 9, Field Sampling Guidance #1230, Sampling Equipment Decontamination.

USEPA Region 1, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells.