

AR226-0072
EM-10

**Battelle Field Sampling Procedures Review
Columbus Georgia City Survey
regarding
Empirical Human Exposure Assessment
Multi-City Study**

To

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Prepared by

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Review Objective

The objective of the on-site review was to observe the sampling and handling techniques used by Battelle during the Columbus, Georgia city survey for appropriateness and completeness within the context of the Multi-City Human Exposure Assessment Study (MCHEAS).

City Survey Scope

The sampling performed in Columbus, Georgia included the following sampling sources and types:

- 1) Urban Ambient Air
 - particulate phase
 - vapor phase
- 2) Drinking Water
 - surface water source (three distinct locations at least 500 feet apart)
 - sediment (coincident with surface water locations above)
 - water treatment plant inlet
 - water treatment plant final outlet
 - tap water from water distribution system (three distinct locations)
- 3) Wastewater (POTW)
 - final effluent
 - final sludge
- 4) Sanitary Landfill
 - Leachate
- 5) Quiet Water
 - surface water

Review Criteria

The criteria used to conduct the on-site review are based on the Quality Assurance Project Plan (QAPP) dated May 14, 1999 prepared by Battelle. Observations were made and questions were asked that directly addressed whether or not specific details documented in the QAPP were actually performed on site. Additionally, observations were made regarding the appropriateness of the sampling techniques followed in light of fluorochemical (FC) characteristics.

Chronology

The following is a list of sample locations, dates, times, and types.

Location	Date	Time	Source	Type
Fire Station #1 201 10 th Street	7/26/99	16:20 start	Urban Ambient Air	Particulate Vapor
Fire Station #1 201 10 th Street	7/27/99	4:20 stop	Urban Ambient Air	Particulate Vapor
Fire Station #1 201 10 th Street	7/27/99	8:30	Drinking Water	Tap Water Kitchen Sink
Water Treatment Plant	7/27/99	9:42	Drinking Water	Outlet
Oliver Lake Chattahoochee River	7/27/99	10:16	Drinking Water	Surface Water Source Inlet to Water Plant
Oliver Lake Chattahoochee River	7/27/99	10:30	Drinking Water	Surface Water Source Surface water
Oliver Lake Chattahoochee River	7/27/99	10:35	Drinking Water	Sediment
Oliver Lake Chattahoochee River	7/27/99	11:05	Drinking Water	Surface Water Source Bay area near Roaring Branch River

Location	Date	Time	Source	Type
Oliver Lake Chattahoochee River	7/27/99	11:10	Drinking Water	Sediment
Oliver Lake Chattahoochee River	7/27/99	11:15	Drinking Water	Surface Water Source Bay area near Roaring Branch River, Marina
Oliver Lake Chattahoochee River	7/27/99	11:20	Drinking Water	Sediment
Municipal Marina	7/27/99	11:35	Drinking Water	Tap Water Public Lavatory
Hieferhorn Creek	7/27/99	12:10	Quiet Water	Surface Water - pond overflow to creek
Pine Grove Landfill	7/27/99	14:15	Leachate	Leachate Flowing into sump
POTW	7/27/99	16:00	Wastewater	Final Effluent
POTW	7/27/99	16:10	Wastewater	Final Sludge
Holiday Inn	7/27/99	17:00	Drinking Water	Tap Water Room #204

Discussion

Jess Eldridge (3M) and Susan Beach (3M) held several discussions regarding the Columbus City Survey during the week of 7/19/99. Jess made plans to meet with the Battelle sampling team in Columbus, Georgia to conduct the on-site review. The Battelle sampling team members were Kelly Irizarry, Scott Macomber, and Chris Gagnon. Kelly was contacted to coordinate a meeting of the sampling team on Monday 7/26/99 in Columbus, Georgia at the Public Safety Center located at 510 10th Street. Contact with Fire Chief Schmidt was planned to initiate the sampling activities for the next two days. The following paragraphs address each event in chronological order. Each paragraph briefly describes what was done followed by reviewer comments. Underlined comments indicate areas of concern that warrant further discussion. Overall reviewer comments are listed at the end of the discussion. Photographs were taken throughout the city survey which were scanned and included in the photograph section.

Day 1, Monday 7/26/99

After traveling to Columbus and meeting Chief Schmidt, the Ambient Urban Air Sampler was set up. The sampler was set up on the ground near a wash area behind Fire Station #1 located at 201 10th Street. See the scanned images of the sampling location in the photograph section. Initially there was trouble getting the unit to operate; improper power connection. No timer switch was shipped with the sampler therefore one had to be purchased. After a switch was purchased they went ahead with the set-up. According to the QAPP; the sampler was set up at 15:00 hours $\pm$ three hours (start time 16:20 hours), an initial totalizer reading was recorded, and the sampler was set to run 12 hours. The coordinates of the sampler location were recorded based on a hand held Global Positioning System (GPS).

Reviewer Comments: The initial troubles were resolved quickly and effectively, documentation was thorough, personnel wore disposable gloves while handling critical components of sampling train, and aluminum foil wrapping was in place on pre-cleaned parts.

Method TO-13 "Determination of Benzopyrene and Other Polynuclear Aromatic (PAH) in Ambient Air Using GC/HPLC" was cited in the QAPP as the method followed to perform the ambient air sampling. It may be more accurate to state that a modified method TO-13 was followed in that the compounds of interest for this study are FC's and not PAH's. The analytical portion of TO-13 are detailed and the techniques used to analyze the particulate and PUF filters should be audited. An audit should also include a review of cleaning procedures used to prepare filters for use. TO-13 is part of the EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. This version was published

in 1989. For future reference a new version, TO-13A was published in January 1997 and should be considered as a replacement for TO-13.

Several specific sampling set-up requirements were not followed (section 11.3 in TO-13). The sampler was not set-up at least 2 meters from any obstacle (11.3.2). The sampler was placed approximately one foot away from a wall which could cause a flow obstruction. The sampler was not equipped with an exhaust hose to prevent recycling of air into the sample head (11.3.2). A single point flow check was not performed as described in section 11.2.3 of TO-13. Flow rates were varied from 55, 50, 40, 30, and 20 inches of water using the voltage variator during set-up which is incorrect. It appeared that the five point flow variator adjustments were somehow thought to be the calibration procedure described in section 11.2 of TO-13. A thorough review of TO-13 and TO-13A are recommended prior to conducting any further ambient air testing relative to this study.

Day 2, Tuesday 7/27/99

Event #1 - Ambient Urban Air Sampler: At approximately 08:00 hours the team arrived at Fire Station #1 to retrieve the particulate and PUF filters from the Ambient Urban Air Sampler. Upon arrival the sampler was still operating. The sampler should have stopped operating at 04:20 hours. One of the "start" pins on the timer switch had inadvertently been set to restart at around 08:00 hours. According to the QAPP; a final differential pressure and totalizer reading were recorded, the sampler was turned off, the particulate and PUF filters were retrieved, filter blanks and spikes were collected, the sampler filter holders were decontaminated with methanol, and wrapped in foil and packed.

Reviewer Comments: The longer run time was minimal and the extra time is accounted for with the totalizer and factored into the results without bias. Field data documentation was thorough, personnel wore disposable gloves while handling critical components of sampling train, and the particulate and PUF filters were handled carefully and properly. The critical parts contacting the filters were methanol rinsed and re-packed. There is concern that not enough methanol was used to rinse such that liquid methanol dripped off the sampler parts thus rinsing away potential contaminants. The methanol was evaporating nearly as fast as it was being applied. This would only re-distribute potential contaminants rather than rinse them away. There is a question as to why the air sampler was placed on the ground near the wall of the building.

Event # 2 - Tap Water Sample: A tap water sample was collected at approximately 08:30 hours from the fire station kitchen sink after the air sampler activities were completed. According to the QAPP; replicate samples were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets.

Reviewer Comments: The collection of this sample was not witnessed. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Event # 3 - Water Treatment Plant Outlet: A tap water sample was collected at 09:42 hours from the final treated water. According to the QAPP; replicate samples of the final treated water were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. There was a short piece of flexible tubing attached to the faucet where the samples were collected. Water runs continually into the sink located in the test lab from several different treatment steps. There is concern about possible residual accumulation of FC's onto the surface of the flexible tubing. Some discussions regarding this concern are warranted. For future reference, it may be advisable to remove any such tubing before sampling.

Event # 4 - Water Treatment Plant Inlet: A water sample was collected at 10:16 hours from a slip stream off the pump house main that supplies the water treatment plant. According to the QAPP; replicate samples of the inlet water were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling

information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. The water source is Oliver Lake that has formed behind Oliver Dam located on the Chattahoochee River.

Event # 5 and # 6 – Oliver Lake Surface Water: Surface water and sediment samples were collected at 10:30 and 10:35 hours respectively from a pooled area outside of the pump house. Samples were collected in an area between a floating baffle/dock structure and shore. Sediment samples were collected near the water/shore boundary using a pre-cleaned stainless steel spoon. According to the QAPP; replicate samples of the surface water and sediment were collected in pre-cleaned polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. The water source is Oliver Lake that has formed behind Oliver Dam located on the Chattahoochee River. The surface water and sediment samples were collected by wading into the shallows near shore. The process of wading stirred sediment from the bottom while water samples were being collected. The suggestion was made that Chris remain still and Kelly hand the bottles to him while he collected the water samples. This technique was used to collect the samples thereafter.

Event # 7 and # 8 – Oliver Lake Surface Water: Surface water and sediment samples were collected at 11:05 and 11:10 hours respectively from a bay area near Roaring Branch River south of the Municipal Marina. Sediment samples were collected near the water/shore boundary using a pre-cleaned stainless steel spoon. According to the QAPP; replicate samples of the surface water and sediment were collected in pre-cleaned polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. The water source is from Oliver Lake that has formed behind Oliver Dam located on the Chattahoochee River. The surface water and sediment samples were collected by wading into the shallows near shore. The water samples were collected while remaining still so as not to stir sediment from the bottom.

Event # 9 and # 10 – Oliver Lake Surface Water: Surface water and sediment samples were collected at 11:15 and 11:20 hours respectively from a bay area near Roaring Branch River north of the Municipal Marina. Sediment samples were collected near the water/shore boundary using a pre-cleaned stainless steel spoon. According to the QAPP; replicate samples of the surface water and sediment were collected in pre-cleaned polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. The water source is Oliver Lake that has formed behind Oliver Dam located on the Chattahoochee River. The surface water and sediment samples were collected by wading into the shallows near shore. The water samples were collected while remaining still so as not to stir sediment from the bottom.

Event # 11 – Tap Water Sample: A tap water sample was collected at 11:35 hours from the women's lavatory sink at the Municipal Marina near Roaring Branch River. According to the QAPP; replicate samples were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets.

Reviewer Comments: The collection of this sample was not witnessed. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Event # 12 – Quiet Water Sample: A quiet water sample was collected at 12:10 hours from a pond located on private property to the east of Highway 219 near Hieferhorn Creek. Permission was given to sample from the pond. There was a weir structure to allow overflow directly into Hieferhorn Creek if water levels reached the weir elevation. There was a slight trickle of water overflowing the weir at the time of sampling. According to the QAPP; replicate samples were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned image of the sampling location in the photograph section.

Reviewer Comments: The surface water sample was collected by wading into the shallows near shore. The water sample was collected while remaining still so as not to stir sediment from the bottom. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Event # 13 – Leachate Sample: A leachate sample was collected 14:15 hours from the Pine Grove Landfill as water poured into the leachate collection sump. According to the QAPP; replicate samples were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Access to the sample was through a manhole opening into the collection sump. The pipe connection was about 8 feet below grade so samples needed to be collected remotely utilizing some apparatus. Access into the manhole was considered a confined space entry. Proper safety gear was not available for a confined space entry thus preventing entry. The sampling crew did not have any remote sampling apparatus so one was improvised. The sample bottles were taped to a jumper cable and lowered into position from ground level. A suggestion was made to consider using a 6-8 foot telescoping handle for sample collection in these types of situations. The handles are inexpensive and can be found in any home improvement/hardware store. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Event # 14 – POTW Final Effluent Sample: A wastewater sample was collected at 16:00 hours from the final effluent. According to the QAPP; replicate samples were collected in pre-cleaned polyethylene bottles, labeled, and sampling information recorded on data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned images of the sampling location in the photograph section.

Reviewer Comments: Access to the sample was through a trap door opening into the overflow structure. The pipe connection was about 10 feet below the trap doors so samples needed to be collected remotely utilizing some apparatus. Access into the structure was considered a confined space entry. Proper safety gear was not available for a confined space entry thus preventing entry. The POTW operators have a bucket and rope permanently set up to allow for sample collection. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples. There is concern about possible residual accumulation of FC's onto the surface of the bucket. Some discussions regarding this concern are warranted. For future reference it may be advisable for the sampling crew to provide a remote sampling apparatus such as a telescoping handle.

Event # 15 – POTW Final Sludge Sample: A sludge sample was collected by one of the POTW operators at 16:10 hours from the discharge line from the anaerobic digesters. According to the QAPP; replicate samples were collected in pre-cleaned polyethylene bottles, labeled, and sampling information recorded on the data sheets. The coordinates of the sampling location were recorded based on a hand held GPS. See the scanned image of the sampling location in the photograph section.

Reviewer Comments: The sludge sample was collected from the main discharge line by one of the operators and given directly to Chris. Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Event # 16 – Tap Water Sample: A tap water sample was collected at approximately 17:00 hours from room # 204 at the Center City Holiday Inn. According to the QAPP, replicate samples were collected in pre-cleaned one liter polyethylene bottles, labeled, and sampling information recorded on data sheets.

Reviewer Comments: The collection of this sample was not witnessed.

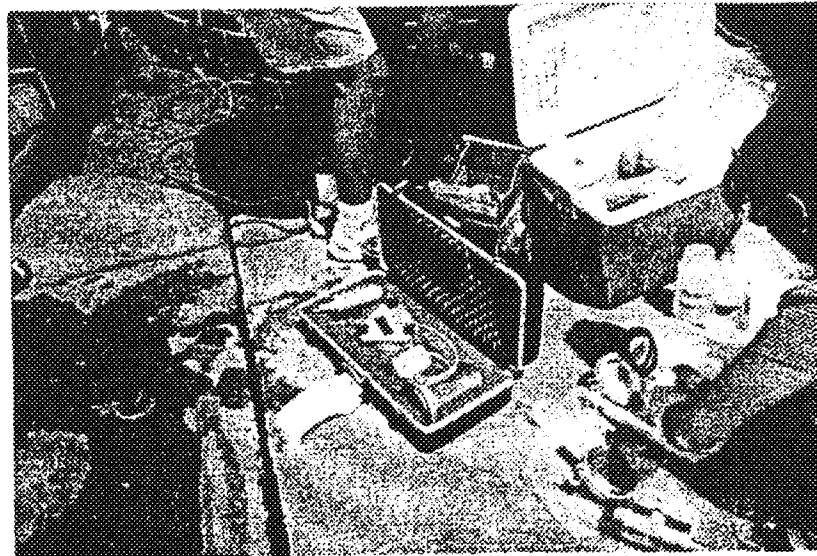
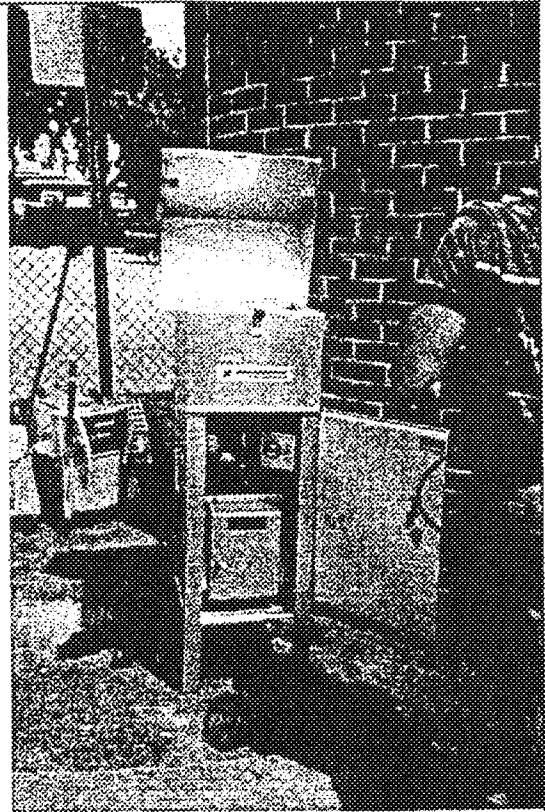
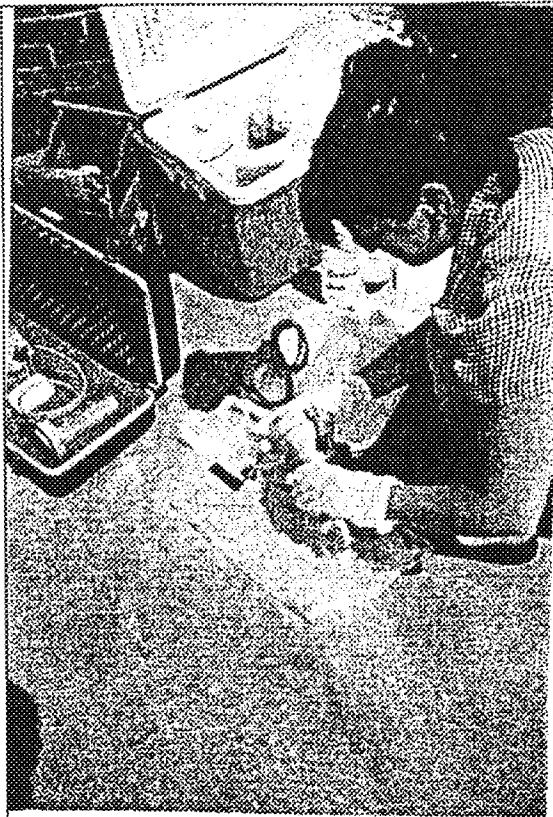
Event # 17 – Field Spiking: A set of samples collected throughout the day were field spiked. Glass ampules containing the analytes of interest were emptied into the sample bottles. After an ampule was emptied, it was dropped into the sample bottle that was spiked.

Reviewer Comments: The addition of the empty vial to the sample raises concern. This procedure follows the QAPP but poses a potential contamination source, that being the outside surfaces of the vial. The QAPP specifies the vial be methanol rinsed and wiped dry with a ChemWipe. What are the precautions that the external surfaces are kept from potential contamination? Field data documentation was thorough, and personnel wore disposable gloves while handling the samples.

Overall Comments/Questions

- 1) For the most part the test crew followed the conditions stated in the QAPP for the water sampling.
- 2) Documentation, labeling, and sampling handling were performed according to the QAPP.
- 3) The survey was well coordinated before arrival in Columbus.
- 4) The GPS was cross-checked for accuracy with a known survey marker.
- 5) The lack of a remote sampling apparatus for the leachate sampling indicated a lack of forethought and experience.
- 6) Has there been any testing to prove that ChemWipes are not a source of FC contamination?
- 7) Have any vial blanks been tested to assure the external surfaces have been kept clean?
- 8) A thorough review of TO-13 and TO-13A methods are recommended prior to performing any further ambient air testing.

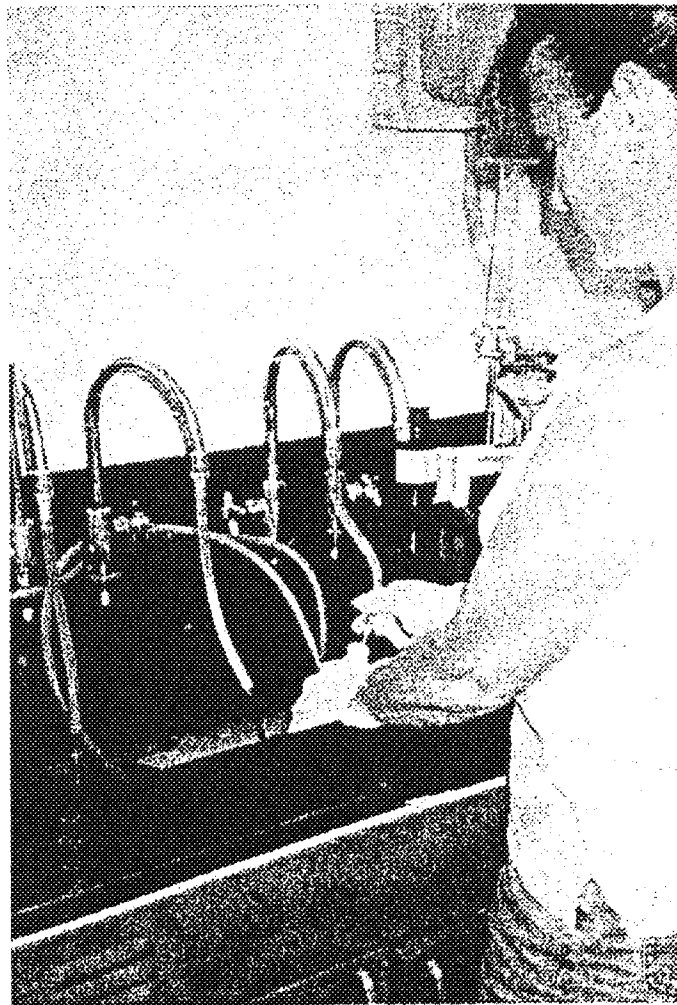
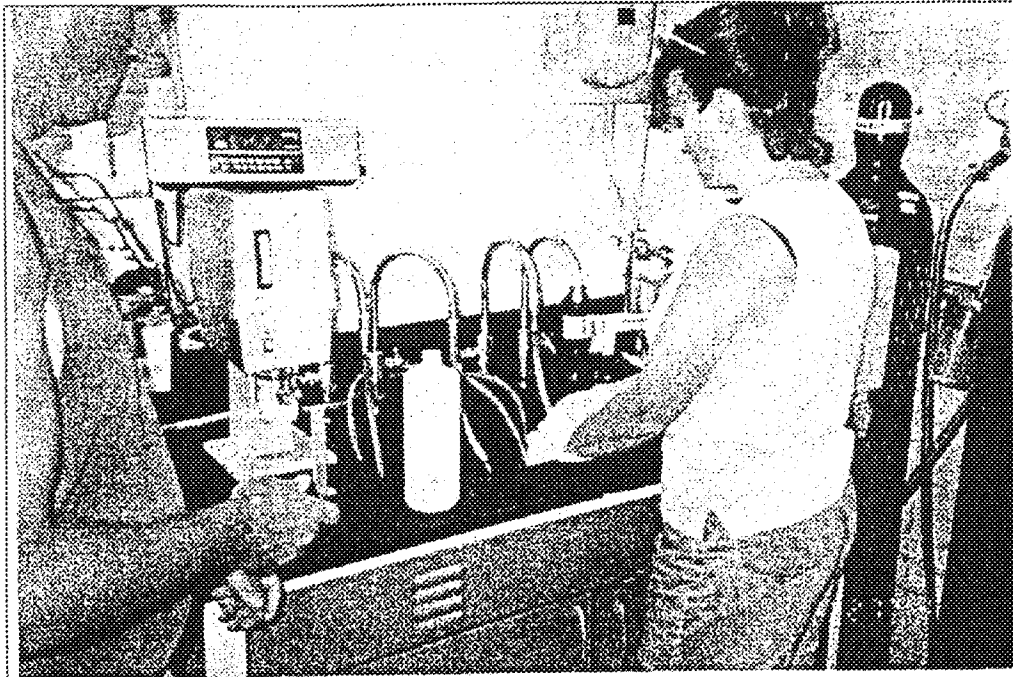
Urban Air Sampler
Day 1, Set-Up



