Hammonds Ferry Constructed Wetland Design

Southeastern Natural Sciences Academy

April 18, 2007

Introduction

We are pleased to present the Hammonds Ferry Wetland Design (Figure 1). This design allows a functional wetland to be constructed with minimal clearing and filling of the existing ponds and surrounding area. The wetland will treat stormwater runoff, provide wildlife habitat, and contribute to the aesthetics of the development. The wetland will be constructed in the small pond closest to the Georgia Avenue Bridge and will be approximately 1.5 acres. Upon completion the wetland will be planted with a suite of wetland plant species adapted to a range of hydrologic conditions.

Existing depressions

The wetland will receive the majority of its influent from the existing area consisting of numerous interconnected depressions (Figure 2). This area currently receives stormwater runoff from most of the area surrounding lower Georgia Avenue and the bridge. In addition it will also receive inflows from the proposed Municipal Complex. During times of intense rainfall the velocity of water from this stormwater pipe can be quite high (Figure 3). However, the existing depressions facilitate slowing and storage of stormwater which is then distributed to the larger ponds. Therefore, we feel that it is best to leave this area intact. However, the depressions area collects significant amounts of trash and woody debris. Thus we suggest it be thoroughly cleaned of trash and debris. We also suggest the installation of stormwater trash traps to help prevent the deposition of additional trash.

Constructed wetland

We propose that three wetland influent weir boxes be installed to facilitate flow from the depressions area into the constructed wetland (Figure 1). Based on water level data collected over the past few months we suggest that "full pool" of the wetland be 126 feet above mean sea level (AMSL) (Figure 4). To minimize flooding during periods of intense precipitation we suggest that an emergency overflow to the river be constructed at an elevation of 128 feet AMSL. This will allow an additional two feet of water level rise above full pool which greatly increases the stormwater storage capacity. Brief periods of increased water level in the constructed wetland should not negatively impact the wetland.

Based on full pool of 126 AMSL we propose to create a shallow vegetated wetland by filling the existing pond and creating a bottom gradient elevation going from 126 to 123 feet AMSL with the shallow end on the Georgia Avenue side (Figure 1). The wetland will consist of three planting zones with water depths ranging from zero to three feet. Within each zone, wetland vegetation adapted to the water depths associated with each zone will be planted and/or seeded (Table 1). Beyond the third planting zone will be an area of open water approximately 10 to 12 feet wide. In this open area the bottom elevation will drop to approximately 119-120 feet AMSL.

We propose that three wetland effluent weir boxes or stop logs be installed on the narrow land bridge to allow water to freely flow into the adjacent open water pond. This design allows us to adjust the weir plates to hold water in the wetland during periods of drought. Alternatively, weirs could be installed on the proposed SCDOT Central Avenue Bridge. However, the ability to independently manage the wetland water level would be lost.

Additional suggestions

Further development will increase runoff from impervious surfaces. Thus, we suggest connecting East Pond and West Pond with a culvert through the existing land bridge. The water level data show that West Pond is approximately one foot lower than East Pond (Figure 4). Connecting the two ponds will slightly lower the water level in East Pond, but will significantly increase the overall stormwater storage capacity of the system.

We suggest constructing two waterfalls in the wetland complex (Figure 1). The waterfalls will greatly improve the aesthetics of the area, aerate the water, and serve as overflow during periods of high water. The first waterfall will be in the corner of the perched wetland near the large beaver dam and will flow into the open water pond (Figures 1 and 5). We suggest the elevation of this waterfall be approximately 1 foot higher than the elevation of the second proposed waterfall. This will allow flow over the second waterfall during normal flow conditions and flow over the first waterfall during times of high flows. Such a scenario will allow water to flow through the constructed wetland during most flow scenarios and will decrease the impact of high flows on the constructed wetland.

The second waterfall will flow from the small stream that currently flows from the North Augusta Greenway to the perched wetland, and into the depressions area (Figures 1 and 6). We propose rerouting this stream so that it is diverted to the waterfall instead of the perched wetland. The perched wetland will receive stormwater runoff from the proposed Central Avenue and Municipal Complex and should remain wet under normal conditions.

We propose the construction of an extension to the North Augusta Greenway that would provide access to the wetland complex. The extension would consist of a walking trail, boardwalk, and small bridge. It would loop from the small road adjacent to the Georgia Avenue

Bridge over the constructed wetland and into the flat area just below the perched wetland, then over the waterfall and back to the Greenway.

Finally, throughout the wetland design phase of this project we compiled ancillary data pertaining to the constructed wetlands and adjacent ponds. The first set of data collected was a list of fauna species observed throughout the initial design phase (Appendix A). It should be noted that this list resulted from a casual assessment and by no means constitutes a complete qualitative or quantitative species list. The second data set is a synoptic survey of sediment and water column chemistries taken within the proposed constructed wetland pond (Appendix B).

