

MULTI-CITY STUDY
FIELD REPORT FOR CLEVELAND TENNESSEE AND DECATUR
ALABAMA - BATTELLE DUXBURY ACTIVITIES

for

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TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 SURVEY SPECIFIC APPROVAL	1
2. METHODS	2
3. CHRONOLOGY	2
4. RESULTS.....	4
4.1 SAMPLE MATRIX AVAILABILITY	5
4.2 ONSITE OBSERVATIONS	5
4.3 INSTRUMENTATION RESULTS	10
4.4 COMMUNICATIONS	12
5. PROBLEMS EXPERIENCED AND RECOMMENDATIONS.....	12

LIST OF TABLES

TABLE 1 MUNICIPALITIES SAMPLED AND APPROVALS GRANTED DURING SURVEY.....	1
TABLE 2 CHRONOLOGY OF EVENTS ON MAY 24, 1999	2
TABLE 3 CHRONOLOGY OF EVENTS ON MAY 25, 1999	3
TABLE 4 CHRONOLOGY OF EVENTS ON MAY 26, 1999	3
TABLE 5 CHRONOLOGY OF EVENTS ON MAY 27, 1999	4
TABLE 6 CHRONOLOGY OF EVENTS ON MAY 28, 1999	4
TABLE 7 COLLECTED SAMPLES FROM CLEVELAND TN	6
TABLE 8 COLLECTED SAMPLES FROM DECATUR AL	8
TABLE 9 SAMPLING SITE POSITIONS IN CLEVELAND TN	11
TABLE 10 SAMPLING SITE POSITIONS IN DECATUR AL	11
TABLE 11 GPS POSITION VERIFICATION RESULTS	11

1. INTRODUCTION

The objective of the sampling task in this study is to collect representative samples for trace-level analysis of specific FC residuals, to assess sources, dispersion in the environment, and human exposure through the food chain. The cities selected for sample collection will be considered 'study' or 'control' cites. 'Study' cities are considered those areas with FC production facilities or large industrial FC-consumers. 'Control' cites do not contain FC production or consumption facilities and are matched to study cities based on general location, population size, and drinking water source.

During the initial phase of the study phone calls were made to municipal agencies requesting permission to collect various matrices of interest. Based upon the level of cooperation received from the municipal agencies, appropriate sampling strategies were developed. The Quality Assurance Project Plan (QAPP) and the Survey Plan contain the detailed information concerning the matrices for collection and methods to be utilized for this process.

The full project sampling scope is accomplished using two field teams: 1) Battelle's Duxbury Personnel collect drinking water, POTW, landfill and urban air samples, and 2) Battelle's Marine Sciences Laboratory (MSL) personnel collect surface water microlayer, bulk water and finfish samples. This report summarizes the Duxbury team effort. A separate report summarizes the MSL activities.

1.1 Survey Specific Approval

Approval was granted in Cleveland Tennessee from the Publicly Owned Treatment Works (POTW), municipal drinking water plant, and Cleveland Fire Department (for atmospheric sampling). Permission was not granted for sampling at the municipal landfill. Permission to sample was granted in Decatur Alabama for the POTW (including air sampling), municipal drinking water plant, and municipal landfill. The Decatur Fire Department denied access to their property for atmospheric sampling. Table 1 highlights the cities visited during this survey and the approvals granted by municipal departments.

Table 1. Municipalities Sampled and Approvals Granted During Survey

City	Study or Control	Fire Department (Air Sampling)	POTW	Drinking Water Plant	Municipal Landfill
Decatur, AL	Study	NA	[*]	[]	[]
Cleveland, TN	Control	[]	[]	[]	NA

NA = No Approval Received

- Air sample collected

2. METHODS

The collection of environmental samples is conducted according to Standard Operation Procedures (SOP's). The SOP's used in the Multi-City Study were written by Battelle and are used to train personnel prior to conducting field activities and also serve as a reference documents while in the field. These documents, along with the QAPP, serve as the guidance documents for the collection of field samples. The methods used for collection are summarized below. The collection of position data (latitude and longitude) was completed at each sampling location using a Garmin 12XL GPS unit according to Battelle SOP 3-164-01. Instrument accuracy was validated by comparing an acquired position versus a position of known location. The collection of air samples was completed using a General Metals Model PS-1 atmospheric sampler. The sampling was conducted according to Battelle SOP M3-MC-F-1.1. The use of this system allows the separate collection of particulate and vapor phase compounds using a glass fiber filter for particulate matter and a polyurethane foam PUF for the vapor phase. Water samples from drinking water supplies, POTW's, and landfills were collected according to SOP M3-F-2.0. Surface water samples were collected via direct submersion, tap water and drinking water supplied by the municipal plant were collected via a valve system, and effluent was collected using either a bucket or small sampling beaker. Sediment samples were collected using Battelle SOP M3-F-7.0. Both sludge and sediment were collected using a stainless steel spoon.

3. CHRONOLOGY

Tables 2 through 6 provide a detailed chronology of the events that occurred each day of the survey. The times recorded for the collection of each sample matrix has been transcribed from the sample collection log, all other times have been estimated based on the events of the day. All times have been recorded in Eastern Standard Time.

Table 2. Chronology of Events on May 24, 1999

0615	Battelle Duxbury personnel depart Boston.
0900	Arrive in Atlanta, GA and meet with Kim Andrews.
1130	Arrive in Chattanooga, TN.
1145	Pick up rental van and proceed to Federal Express to retrieve sampling materials. All materials present and accounted for.
1300	Depart Chattanooga and proceed to Cleveland, TN.
1400	Arrive in Cleveland and check into hotel. Proceed to have kick off meeting over lunch. During the meeting it is discovered that more sampling materials are required for air sampler.
1500	Arrive at fire station and place air sampling unit behind building for sample collection.
1545	Conduct calibration of air sampler and start sampling for 12hr period.
1600	Meet with Paul Pitts, the assistant manager of the water division of Cleveland Utilities. He provides maps, directions, and informs the managers of the plants of our scheduled arrival.
1630	Return to hotel. Battelle Columbus contacted and more supplies are scheduled for shipment to Chattanooga.

Table 3. Chronology of Events on May 25, 1999

0730	Arrive at the fire station, air sampler did not stop at end of 12hr period. Sampling event concluded at 0745. Cleaned sampler and placed the PUF and filter blanks into the sampler. Blanks remained in sampler for ~30 seconds, they were then placed in storage or shipment.
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Table 3 Continued

1000	Arrive at Cleveland Utilities Wastewater Treatment Plant (WWTP). Discuss sampling with Mr. Mike Ward who was the supervisor for the shift, no significant issues raised.
1015	Collect post centrifuged sludge. Used stainless steel spoon for collection
1030	Collect chlorinated effluent sample via old steel pail. Collection assistance provided by plant employee. Complete collection at 1055. Following collection of sample Kim Andrews departed the team to return to Columbus.
1100	Benchmark discovered at the WWTP, inquired about the coordinates from the plant employee. He contacted a member of the city engineering department who provided the coordinates for the benchmark. The coordinates are, N 35°18'35.0" W 85°47'54.0".
1210	Arrive at Hiwassee drinking water plant. Spoke with Chris Wiles who is the manager of the plant water quality lab. Collect raw untreated river water and post filtration drinking water from water quality lab.
1420	Arrive at State access area located on Hiwassee River. This access area was used to collect surface water and sediment samples.
1450	Collect surface water and sediment sample at Site 1.
1520	Collect surface water and sediment sample at Site 2.
1535	Collect surface water and sediment sample at Site 3.
1630	Collect Site 1 tap water from room 107 of Baymont Hotel.
1700	Commence spiking of field spike samples
1820	Prepare samples for shipping.
2015	Collect Site 2 tap water from an Amoco gas station/convenience store located at the intersection of Routes 60 and 75.
2145	Collect Site 3 tap water from Tennessee Jack's Café.

Table 4. Chronology of Events on May 26, 1999

0800	Collect GPS locations at the three tap water sites.
0830	Depart for Chattanooga.
0915	Arrive in Chattanooga.
0930	Finalize shipping logistics. (Samples were repacked in garbage bags because of leaking water). Copies made of Chain of Custody Sheets.
1115	Rendezvous with Rosanna Buhl at the Chattanooga Airport.
1200	Ship Cleveland TN samples via Federal Express to their respective destinations. Picked up air sampler supplies (filters, PUF's, and field spike samples).
1210	Depart for Decatur, AL.
1430	Receive phone call from Marcia Nishioka. The client and Decatur Utilities manager Kem Carr agreed to a confidentiality agreement that would allow us to sample from the POTW and the drinking water plant.
1440	Call Kem Carr to confirm sampling approval and inform him that we are expecting to begin sampling within the day.
1510	Arrive at the Dry Creek WWTP and meet with Ed Buyers the plant supervisor. Begin calibration of instrument.