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Water Treatment Plant Outlet Day 2 Event #3

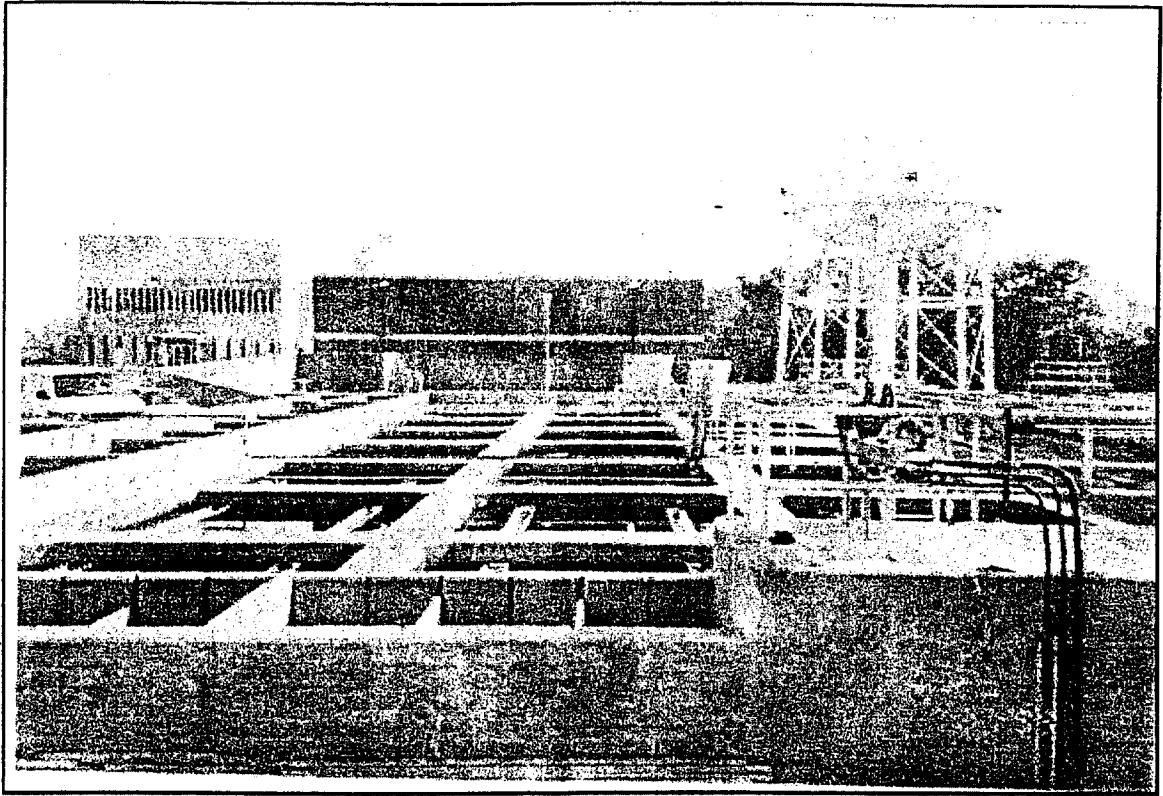


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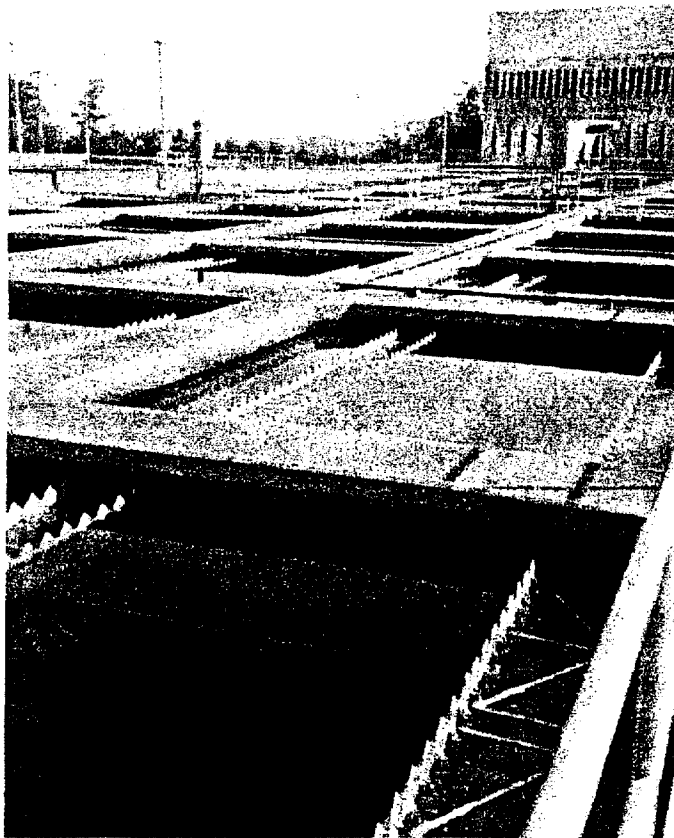
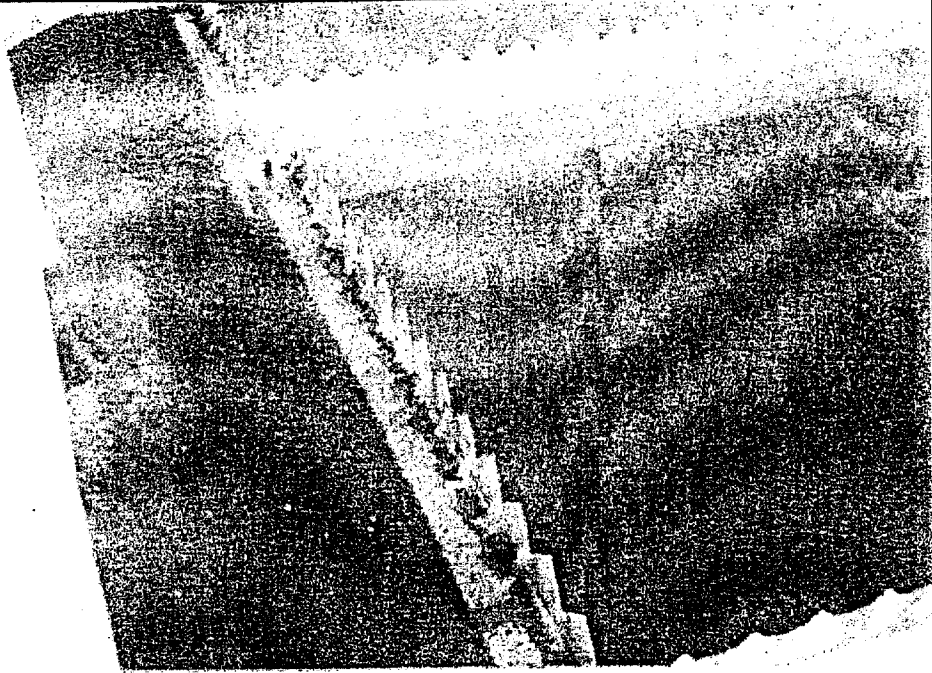