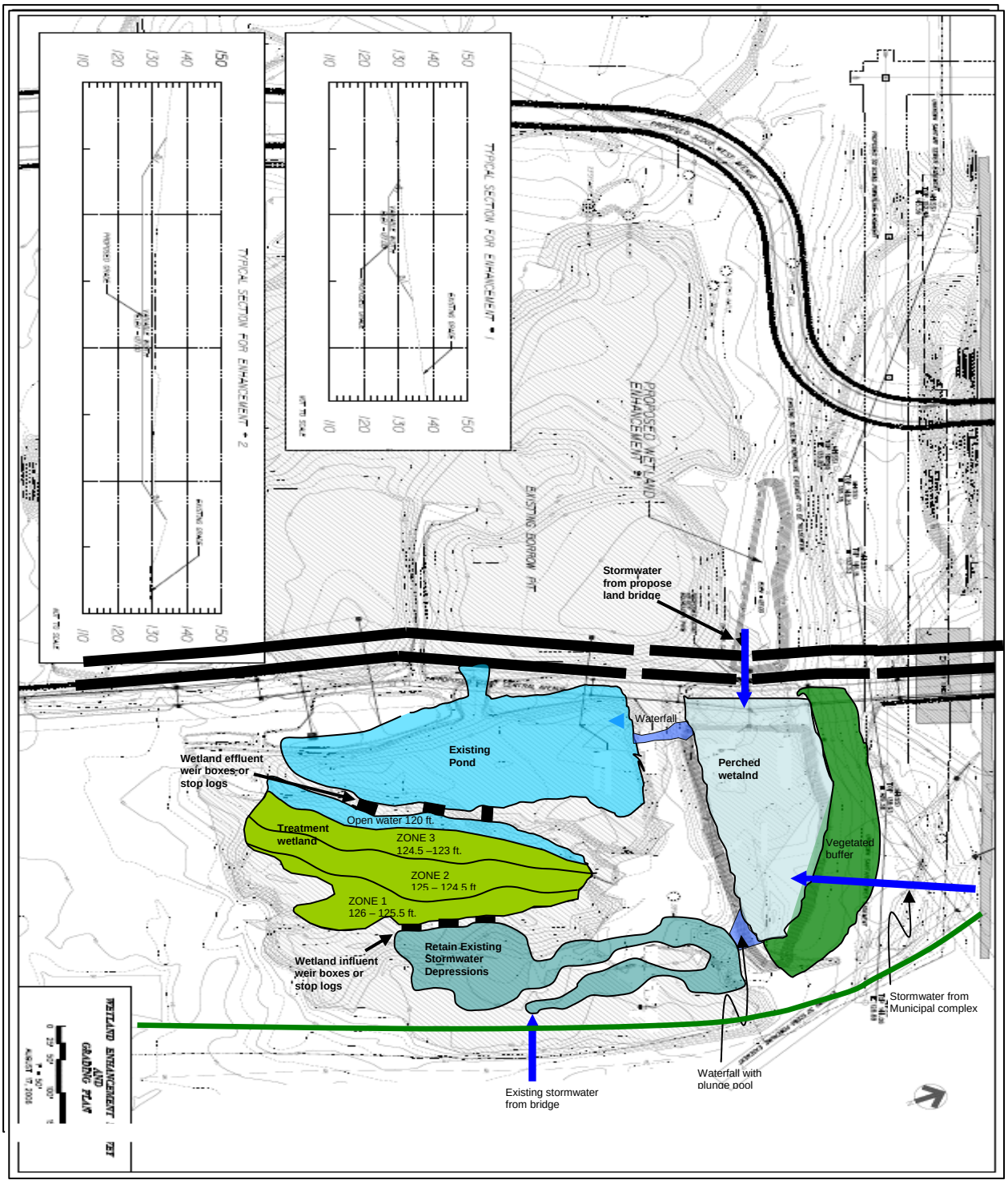

Figure 1. Conceptual wetland design.

Figure 2. Interconnected depression area serves to diminish stormwater velocity and feed wetland.

Figure 3. Velocity of stormwater from Georgia Avenue Bridge during heavy rain.