1540	Air sampling initiated.
1600	Arrive at hotel and begin preparing water-sampling bottles for the following day.

Table 5. Chronology of Events on May 27, 1999

Table 5. Continued : at Dry Creek WWTP. Collect air sample, air sampler stopped automatically after 12 hours. Clean unit and collect QC samples including an extra field spike sample.	
0930	Collect effluent sample using 500ml-sample collector that the facility provided. The sample was collected from the spillway that led to the discharge pipe. The effluent is discharged ~500 feet into the river where the channel exists.
1015	Jim Meares collected liquid sludge from a collection tank using a plastic jar. No GPS location recorded; the collection tank was ~500yds from the air sampling location.
1045	Arrive at Decatur Water Plant. Collect raw and final processed drinking water. Samples collected in the water quality lab of the facility; Richard Blackwood was the technician on duty during our collection.
1125	Collect quiet water body sample from the Northwest corner of Flint Creek. The area was located across from the Decatur Country Club. It was north of Country Club Lane S.E. by ~200-300 yards.
1300	Collect surface water and sediments at sites 1, 2, and 3 from the Riverwalk Marina complex located on the Tennessee River.
1410	Collect tap water from Site 2 located at the Decatur Boat Harbor (within Riverwalk complex).
1435	Arrive at Morgan County Landfill. Present site manager Richard Terry, with a request letter that was required prior to our collection of samples. Following a terse discussion we proceeded to the leachate pond unsupervised and collect leachate sample.
1550	Collect Site 3 tap water from a Texaco gas station/convenience store on Route 67 in Decatur.
1635	Collected Site 1 tap water from room 207 of the Hampton Inn.
1710	Field spike samples were processed, samples segregated, and coolers packaged for shipping.

Table 6. Chronology of Events on May 28, 1999

0645	Depart for Chattanooga.
0945	Arrive in Chattanooga, paperwork completed for sample shipment, coolers repackaged for shipment.
1030	Arrive at Federal Express and ship all samples and equipment to there respective destinations
1300	Depart Chattanooga for Boston.

4. RESULTS

The initial survey of the Multi-City Study resulted in the collection of the majority of the samples described in Tables 3 through 5 of the QAPP. Also collected but not included in Tables 3 through 5 of the QAPP were samples for the client and a third laboratory specified by the client. The collection of these samples tripled the number of water and sediment samples taken. The samples were collected and processed in the same manner as those intended for Battelle. The following sections describe the results of the sample collection effort that occurred during

this survey. Tables 7 and 8 provide a list of the samples collected including sampling locations and sample ID's. Tables 7 and 8 do not contain the Quality Assurance samples collected along with authentic samples.

4.1 Sample Matrix Availability

Per client instructions no food items were collected during survey. Due to scheduling and permit issues no finfish were collected during this survey. The collection of POTW influent was not collected at either Cleveland or Decatur due to health concerns. Both POTW influent streams available for sampling contained biological hazards. In both cities, the staff at the facilities indicated that the chlorination process occurs following secondary treatment.

Neither landfill leachate nor an alternative sample was collected for the municipality of Cleveland, TN. The reasoning that an alternative sample was not sought after is based on the following information. A discussion with the manager of the landfill in February resulted in the denial of permission to collect a sample. During this discussion it was revealed that the leachate from the landfill is pumped to the POTW for treatment. During subsequent discussions with Cleveland Utilities an offer was made to remove a manhole cover that would allow us access to the leachate as it is pumped in from the landfill. However, because we had not been granted permission it was decided that we would not collect the leachate sample. With the sample unattainable and the leachate pumped from the landfill it reasoned that the leachate would not be migrating from the landfill and entering a nearby water source. Therefore, no alternative site was collected.

Also to be collected, but not included in the QAPP, was a sample of quiet/undisturbed surface water. This sample is intended for use in a long-term transport study that is currently being conducted. In Cleveland we were unable to collect this sample because access was unavailable to the pond selected as a sampling site as it was located on private property. A sample was collected at Flint Creek in Decatur.

4.2 Onsite Observations

Cleveland, TN: The drinking water plant withdrawal location is approximately 2 miles east/northeast of the plant in the Hiwassee River. The location of the surface water site is at the end of Eades or Eads road. One spelling was observed on a local street sign and the other displayed on a local map. The site is a small state access area located at the tip of the peninsula. The area appeared highly utilized by the local population for recreational activities.