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Water Treatment Plant Day 2 Event # 3



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Water Treatment Plant Clarifier Day 2 Event # 3



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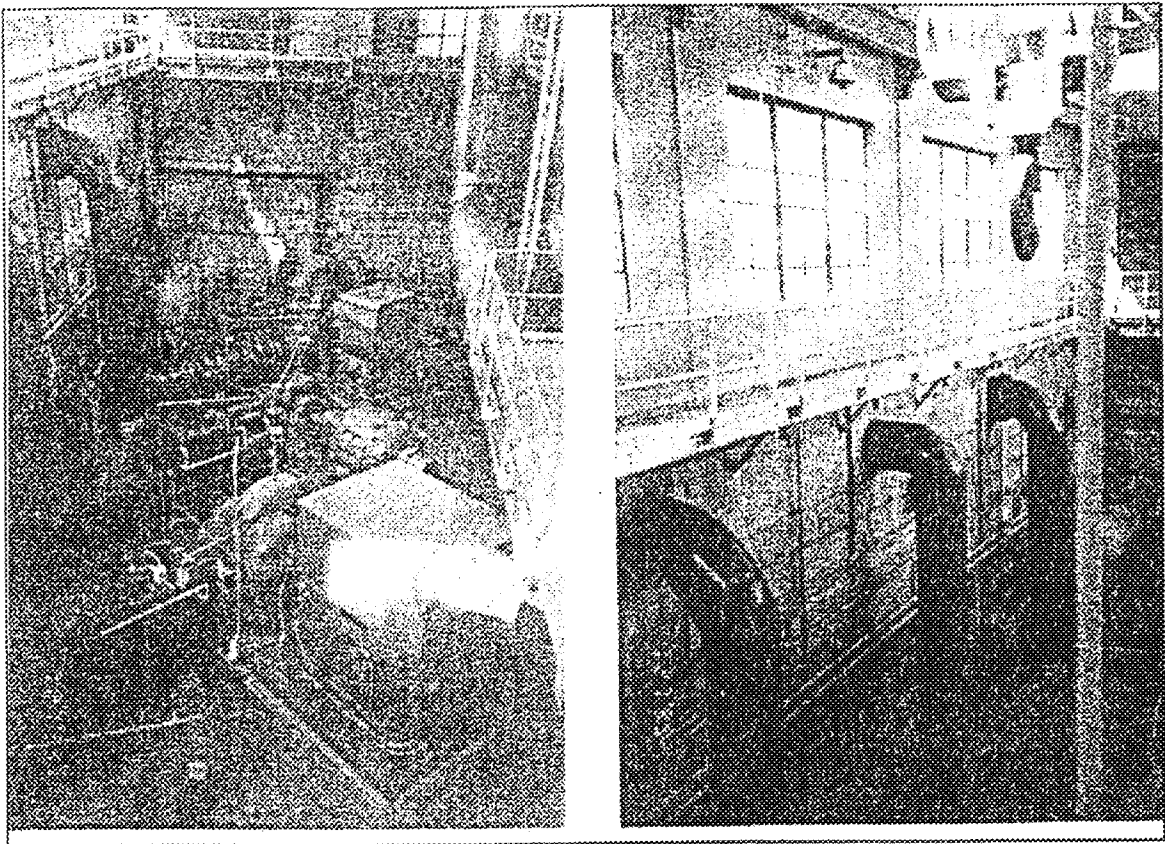
Water Treatment Plant Inlet Day 2 Event # 4