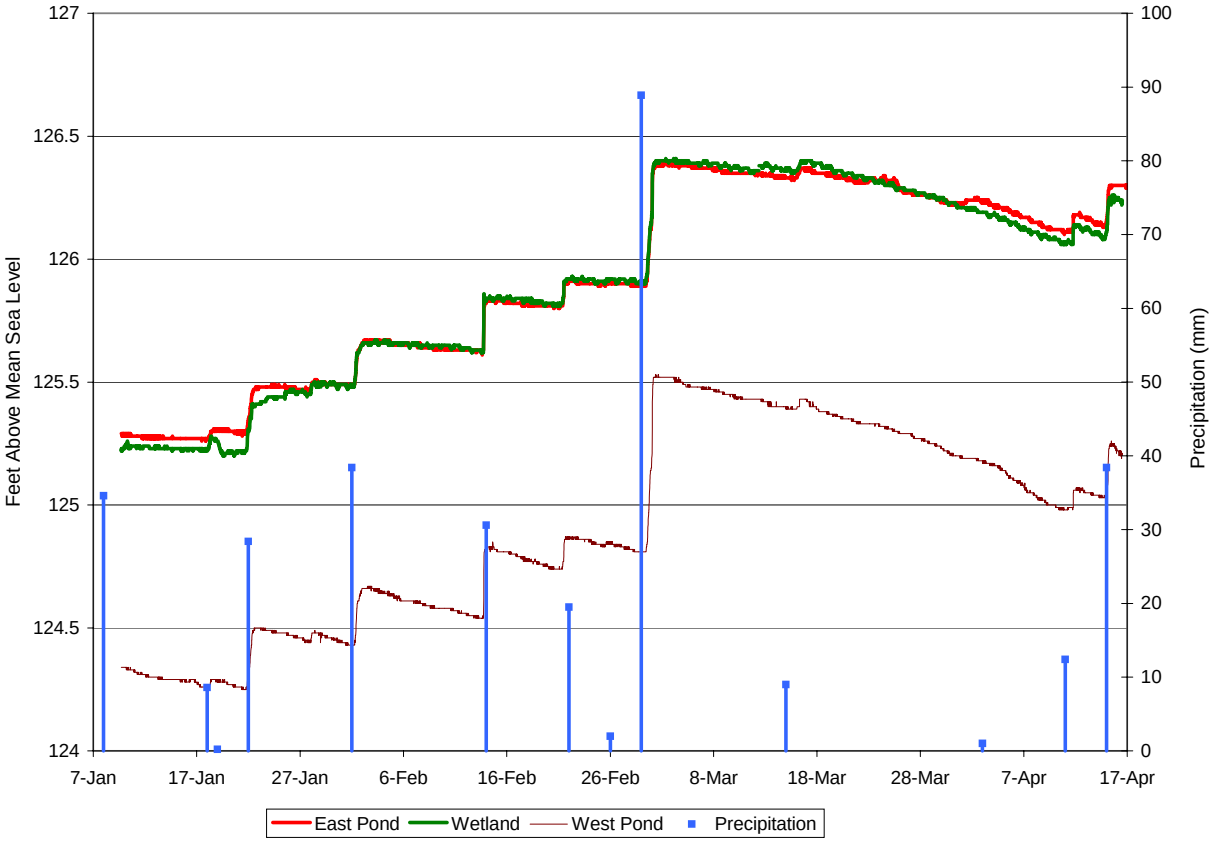

Figure 4. Water level elevation and precipitation at Hammonds Ferry wetland, East Pond, and West Pond.

Figure 5. Conceptual waterfall flowing from perched wetland to open water pond.

Figure 6. Conceptual waterfall flowing from rerouted feeder stream to depression area.

Table 1. Proposed wetland plant species (water depth) for planting or seeding into vegetation zones.

Zone 1 (0”-6”)
Juncus sp. (rushes) <2”-10”
Carex sp. (sedges) <2”-10”
Canna sp. (canna) <2”-10”
Polygonum aviculare (smartweed) <2”-10”
Spartina ambiguus (cordgrass) <2”-10”
Phragmites sp. (Common reed) <2”-20”
Cyperus flavescens (sedges) <2”-20”
Panicum sp. (panic grass) <2”-20”
Eleocharus (spike rush) <2”-20”
Arundo donax (Giant reed) <2”-20”
Glyceria striata (Manna grass) <2”-12”

Zone 2 (1”-18”)
Cyperus flavescens (sedges) <2”-20”
Panicum sp. (panic grass) <2”-20”
Eleocharus (spike rush) <2”-20”
Arundo donax (Giant reed) <2”-20”
Pontederia cordata (Pickerelweed) 4”-10”
Typha sp. (cattails) 4”-30”
Ludwigia leptocarpa (water primrose) 4”-20”
Zizania aquatica (Wild rice) 4”-40”
Scirpus cyperinus (Bullrush) 4”-48”
Sagittaria latifolia (Arrowheads) 10”-20”
Nelumbo lutea (American lotus) 10”-60”

Zone 3 (18”-36”)
Typha sp. (Cattails) 4”-30”
Zizania aquatica (Wild rice) 4”-40”
Scirpus cyperinus (Bullrush) 4”-48”
Sagittaria latifolia (Arrowheads) 10”-20”
Brasenia sp. (Watershield) 10”-24”
Nelumbo lutea (American lotus) 10”-60”
Nymphacae odorate (Waterlily) 20”-120”

Appendix A

Species list of observed animals.

Amphibians
Spotted salamanders
Eastern narrowmouth toad
Southern cricket frog
Leopard frog
Bronze frog

Reptiles
Eastern box turtle
Yellowbelly sliders
Eastern painted turtle
Eastern river cooter
Mud turtle
Musk turtle
Ground skink
Five-lined skink
Green anole
Rat snake
American alligator

Birds
Belted kingfisher
Wood duck
Mallard duck
Green heron
Great blue heron
Great egret

Mammals
Beaver
Deer

Appendix B

Chemistry Data

SHEALY ENVIRONMENTAL SERVICES, INC.

Report of Analysis

Southeastern Natural Sciences Academy
1858 Lock & Dam Road
Augusta, GA 30906
Attention: Oscar Flite

Project Name: **Hammonds Ferry**

Lot Number: **HL08045**
Date Completed: **12/26/2006**

Kelly M. Maberry
Project Manager

The following non-paginated documents are considered part of this report: Chain of Custody Record and Sample Receipt Checklist.