Decatur, AL: The Riverwalk Marina complex where surface water and sediments were collected is located adjacent to the Highway 72 bridge that traverses the Tennessee River into Decatur. This area is a highly active marina complex, several people were observed fishing from the banks. Several dead catfish were observed along the shore. A semi-softshelled turtle of unknown species was observed at Site 2. At the Morgan County Landfill the leachate sample was collected from a recently constructed collection pond. This previously sampled pond

(December 1998) was surrounded by vegetation and access would have been extremely difficult. The pond sampled during this survey contained a variety of wildlife living in and or around it. Several turtles, multitudes of insects and larvae, and various birds were observed feeding at the pond.

Table 7. Collected Samples from Cleveland TN

Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
Drinking Water Processed	MC-121B	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-122B	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-123B	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-124B	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-125B	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-121K	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-122K	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-123K	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-124K	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-125K	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-121H	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-123H	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-124H	1	Hiwassee Drinking Water Plant
Drinking Water Processed	MC-125H	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-115B	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-116B	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-117B	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-118B	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-119B	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-115K	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-116K	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-117K	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-118K	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-119K	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-115H	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-117H	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-118H	1	Hiwassee Drinking Water Plant
Drinking Water Unprocessed	MC-119H	1	Hiwassee Drinking Water Plant
Tap Water Site #1	MC-126B	1	Baymont Hotel
Tap Water Site #1	MC-127B	1	Baymont Hotel
Tap Water Site #1	MC-128B	1	Baymont Hotel
Tap Water Site #1	MC-129B	1	Baymont Hotel
Tap Water Site #1	MC-130B	1	Baymont Hotel
Tap Water Site #1	MC-126K	1	Baymont Hotel
Tap Water Site #1	MC-127K	1	Baymont Hotel
Tap Water Site #1	MC-128K	1	Baymont Hotel
Tap Water Site #1	MC-129K	1	Baymont Hotel
Tap Water Site #1	MC-130K	1	Baymont Hotel
Tap Water Site #1	MC-126H	1	Baymont Hotel
Tap Water Site #1	MC-127H	1	Baymont Hotel
Tap Water Site #1	MC-128H	1	Baymont Hotel

Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
Tap Water Site #1	MC-129H	1	Baymont Hotel
Table 7. Continued	MC-130H	1	Baymont Hotel
Tap Water Site #2	MC-131B	1	Amoco Gas Station
Tap Water Site #2	MC-131K	1	Amoco Gas Station
Tap Water Site #2	MC-131H	1	Amoco Gas Station
Tap Water Site #3	MC-132B	1	Tennessee Jacks Café
Tap Water Site #3	MC-132K	1	Tennessee Jacks Café
Tap Water Site #3	MC-132H	1	Tennessee Jacks Café
Surface Water Site #1	MC-101B	1	Hiwassee River
Surface Water Site #1	MC-102B	1	Hiwassee River
Surface Water Site #1	MC-103B	1	Hiwassee River
Surface Water Site #1	MC-104B	1	Hiwassee River
Surface Water Site #1	MC-105B	1	Hiwassee River
Surface Water Site #1	MC-101K	1	Hiwassee River
Surface Water Site #1	MC-102K	1	Hiwassee River
Surface Water Site #1	MC-103K	1	Hiwassee River
Surface Water Site #1	MC-104K	1	Hiwassee River
Surface Water Site #1	MC-105K	1	Hiwassee River
Surface Water Site #1	MC-101H	1	Hiwassee River
Surface Water Site #1	MC-102H	1	Hiwassee River
Surface Water Site #1	MC-103H	1	Hiwassee River
Surface Water Site #1	MC-104H	1	Hiwassee River
Surface Water Site #1	MC-105H	1	Hiwassee River
Surface Water Site #2	MC-106B	1	Hiwassee River
Surface Water Site #2	MC-106K	1	Hiwassee River
Surface Water Site #2	MC-106H	1	Hiwassee River
Surface Water Site #3	MC-107B	1	Hiwassee River
Surface Water Site #3	MC-107K	1	Hiwassee River
Surface Water Site #3	MC-107H	1	Hiwassee River
Sediment Site #1	MC-110B	200*	Hiwassee River
Sediment Site #1	MC-110K	200*	Hiwassee River
Sediment Site #1	MC-110H	200*	Hiwassee River
Sediment Site #2	MC-111B	200*	Hiwassee River
Sediment Site #2	MC-111K	200*	Hiwassee River
Sediment Site #2	MC-111H	200*	Hiwassee River
Sediment Site #3	MC-112B	200*	Hiwassee River
Sediment Site #3	MC-112K	200*	Hiwassee River
Sediment Site #3	MC-112H	200*	Hiwassee River
POTW Effluent	MC-139B	1	Cleveland Municipal POTW
POTW Effluent	MC-140B	1	Cleveland Municipal POTW
POTW Effluent	MC-141B	1	Cleveland Municipal POTW
POTW Effluent	MC-142B	1	Cleveland Municipal POTW
POTW Effluent	MC-139K	1	Cleveland Municipal POTW
POTW Effluent	MC-140K	1	Cleveland Municipal POTW
POTW Effluent	MC-141K	1	Cleveland Municipal POTW
POTW Effluent	MC-142K	1	Cleveland Municipal POTW
POTW Effluent	MC-139H	1	Cleveland Municipal POTW
POTW Effluent	MC-141H	1	Cleveland Municipal POTW
POTW Effluent	MC-142H	1	Cleveland Municipal POTW



Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
POTW Sludge	MC-144B	200*	Cleveland Municipal POTW
POTW Sludge	MC-144K	200*	Cleveland Municipal POTW
POTW Sludge	MC-144H	200*	Cleveland Municipal POTW
Urban Air (Vapor)	MC-146	1 Filter	Cleveland Fire Department
Urban Air (Particulate)	MC-147	1 PUF	Cleveland Fire Department

Table 8. Collected Samples from Decatur AL

Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
Drinking Water Processed	MC-221B	1	Decatur Water Plant
Drinking Water Processed	MC-222B	1	Decatur Water Plant
Drinking Water Processed	MC-223B	1	Decatur Water Plant
Drinking Water Processed	MC-224B	1	Decatur Water Plant
Drinking Water Processed	MC-225B	1	Decatur Water Plant
Drinking Water Processed	MC-221K	1	Decatur Water Plant
Drinking Water Processed	MC-222K	1	Decatur Water Plant
Drinking Water Processed	MC-223K	1	Decatur Water Plant
Drinking Water Processed	MC-224K	1	Decatur Water Plant
Drinking Water Processed	MC-225K	1	Decatur Water Plant
Drinking Water Processed	MC-221H	1	Decatur Water Plant
Drinking Water Processed	MC-223H	1	Decatur Water Plant
Drinking Water Processed	MC-224H	1	Decatur Water Plant
Drinking Water Processed	MC-225H	1	Decatur Water Plant
Drinking Water Unprocessed	MC-215B	1	Decatur Water Plant
Drinking Water Unprocessed	MC-216B	1	Decatur Water Plant
Drinking Water Unprocessed	MC-217B	1	Decatur Water Plant
Drinking Water Unprocessed	MC-218B	1	Decatur Water Plant
Drinking Water Unprocessed	MC-219B	1	Decatur Water Plant
Drinking Water Unprocessed	MC-215K	1	Decatur Water Plant
Drinking Water Unprocessed	MC-216K	1	Decatur Water Plant
Drinking Water Unprocessed	MC-217K	1	Decatur Water Plant
Drinking Water Unprocessed	MC-218K	1	Decatur Water Plant
Drinking Water Unprocessed	MC-219K	1	Decatur Water Plant
Drinking Water Unprocessed	MC-215H	1	Decatur Water Plant
Drinking Water Unprocessed	MC-217H	1	Decatur Water Plant
Drinking Water Unprocessed	MC-218H	1	Decatur Water Plant
Drinking Water Unprocessed	MC-219H	1	Decatur Water Plant
Tap Water Site #1	MC-226B	1	Hampton Inn
Tap Water Site #1	MC-227B	1	Hampton Inn
Tap Water Site #1	MC-228B	1	Hampton Inn
Tap Water Site #1	MC-229B	1	Hampton Inn
Tap Water Site #1	MC-230B	1	Hampton Inn
Tap Water Site #1	MC-226K	1	Hampton Inn
Tap Water Site #1	MC-227K	1	Hampton Inn
Tap Water Site #1	MC-228K	1	Hampton Inn
Tap Water Site #1	MC-229K	1	Hampton Inn
Tap Water Site #1	MC-230K	1	Hampton Inn
Tap Water Site #1	MC-226H	1	Hampton Inn



Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
Tap Water Site #1	MC-228H	1	Hampton Inn
Tap Water Site #1	MC-229H	1	Hampton Inn
Tap Water Site #1	MC-230H	1	Hampton Inn
Table 8. Continued	MC-231B	1	Decatur Boat Harbor
	MC-231K	1	Decatur Boat Harbor
Tap Water Site #2	MC-231H	1	Decatur Boat Harbor
Tap Water Site #3	MC-232B	1	Texaco Gas Station
Tap Water Site #3	MC-232K	1	Texaco Gas Station
Tap Water Site #3	MC-232H	1	Texaco Gas Station
Surface Water Site #1	MC-201B	1	Tennessee River
Surface Water Site #1	MC-202B	1	Tennessee River
Surface Water Site #1	MC-203B	1	Tennessee River
Surface Water Site #1	MC-204B	1	Tennessee River
Surface Water Site #1	MC-205B	1	Tennessee River
Surface Water Site #1	MC-201K	1	Tennessee River
Surface Water Site #1	MC-202K	1	Tennessee River
Surface Water Site #1	MC-203K	1	Tennessee River
Surface Water Site #1	MC-204K	1	Tennessee River
Surface Water Site #1	MC-205K	1	Tennessee River
Surface Water Site #1	MC-201H	1	Tennessee River
Surface Water Site #1	MC-202H	1	Tennessee River
Surface Water Site #1	MC-203H	1	Tennessee River
Surface Water Site #1	MC-204H	1	Tennessee River
Surface Water Site #1	MC-205H	1	Tennessee River
Surface Water Site #2	MC-206B	1	Tennessee River
Surface Water Site #2	MC-206K	1	Tennessee River
Surface Water Site #2	MC-206H	1	Tennessee River
Surface Water Site #3	MC-207B	1	Tennessee River
Surface Water Site #3	MC-207K	1	Tennessee River
Surface Water Site #3	MC-207H	1	Tennessee River
Sediment Site #1	MC-210B	200*	Tennessee River
Sediment Site #1	MC-210K	200*	Tennessee River
Sediment Site #1	MC-210H	200*	Tennessee River
Sediment Site #2	MC-211B	200*	Tennessee River
Sediment Site #2	MC-211K	200*	Tennessee River
Sediment Site #2	MC-211H	200*	Tennessee River
Sediment Site #3	MC-212B	200*	Tennessee River
Sediment Site #3	MC-212K	200*	Tennessee River
Sediment Site #3	MC-212H	200*	Tennessee River
POTW Effluent	MC-239B	1	Dry Creek WWTP
POTW Effluent	MC-240B	1	Dry Creek WWTP
POTW Effluent	MC-241B	1	Dry Creek WWTP
POTW Effluent	MC-242B	1	Dry Creek WWTP
POTW Effluent	MC-239K	1	Dry Creek WWTP
POTW Effluent	MC-240K	1	Dry Creek WWTP
POTW Effluent	MC-241K	1	Dry Creek WWTP
POTW Effluent	MC-242K	1	Dry Creek WWTP
POTW Effluent	MC-239H	1	Dry Creek WWTP
POTW Effluent	MC-241H	1	Dry Creek WWTP

Matrix	Sample ID	Approximate Total Volume Collected (L) or *Sediment Mass (g)	Location Collected
POTW Effluent	MC-242H	1	Dry Creek WWTP
POTW Sludge	MC-244B	200*	Dry Creek WWTP
POTW Sludge	MC-244K	200*	Dry Creek WWTP
POTW Sludge	MC-244H	200*	Dry Creek WWTP
Quiet Surface Water ¹	MC-284B	1	Flint Creek
Quiet Surface Water ¹	MC-284K	1	Flint Creek
Quiet Surface Water ¹	MC-284H	1	Flint Creek
Landfill Leachate	MC-235B	1	Morgan County Landfill
Landfill Leachate	MC-235K	1	Morgan County Landfill
Landfill Leachate	MC-235H	1	Morgan County Landfill
Urban Air (Vapor)	MC-246	1 Filter	Dry Creek WWTP
Urban Air (Particulate)	MC-247	1 PUF	Dry Creek WWTP

Table 8. Continued

¹ Samples are not part of the Multi-City Study

4.3 Instrumentation Results

Air samples were collected using a General Metals Model PS-1 air sampler. According to SOP M3-MC-F1.1 the air sampler calibration is acceptable if it is within 10% of the expected results. To determine the acceptable results a calibration was conducted in Duxbury prior to the initiation of the study. The initial calibration curve resulted in an R^2 value of 0.997. The calibration curves generated in Cleveland and Decatur had R^2 values of 0.997 and 0.996 respectively. The percent difference in recorded values from the initial calibration ranged from -1.92% to 3.70% for Cleveland and 0% to 6.56% for Decatur, respectively.