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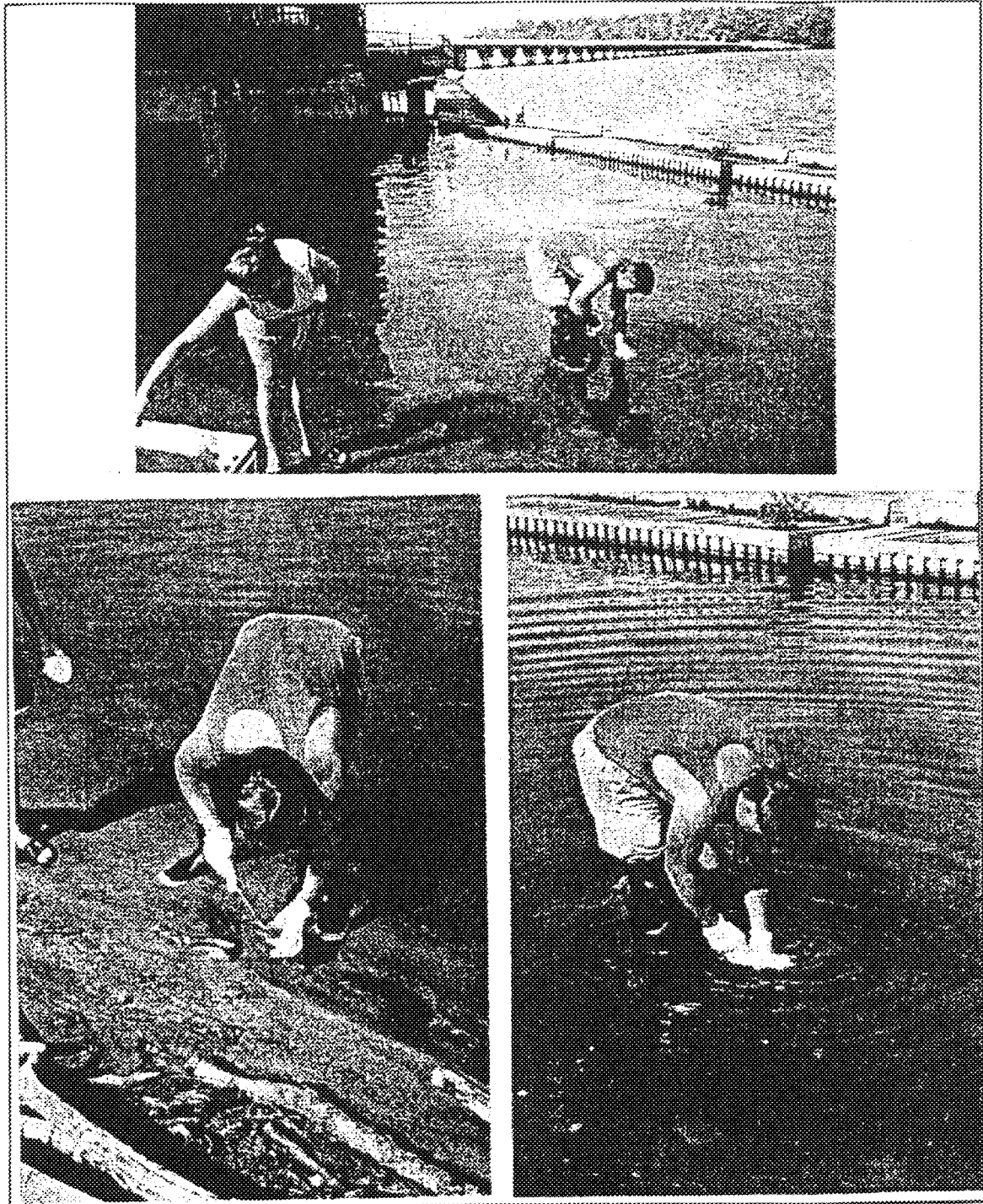
Water Treatment Inlet Pump House Day 2 Event # 4



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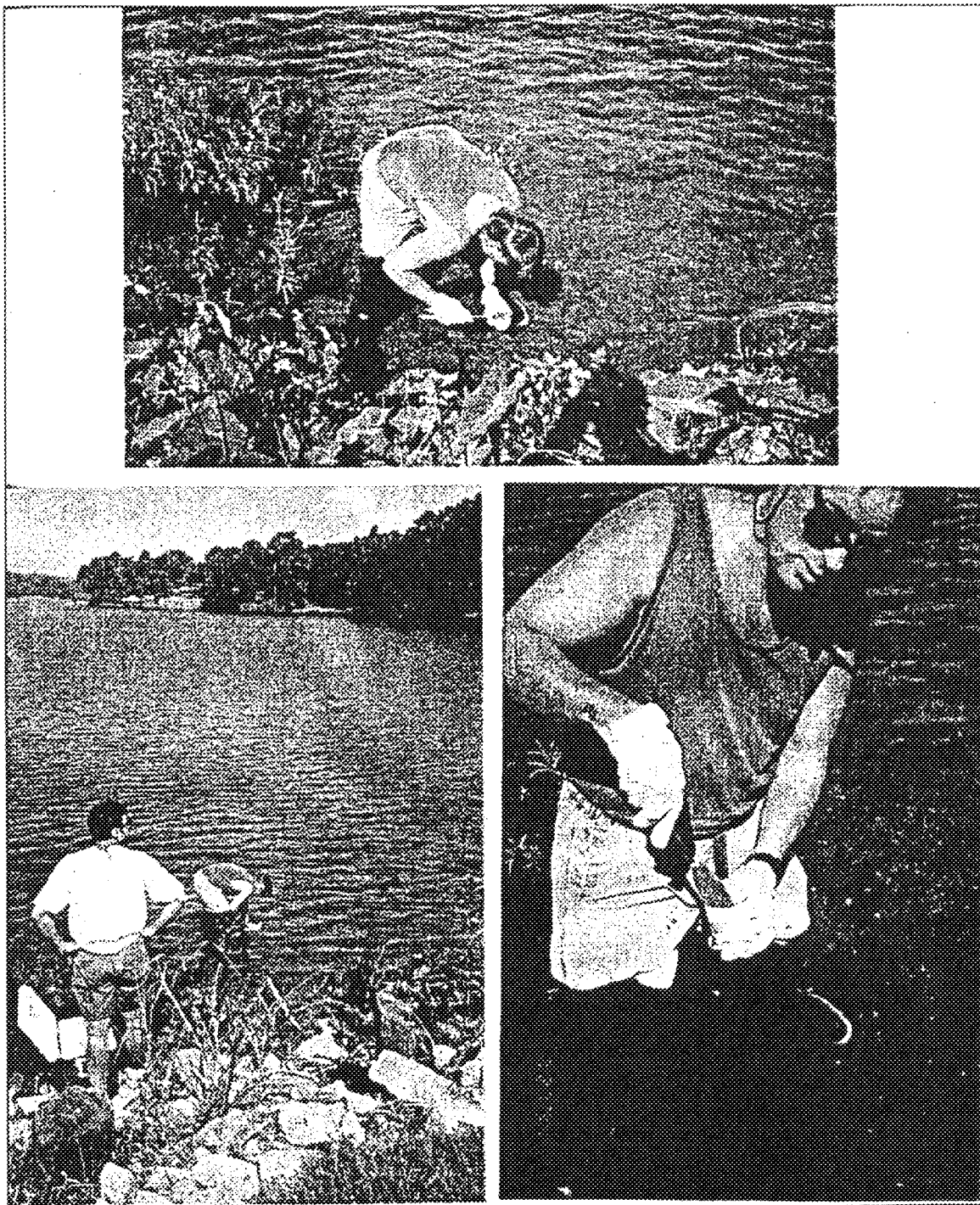
Drinking Water Source Day 2 Event # 5 and # 6
Oliver Lake, Chattahoochee River