HL08045

Case Narrative
Southeastern Natural Sciences Academy
Lot Number: HL08045

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies. Any exceptions to the NELAC standards, the QAMP, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Shealy Project Manager listed on the cover page.

Pesticides
Sample -002 was diluted 10x due to matrix interference. The PQLs have been elevated as a result of this dilution.

Sample Summary
Southeastern Natural Sciences Academy
Lot Number: HL08045

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	Hammond's Ferry	Aqueous	12/08/2006 1040	12/08/2006
002	Hammond's Ferry	Solid	12/08/2006 1100	12/08/2006

(2 samples)

Executive Summary
Southeastern Natural Sciences Academy
Lot Number: HL08045

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	Hammond's Ferry	Aqueous	Alkalinity	310.1	17		mg/L	6
001	Hammond's Ferry	Aqueous	BOD, 5 day	405.1	2.2		mg/L	6
001	Hammond's Ferry	Aqueous	Carbonaceous BOD, 5 day	405.1	2.0	7	mg/L	6
001	Hammond's Ferry	Aqueous	Chloride	300.0	3.7		mg/L	6
001	Hammond's Ferry	Aqueous	COD (low-level)	410.4	46		mg/L	6
001	Hammond's Ferry	Aqueous	Dissolved Chloride	300.0	4.8		mg/L	6
001	Hammond's Ferry	Aqueous	Dissolved Nitrate-Nitrite - N	353.2	0.10		mg/L	6
001	Hammond's Ferry	Aqueous	Dissolved Nitrite - N	354.1	0.0076	J	mg/L	6
001	Hammond's Ferry	Aqueous	Dissolved Sulfate	300.0	1.2		mg/L	6
001	Hammond's Ferry	Aqueous	DOC	415.1	10		mg/L	6
001	Hammond's Ferry	Aqueous	Ortho-phosphorus	365.2	0.010		mg/L	6
001	Hammond's Ferry	Aqueous	Phosphorus	365.1	0.054		mg/L	6
001	Hammond's Ferry	Aqueous	Sulfate	300.0	1.8		mg/L	6
001	Hammond's Ferry	Aqueous	TDS	160.1	31		mg/L	6
001	Hammond's Ferry	Aqueous	TIC	415.1	2.8		mg/L	6
001	Hammond's Ferry	Aqueous	TKN	351.2	0.49	J	mg/L	6
001	Hammond's Ferry	Aqueous	TOC	415.1	7.6		mg/L	6
001	Hammond's Ferry	Aqueous	TSS	160.2	7.2		mg/L	6
001	Hammond's Ferry	Aqueous	TVSS	160.2/160.4	5.9	J	mg/L	6
001	Hammond's Ferry	Aqueous	Calcium	200.8	4300	B	ug/L	10
001	Hammond's Ferry	Aqueous	Chromium	200.8	0.50	J	ug/L	10
001	Hammond's Ferry	Aqueous	Copper	200.8	1.1		ug/L	10
001	Hammond's Ferry	Aqueous	Iron	200.8	1200		ug/L	10
001	Hammond's Ferry	Aqueous	Lead	200.8	0.44	BJ	ug/L	10
001	Hammond's Ferry	Aqueous	Magnesium	200.8	1400		ug/L	10
001	Hammond's Ferry	Aqueous	Manganese	200.8	74	B	ug/L	10
001	Hammond's Ferry	Aqueous	Nickel	200.8	0.48	J	ug/L	10
001	Hammond's Ferry	Aqueous	Potassium	200.8	2200	B	ug/L	10
001	Hammond's Ferry	Aqueous	Silicon	200.8	660	B	ug/L	10
001	Hammond's Ferry	Aqueous	Sodium	200.8	2200		ug/L	10
001	Hammond's Ferry	Aqueous	Zinc	200.8	8.4	BJ	ug/L	10
002	Hammond's Ferry	Solid	Dalapon	8151A	57	JP	ug/kg	12
002	Hammond's Ferry	Solid	Arsenic	6010B	5.1		mg/kg	15
002	Hammond's Ferry	Solid	Cadmium	6010B	0.24	BJ	mg/kg	15
002	Hammond's Ferry	Solid	Calcium	6010B	2000		mg/kg	15
002	Hammond's Ferry	Solid	Chromium	6010B	40		mg/kg	15
002	Hammond's Ferry	Solid	Copper	6010B	32		mg/kg	15
002	Hammond's Ferry	Solid	Iron	6010B	20000		mg/kg	15
002	Hammond's Ferry	Solid	Lead	6010B	43		mg/kg	15
002	Hammond's Ferry	Solid	Magnesium	6010B	2700		mg/kg	15
002	Hammond's Ferry	Solid	Manganese	6010B	300		mg/kg	15
002	Hammond's Ferry	Solid	Nickel	6010B	22	B	mg/kg	15
002	Hammond's Ferry	Solid	Potassium	6010B	1800		mg/kg	15
002	Hammond's Ferry	Solid	Selenium	6010B	1.2	J	mg/kg	15

Executive Summary (Continued)

Lot Number: HL08045

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
002	Hammond's Ferry	Solid	Zinc	6010B	210		mg/kg	15