The location of each sampling site was determined using a Garmin 12 XL GPS, the results are presented in Tables 9 and 10. The accuracy of the GPS unit was verified prior to departure from Duxbury by comparing a benchmark at Battelle versus the measured location determined by the instrument. The difference the true and measured coordinates was 0.01 kilometers. Following shipment to Tennessee the instrument was reinitialized. This was conducted at the Baymont Hotel on May 24th. Within several minutes of the process, the unit was displaying maps and locations of the local area, which indicated that it was working properly. The results of the verifications for each sampling day are presented in Table 11.

The result of the verification for Cleveland was a difference of 0.11 kilometers between the "true" and measured coordinates. Although the verification is beyond the acceptance criteria, the position data for the day will be considered valid because it appeared that while the instrument was receiving data, the Department of Defense might have adjusted the satellite selective availability. The instrument did not record a constant position over a five-minute period and the position appeared to change in a regulated step manner.

The result of the verification in Decatur resulted in a difference of 1.68 kilometers between the "true" and measured coordinates. The reference point that was used for the verification was that of the discharge for the plant. During the verification the plant manager suspected that the reference position was that of the plant outflow located onsite. Based on the substantial

difference in positions further investigation was conducted. Subsequently it has been discovered that the position is the termination point of the discharge pipe located in the river. Based on this information verification was not possible for that day.

According the QAPP the minimum distance between sediment sampling sites positions is 500 feet apart. The following results have been calculated using the Garmin GPS. The distance from Cleveland Site 1 to Site 2 is 229.6', the distance from Site 2 to Site 3 is 196.8' and the distance from Site 1 to Site 3 is 360.8'. Sampling at Cleveland did not meet the QAPP requirements. The distance from Decatur Site 1 to Site 2 is 951.2', the distance from Site 2 to Site 3 is 754.4' and the distance from Site 1 to Site 3 is 1,148'.

Table 9. Sampling Site Positions in Cleveland TN

Sampling Location	Latitude	Longitude	Address
Hiwassee Drinking Water Plant	N 35°16'01.5"	W 84°45'31.9"	114 Valley Road
Baymont Hotel	N 35°11'34.2"	W 84°53'28"	Routes 60 and 75
Amoco Gas Station	N 35°11'44.1"	W 84°53'20.9"	Routes 60 and 75
Tennessee Jacks Café	N 35°11'38"	W 84°53'28.2"	Routes 60 and 75
Hiwassee River Site #1 ^T	N 35°20'38.2"	W 84°51'10.4"	Eads Bluff Road
Hiwassee River Site #2 ^T	N 35°20'40.3"	W 84°51'10.8"	Eads Bluff Road
Hiwassee River Site #3 ^T	N 35°20'40.8"	W 84°51'13.1"	Eads Bluff Road
Cleveland Municipal POTW	N 35°18'35"	W 84°47'58.2"	Lower River Road
Cleveland Fire Department	N 35°09'19.5"	W 84°52'41.9"	555 Ocoee Road

T= Transcribed data in log

Table 10. Sampling Site Positions in Decatur AL

Sampling Location	Latitude	Longitude	Address
Decatur Water Plant	N 34°36'14.7"	W 86°57'41.7"	Market Street
Hampton Inn	N 34°34'41.4"	W 87°01'13.5"	Route 67
Decatur Boat Harbor	N 34°36'57.2"	W 86°58'16.1"	Riverwalk Marina
Texaco Gas Station	N 34°35'26.9"	W 87°01'50.3"	Route 67
Tennessee River Site #1	N 34°37'03.2"	W 86°58'08.2"	Riverwalk Marina
Tennessee River Site #2	N 34°37'07.1"	W 86°58'18.7"	Riverwalk Marina
Tennessee River Site #3	N 34°37'00.1"	W 86°58'21.3"	Riverwalk Marina
Dry Creek WWTP (Effluent Sample)	N 34°37'31.5"	W 86°59'55.7"	Highway 20
Dry Creek WWTP (Air Sample)	N 34°37'20.4"	W 86°59'53.8"	Highway 20
Morgan County Landfill	N 34°37'19"	W 87°06'02"	Highway 20
Flint Creek	N 34°33'59.4"	W 86°57'55.6"	Country Club Road

Table 11. GPS Position Verification Results

Calibration Locations	Cleveland TN	Decatur AL
Waypoint Position at POTW	N 35°18'35" / W 84°47'54"	N 34°38'10" / W 86°59'09"
GPS Derived Position	N 35°18'35" / W 84°47'58.2"	N 34°37'31.4" / W 86°59'55.7"
Difference	0.11 kilometers - bearing 93°	1.68 kilometers - bearing 47°

4.4 Communications

During the completion of the field survey, several conversations regarding the sampling effort were noted. These communications were conducted between Battelle staff and various municipal employees or the public.