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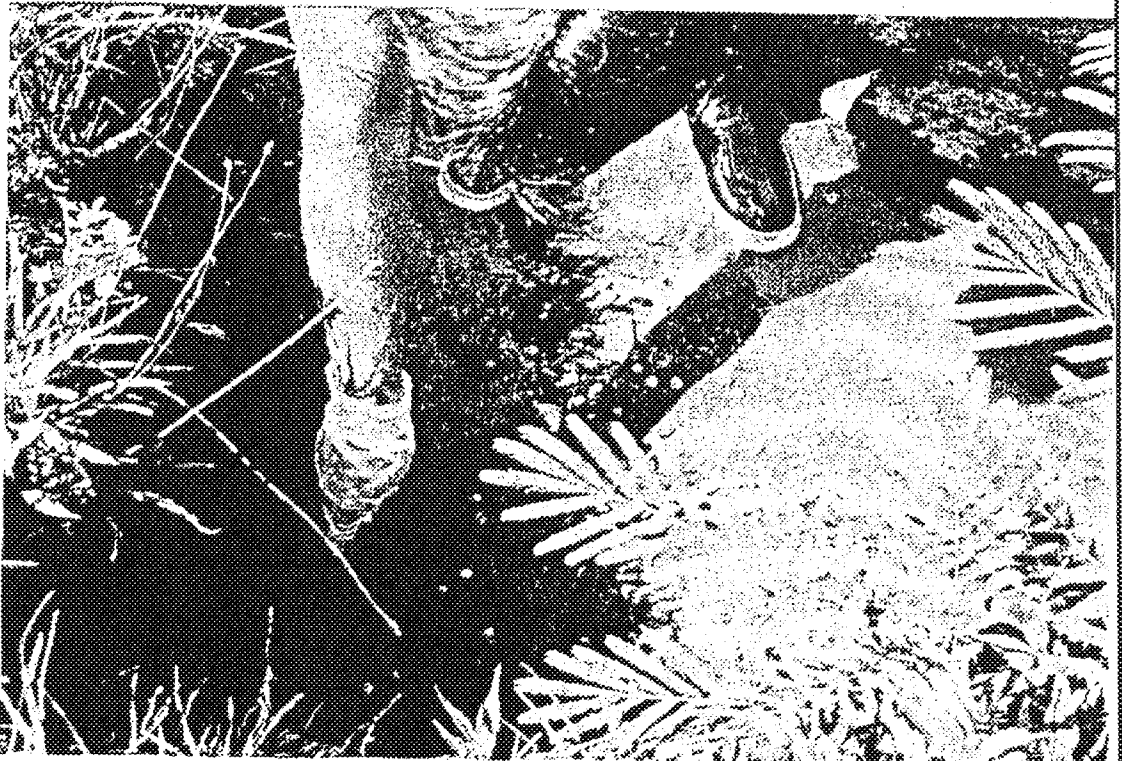
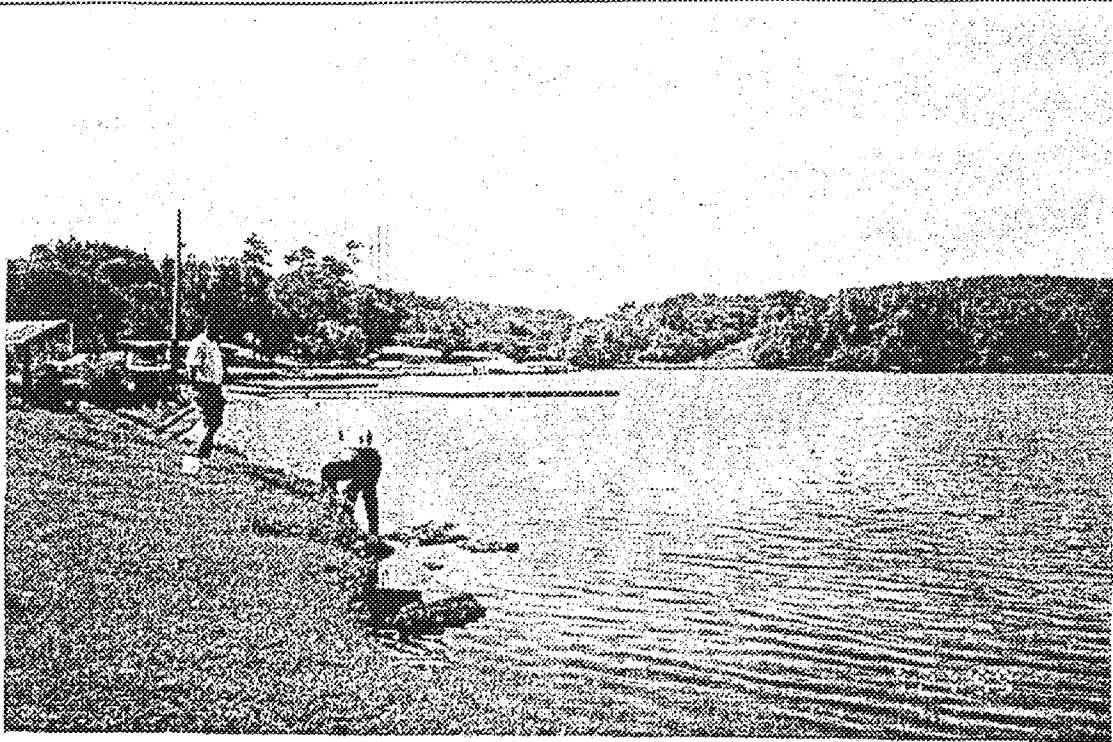
Drinking Water Source Day 2 Event #7 and #8
Oliver Lake, Chattahoochee River



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Drinking Water Source Day 2 Event # 9 and # 10
Oliver Lake, Chattahoochee River



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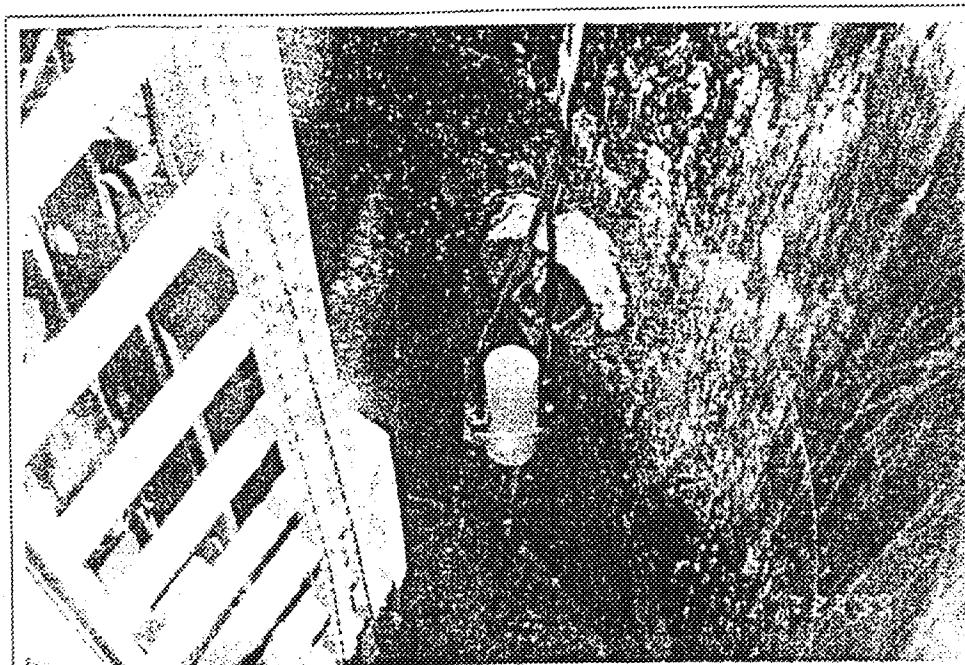
Quiet Water Day 2 Event # 12