(45 detections)

Inorganic non-metals

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) 310.1	1	12/20/2006 2128	IVC		50225
1		(BOD, 5 day) 405.1	1	12/14/2006 1256	RLM	12/09/2006 0927	3401
1		(Carbonaceous) 405.1	1	12/14/2006 1603	IVC	12/09/2006 1356	3402
1		(Chloride) 300.0	1	12/12/2006 1418	DAS		49817
1		(COD (low-lev) 410.4	1	12/18/2006 1330	WD		
1	350.2	(Dissolved Am) 350.1	1	12/21/2006 1203	BMG	12/20/2006 1533	50187
1		(Dissolved Ch) 300.0	1	12/15/2006 1842	DAS		50037
1		(Dissolved Ni) 353.2	1	12/08/2006 1719	MML		49724
1		(Dissolved Ni) 354.1	1	12/08/2006 1719	MML		49722
1		(Dissolved Su) 300.0	1	12/15/2006 1842	DAS		50038
1		(DOC) 415.1	1	12/15/2006 0219	MML		50091
1		(Ortho-phosph) 365.2	1	12/09/2006 1030	NMS		
1		(pH) 150.1	1	12/08/2006 1700	PBC		49666
1		(Phosphorus) 365.1	1	12/22/2006 1116	BMG	12/20/2006 1530	50192
1		(Sulfate) 300.0	1	12/12/2006 1418	DAS		49813
1		(TDS) 160.1	1	12/14/2006 1440	NMS		711
1		(TIC) 415.1	1	12/18/2006 2153	MML		
1	351.4	(TKN) 351.2	1	12/23/2006 1037	DAS	12/19/2006 1200	50144
1		(TOC) 415.1	1	12/18/2006 2153	MML		50153
1		(TSS) 160.2	1	12/11/2006 1115	NMS		49687
1		(TVSS) 160.2/160.4	1	12/11/2006 1115	NMS		257

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		**310.1**	**17**		**10**	**3.9**	**mg/L**	**1**
BOD, 5 day		**405.1**	**2.2**		**2.0**	**0.18**	**mg/L**	**1**
Carbonaceous BOD, 5 day		**405.1**	**2.0**	**7**	**2.0**	**0.21**	**mg/L**	**1**
Chloride		**300.0**	**3.7**		**1.0**	**0.033**	**mg/L**	**1**
COD (low-level)		**410.4**	**46**		**10**	**5.5**	**mg/L**	**1**
Dissolved Ammonia - N (phenate)		350.1	ND		0.10	0.050	mg/L	1
Dissolved Chloride		**300.0**	**4.8**		**1.0**	**0.033**	**mg/L**	**1**
Dissolved Nitrate-Nitrite - N		**353.2**	**0.10**		**0.020**	**0.0013**	**mg/L**	**1**
Dissolved Nitrite - N		**354.1**	**0.0076**	**J**	**0.020**	**0.0034**	**mg/L**	**1**
Dissolved Sulfate		**300.0**	**1.2**		**1.0**	**0.13**	**mg/L**	**1**
DOC		**415.1**	**10**		**1.0**	**0.19**	**mg/L**	**1**
Ortho-phosphorus		**365.2**	**0.010**		**0.010**	**0.0049**	**mg/L**	**1**
pH		**150.1**	**6.68**	*****			**su**	**1**
Phosphorus		**365.1**	**0.054**		**0.010**	**0.0048**	**mg/L**	**1**
Sulfate		**300.0**	**1.8**		**1.0**	**0.13**	**mg/L**	**1**
TDS		**160.1**	**31**		**10**	**3.4**	**mg/L**	**1**
TIC		**415.1**	**2.8**		**1.0**	**0.24**	**mg/L**	**1**
TKN		**351.2**	**0.49**	**J**	**0.50**	**0.084**	**mg/L**	**1**
TOC		**415.1**	**7.6**		**1.0**	**0.048**	**mg/L**	**1**
TSS		**160.2**	**7.2**		**4.0**	**0.34**	**mg/L**	**1**
TVSS		**160.2/160.4**	**5.9**	**J**	**10**	**2.0**	**mg/L**	**1**

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria

Herbicides by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	8151A	8151A	1	12/15/2006 1908	SRW	12/14/2006 1930	49946

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
2,4,5-T	93-76-5	8151A	ND		0.50	0.10	ug/L	1
2,4-D	94-75-7	8151A	ND		2.0	0.40	ug/L	1
Dalapon	75-99-0	8151A	ND		5.0	0.90	ug/L	1
2,4-DB	94-82-6	8151A	ND		4.0	0.81	ug/L	1
Dicamba	1918-00-9	8151A	ND		1.0	0.20	ug/L	1
Dichloroprop	120-36-5	8151A	ND		2.0	0.41	ug/L	1
Dinoseb	88-85-7	8151A	ND		2.0	0.44	ug/L	1
MCPA	94-74-6	8151A	ND		200	40	ug/L	1
MCPP	93-65-2	8151A	ND		200	46	ug/L	1
2,4,5-TP (Silvex)	93-72-1	8151A	ND		0.50	0.10	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
DCAA		84	50-130