In Cleveland, TN, Chief Gaylor of the CFD was informed that a donation to the St. Jude's Hospital would be sent directly from Columbus in their name. We must ensure that this effort is completed. Paul Pitts the Assistant Manager of Cleveland Utilities Water Division provided maps to the facilities and reiterated his offer to allow us to sample the landfill leachate as it is pumped to the POTW.

On May 21, 1999 a call was received from Kem Carr of Decatur Utilities indicating that he would not allow the sampling to occur at the POTW or Drinking Water Plant if he was not informed of the client. Following the conversation, Marcia Nishioka was contacted and made aware of the situation. In response to the situation it was decided by the client and Battelle that a confidentiality agreement revealing the identity of the client would be drafted and offered to Mr. Carr. A conversation between Ms. Nishioka and Mr. Carr resulted in an agreement in which the client's identity was revealed in confidence, and in return were allowed to collect samples at the POTW and the drinking water plant. The agreement was completed on Wednesday May 26, 1999. Later on May 26th during a conversation between Mr. Carr and Scott Macomber, the sampling team leader, Mr. Carr indicated that he wanted to speak to the client directly. Mr. Macomber indicated that he would inform the project manager of the situation. On May 27th Mr. Carr directly contacted the manager of the local manufacturing plant for further information.

Mr. Carr's employees at the POTW inquired several times about what we were looking for during our visit to the facility. During the calibration of the air sampler Michael Deck, an assistant supervisor at the plant asked if we were sampling for Molybdenum. He revealed that the facility had discharge exceedences in the recent past due to local industry input.

There were no other pertinent conversations surrounding the collection of samples at the various facilities that were sampled. During the course of collecting surface water samples in both Decatur and Cleveland, members of the general public inquired about the sampling effort. In each case a general answer was offered and all interested parties were satisfied.

5. PROBLEMS EXPERIENCED AND RECOMMENDATIONS

During the collection of samples from Cleveland TN and Decatur AL the following QAPP deviations were encountered

- The QAPP Section 12.2 states that "samples will be shipped at the end of each collection day for next-day delivery". In both cities logistical problems prevented the samples from being shipped on the same day that they were collected. Cleveland samples were collected on Tuesday May 25th and shipped on Wednesday May 26th. Decatur samples were collected on

Thursday May 27th and shipped on Friday May 28th. Battelle project leaders have indicated that samples can be chilled (on ice) overnight and shipped the following day when adequate time is available, and that this change to protocol will be addressed in an addendum to the QAPP.

- The samples collected in Decatur were shipped on Friday May 28th and were not specifically marked for a Saturday delivery, resulting in a 4-day period in transit. Samples were delivered Tuesday June 1st. Prior to the next survey logistical preparations will be in place for Saturday delivery to recipient laboratories.

Battelle's Sampling Task Quality Assurance Officer, Rosanna Buhl, conducted a field audit during these surveys and has prepared an internal report to improve field operations and ensure full compliance with the QAPP and SOPs. In response to Battelle's internal audit, the field crew will redesign several field log forms to help facilitate timely and accurate data recording.

Field Report Addendum – Cleveland, TN and Decatur, AL

Atmospheric Sampling Details. The following details are included here to complete the field record with respect to sampler positioning.

Cleveland, TN: The air sampler at this site was positioned approximately 4 feet from the fire department headquarters located at 555 S. Ocoee Street.

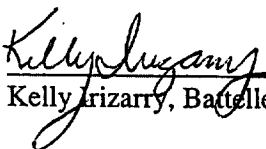
Decatur, AL: The air sampler in Decatur was positioned approximately 3 to 4 feet from the Dry Creek wastewater treatment plant.

Surface Water Sampling. The following details are included here to complete the field record with respect to site characteristics.

Cleveland, TN: The surface water collected at each of 3 within 2 m of shore in ca. 0.5 m depth. Re-suspended bottom sediments were avoided in each case.

Decatur, AL: The surface water collected from the local river system was collected at each of the 3 sites within 2 m of shore in ca. 0.5 m depth. Re-suspended bottom sediments were avoided in each case.

Additionally, a single "quiescent" water site was sampled within Flint Creek accessed from Country Club Road. The sample was also collected within 2 m of shore in ca. 0.5 m depth. Re-suspended bottom sediments were avoided.



Kelly Grizarr, Battelle Duxbury Operations

12/6/99
Date