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

B = Detected in the method blank

J = Estimated result < PQL and ≥ MDL

E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

PCBs by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3520C	8082	1	12/11/2006 2054	NWD	12/10/2006 1232	49674

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Aroclor 1016	12674-11-2	8082	ND		0.25	0.050	ug/L	1
Aroclor 1221	11104-28-2	8082	ND		0.25	0.14	ug/L	1
Aroclor 1232	11141-16-5	8082	ND		0.25	0.20	ug/L	1
Aroclor 1242	53469-21-9	8082	ND		0.25	0.14	ug/L	1
Aroclor 1248	12672-29-6	8082	ND		0.25	0.15	ug/L	1
Aroclor 1254	11097-69-1	8082	ND		0.25	0.11	ug/L	1
Aroclor 1260	11096-82-5	8082	ND		0.25	0.060	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Decachlorobiphenyl		41	10-156
Tetrachloro-m-xylene		83	48-133

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

B = Detected in the method blank

J = Estimated result < PQL and ≥ MDL

E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

Organochlorine Pesticides by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3520C	8081A	1	12/12/2006 1139	SRW	12/10/2006 1232	49675

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Aldrin	309-00-2	8081A	ND		0.025	0.0020	ug/L	1
alpha-BHC	319-84-6	8081A	ND		0.025	0.0030	ug/L	1
beta-BHC	319-85-7	8081A	ND		0.025	0.019	ug/L	1
delta-BHC	319-86-8	8081A	ND		0.025	0.0080	ug/L	1
gamma-BHC (Lindane)	58-89-9	8081A	ND		0.025	0.0050	ug/L	1
alpha-Chlordane	5103-71-9	8081A	ND		0.025	0.0030	ug/L	1
gamma-Chlordane	5103-74-2	8081A	ND		0.025	0.0030	ug/L	1
4,4'-DDD	72-54-8	8081A	ND		0.025	0.0060	ug/L	1
4,4'-DDE	72-55-9	8081A	ND		0.025	0.0060	ug/L	1
4,4'-DDT	50-29-3	8081A	ND		0.025	0.0030	ug/L	1
Dieldrin	60-57-1	8081A	ND		0.025	0.0040	ug/L	1
Endosulfan I	959-98-8	8081A	ND		0.025	0.0060	ug/L	1
Endosulfan II	33213-65-9	8081A	ND		0.025	0.024	ug/L	1
Endosulfan sulfate	1031-07-8	8081A	ND		0.025	0.0030	ug/L	1
Endrin	72-20-8	8081A	ND		0.025	0.0050	ug/L	1
Endrin aldehyde	7421-93-4	8081A	ND		0.025	0.0030	ug/L	1
Endrin ketone	53494-70-5	8081A	ND		0.025	0.0040	ug/L	1
Heptachlor	76-44-8	8081A	ND		0.025	0.020	ug/L	1
Heptachlor epoxide	1024-57-3	8081A	ND		0.025	0.0030	ug/L	1
Methoxychlor	72-43-5	8081A	ND		0.10	0.014	ug/L	1
Toxaphene	8001-35-2	8081A	ND		0.25	0.030	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Decachlorobiphenyl		43	10-156
Tetrachloro-m-xylene		90	48-133

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

B = Detected in the method blank

J = Estimated result < PQL and ≥ MDL

E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ICP-MS

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	200.2	200.8	1	12/14/2006 2237	FTS	12/11/2006 1840	49749
2	200.2	200.8	1	12/20/2006 1610	FTS	12/11/2006 1840	49749

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Arsenic	7440-38-2	200.8	ND		1.0	0.66	ug/L	1
Cadmium	7440-43-9	200.8	ND		0.10	0.042	ug/L	1
Calcium	**7440-70-2**	**200.8**	**4300**	**B**	**200**	**13**	**ug/L**	**1**
Chromium	**7440-47-3**	**200.8**	**0.50**	**J**	**5.0**	**0.35**	**ug/L**	**1**
Copper	**7440-50-8**	**200.8**	**1.1**		**1.0**	**0.15**	**ug/L**	**1**
Iron	**7439-89-6**	**200.8**	**1200**		**20**	**5.9**	**ug/L**	**1**
Lead	**7439-92-1**	**200.8**	**0.44**	**BJ**	**1.0**	**0.012**	**ug/L**	**1**
Magnesium	**7439-95-4**	**200.8**	**1400**		**50**	**0.94**	**ug/L**	**1**
Manganese	**7439-96-5**	**200.8**	**74**	**B**	**5.0**	**0.20**	**ug/L**	**1**
Nickel	**7440-02-0**	**200.8**	**0.48**	**J**	**5.0**	**0.28**	**ug/L**	**1**
Potassium	**7440-09-7**	**200.8**	**2200**	**B**	**200**	**6.0**	**ug/L**	**1**
Selenium	7782-49-2	200.8	ND		1.0	0.25	ug/L	1
Silicon	**7440-21-3**	**200.8**	**660**	**B**	**100**	**5.3**	**ug/L**	**2**
Sodium	**7440-23-5**	**200.8**	**2200**		**200**	**4.0**	**ug/L**	**2**
Zinc	**7440-66-6**	**200.8**	**8.4**	**BJ**	**10**	**1.4**	**ug/L**	**1**

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria

CVAA

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-001**

Description: **Hammond's Ferry** Matrix: **Aqueous**

Date Sampled: **12/08/2006 1040**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		245.1	1	12/14/2006 1708	FLW	12/13/2006 1932	49878

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Mercury	7439-97-6	245.1	ND		0.00010	0.000060	mg/L	1

Footnote(s): * Analyzed outside the 15 minute holding time. 7-SCF Out of range

PQL = Practical quantitation limit
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the MDL
J = Estimated result < PQL and ≥ MDL
P = The RPD between two GC columns exceeds 40%
Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"
N = Recovery is out of criteria

Herbicides by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-002**

Description: **Hammond's Ferry** Matrix: **Solid**

Date Sampled: **12/08/2006 1100** % Solids: **17.5** **12/11/2006 2012**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	8151A	8151A	1	12/15/2006 2110	SRW	12/13/2006 0945	49819
2	8151A	8151A	1	12/15/2006 2134	SRW	12/13/2006 0945	49819

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
2,4,5-T	93-76-5	8151A	ND		57	8.2	ug/kg	1
2,4-D	94-75-7	8151A	ND		230	96	ug/kg	1
Dalapon	**75-99-0**	**8151A**	**57**	**JP**	**570**	**50**	**ug/kg**	**2**
2,4-DB	94-82-6	8151A	ND		460	73	ug/kg	1
Dicamba	1918-00-9	8151A	ND		110	31	ug/kg	1
Dichloroprop	120-36-5	8151A	ND		230	47	ug/kg	1
Dinoseb	88-85-7	8151A	ND		230	110	ug/kg	1
MCPA	94-74-6	8151A	ND		23000	15000	ug/kg	1
MCPP	93-65-2	8151A	ND		23000	12000	ug/kg	1
2,4,5-TP (Silvex)	93-72-1	8151A	ND		57	24	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits	Q	Run 2 % Recovery	Acceptance Limits
DCAA		84	50-130		80	50-130

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

B = Detected in the method blank

J = Estimated result < PQL and ≥ MDL

E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

PCBs by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-002**

Description: **Hammond's Ferry** Matrix: **Solid**

Date Sampled: **12/08/2006 1100** % Solids: **17.5** **12/11/2006 2012**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3550B	8082	1	12/13/2006 1903	NWD	12/11/2006 1815	49700

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Aroclor 1016	12674-11-2	8082	ND		97	15	ug/kg	1
Aroclor 1221	11104-28-2	8082	ND		97	28	ug/kg	1
Aroclor 1232	11141-16-5	8082	ND		97	17	ug/kg	1
Aroclor 1242	53469-21-9	8082	ND		97	17	ug/kg	1
Aroclor 1248	12672-29-6	8082	ND		97	17	ug/kg	1
Aroclor 1254	11097-69-1	8082	ND		97	5.7	ug/kg	1
Aroclor 1260	11096-82-5	8082	ND		97	3.5	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Decachlorobiphenyl		92	50-130
Tetrachloro-m-xylene		110	50-130

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

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E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

Organochlorine Pesticides by GC

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-002**

Description: **Hammond's Ferry** Matrix: **Solid**

Date Sampled: **12/08/2006 1100** % Solids: **17.5** **12/11/2006 2012**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3550B	8081A	10	12/15/2006 1429	SRW	12/11/2006 1815	49699

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Aldrin	309-00-2	8081A	ND		97	19	ug/kg	1
alpha-BHC	319-84-6	8081A	ND		97	22	ug/kg	1
beta-BHC	319-85-7	8081A	ND		97	17	ug/kg	1
delta-BHC	319-86-8	8081A	ND		97	18	ug/kg	1
gamma-BHC (Lindane)	58-89-9	8081A	ND		97	20	ug/kg	1
alpha-Chlordane	5103-71-9	8081A	ND		97	16	ug/kg	1
gamma-Chlordane	5103-74-2	8081A	ND		97	14	ug/kg	1
4,4'-DDD	72-54-8	8081A	ND		97	14	ug/kg	1
4,4'-DDE	72-55-9	8081A	ND		97	18	ug/kg	1
4,4'-DDT	50-29-3	8081A	ND		97	16	ug/kg	1
Dieldrin	60-57-1	8081A	ND		97	19	ug/kg	1
Endosulfan I	959-98-8	8081A	ND		97	19	ug/kg	1
Endosulfan II	33213-65-9	8081A	ND		97	14	ug/kg	1
Endosulfan sulfate	1031-07-8	8081A	ND		97	13	ug/kg	1
Endrin	72-20-8	8081A	ND		97	19	ug/kg	1
Endrin aldehyde	7421-93-4	8081A	ND		97	17	ug/kg	1
Endrin ketone	53494-70-5	8081A	ND		97	12	ug/kg	1
Heptachlor	76-44-8	8081A	ND		97	22	ug/kg	1
Heptachlor epoxide	1024-57-3	8081A	ND		97	18	ug/kg	1
Methoxychlor	72-43-5	8081A	ND		380	77	ug/kg	1
Toxaphene	8001-35-2	8081A	ND		4700	520	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Decachlorobiphenyl		125	50-130
Tetrachloro-m-xylene		72	50-130

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

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E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ICP-AES

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-002**

Description: **Hammond's Ferry** Matrix: **Solid**

Date Sampled: **12/08/2006 1100** % Solids: **17.5** **12/11/2006 2012**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3050B	6010B	1	12/13/2006 1232	MNM	12/11/2006 1430	49727
2	3050B	6010B	1	12/13/2006 1730	MNM	12/11/2006 1430	49727

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Arsenic	**7440-38-2**	**6010B**	**5.1**		**1.4**	**1.1**	**mg/kg**	**1**
Cadmium	**7440-43-9**	**6010B**	**0.24**	**BJ**	**0.57**	**0.060**	**mg/kg**	**1**
Calcium	**7440-70-2**	**6010B**	**2000**		**1400**	**100**	**mg/kg**	**1**
Chromium	**7440-47-3**	**6010B**	**40**		**1.4**	**0.29**	**mg/kg**	**1**
Copper	**7440-50-8**	**6010B**	**32**		**1.4**	**0.28**	**mg/kg**	**1**
Iron	**7439-89-6**	**6010B**	**20000**		**28**	**9.4**	**mg/kg**	**1**
Lead	**7439-92-1**	**6010B**	**43**		**1.4**	**0.53**	**mg/kg**	**1**
Magnesium	**7439-95-4**	**6010B**	**2700**		**1400**	**100**	**mg/kg**	**1**
Manganese	**7439-96-5**	**6010B**	**300**		**4.3**	**0.33**	**mg/kg**	**1**
Nickel	**7440-02-0**	**6010B**	**22**	**B**	**11**	**0.86**	**mg/kg**	**1**
Potassium	**7440-09-7**	**6010B**	**1800**		**1400**	**63**	**mg/kg**	**1**
Selenium	**7782-49-2**	**6010B**	**1.2**	**J**	**1.4**	**0.99**	**mg/kg**	**2**
Sodium	7440-23-5	6010B	ND		1400	98	mg/kg	1
Zinc	**7440-66-6**	**6010B**	**210**		**14**	**1.9**	**mg/kg**	**1**

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

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J = Estimated result < PQL and ≥ MDL

E = Quantitation of compound exceeded the calibration range

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

CVAA

Client: **Southeastern Natural Sciences Academy** Laboratory ID: **HL08045-002**

Description: **Hammond's Ferry** Matrix: **Solid**

Date Sampled: **12/08/2006 1100** % Solids: **17.5** **12/11/2006 2012**

Date Received: **12/08/2006**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		7471A	1	12/12/2006 1929	FLW	12/11/2006 2130	49805

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Mercury	7439-97-6	7471A	ND		0.47	0.078	mg/kg	1

PQL = Practical quantitation limit

ND = Not detected at or above the MDL

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

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E = Quantitation of compound exceeded the calibration range

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N = Recovery is out of criteria

SHEALY **Chain of Custody Record**

SHEALY ENVIRONMENTAL SERVICES, INC.
106 Vantage Point Drive
Cayce, South Carolina 29033
Telephone No. (803) 791-9700 Fax No. (803) 791-9111

Number 64413

Client: SNSA	Report to Contact:	Telephone No. / Fax No. / E-mail:	Quote No.:
Address: 1858 Cock and Dam Rd.	Sampler's Signature: x [signature]	Waybill No.:	Page 1 of 1
City: Augusta; State: GA; Zip Code: 30906	Printed Name: Brian Metts	Analysis (Attach list if more space is needed.)	
Project Name: Hammonds Ferry			
Project No.:	P.O. No.:		Lot No.: [illegible]

Sample ID / Description (Containers for each sample may be combined on one line.)	Date	Time	G=Grab C=Composite	Aqueous	Solid	Non-Aqueous	Unpres.	H2SO4	HNO3	HCl	NaOH	Na Thio	Metals Hg	[illegible]	BOD TSS [illegible]	[illegible]	[illegible] TSS [illegible]	[illegible]	Remarks / Cooler I.D.
Hammonds Ferry	12/8/06	10:40	G	X			6	1	1				1	1	2		1	3	
Hammonds Ferry	12/8/06	11:00	G		X		2						1					1	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison ☐ Unknown

Sample Disposal: ☐ Return to Client ☐ Disposal by Lab

Note: All samples are retained for six weeks from receipt unless other arrangements are made.

Turn Around Time Required (Prior lab approval required for expedited TAT.): ☐ Standard ☐ Rush (Specify)

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished by: [signature]	12/8/06	1600	1. Received by:		
2. Relinquished by:			2. Received by:		
3. Relinquished by:			3. Laboratory received by: [signature]	12/8/06	1600
Comments:			LAB USE ONLY — Received on ice (Circle): (Yes) No Ice Pack	Receipt Temp. 0.4 °C	

DISTRIBUTION: WHITE & YELLOW-Return to laboratory with Sample(s); PINK-Field/Client Copy

Document Number: F-AD-012 Effective Date: 08-04-02