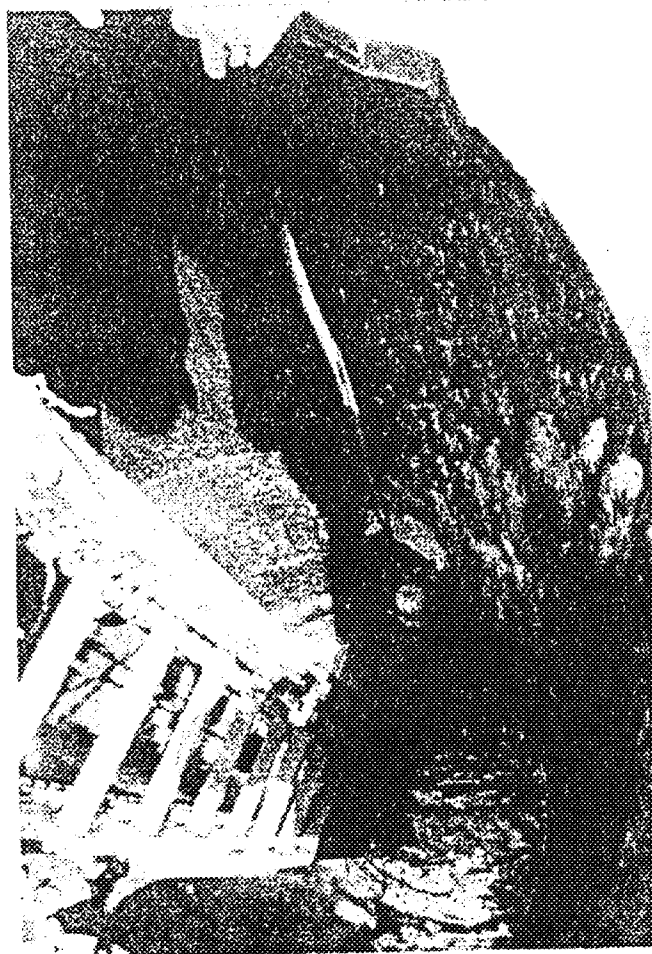
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Landfill Leachate Day 2 Event # 13

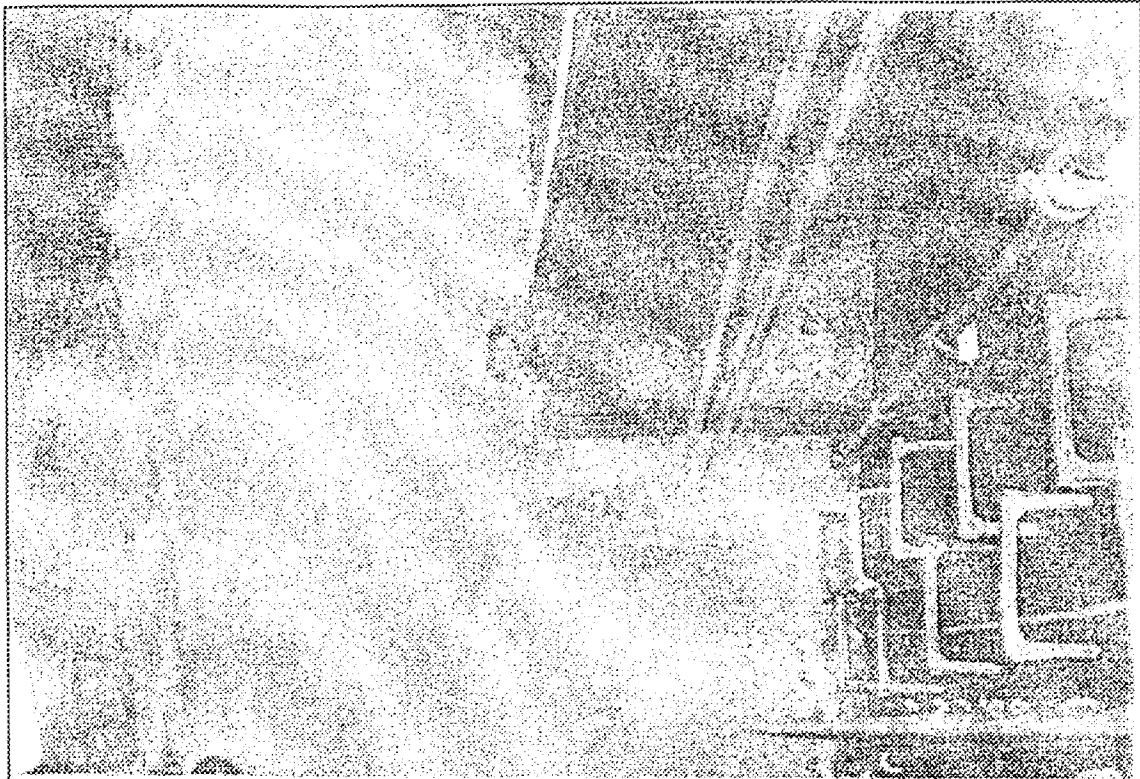


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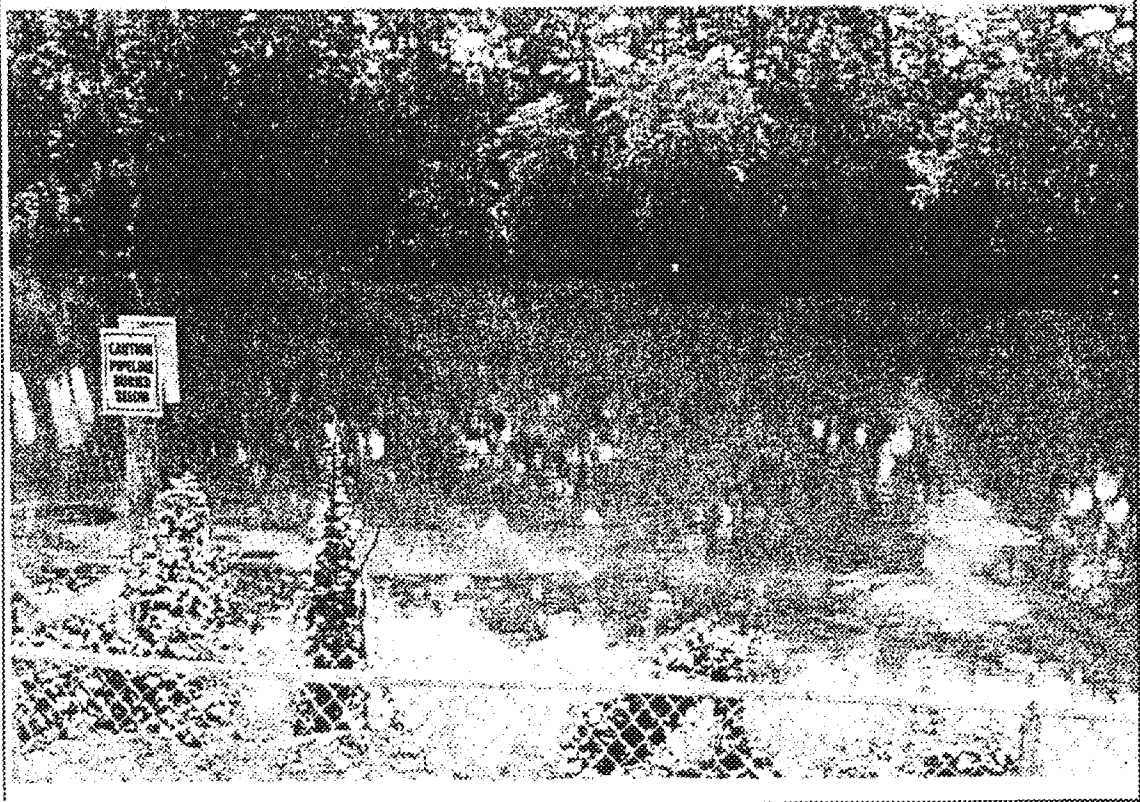


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POTW Final Effluent Day 2 Event # 14

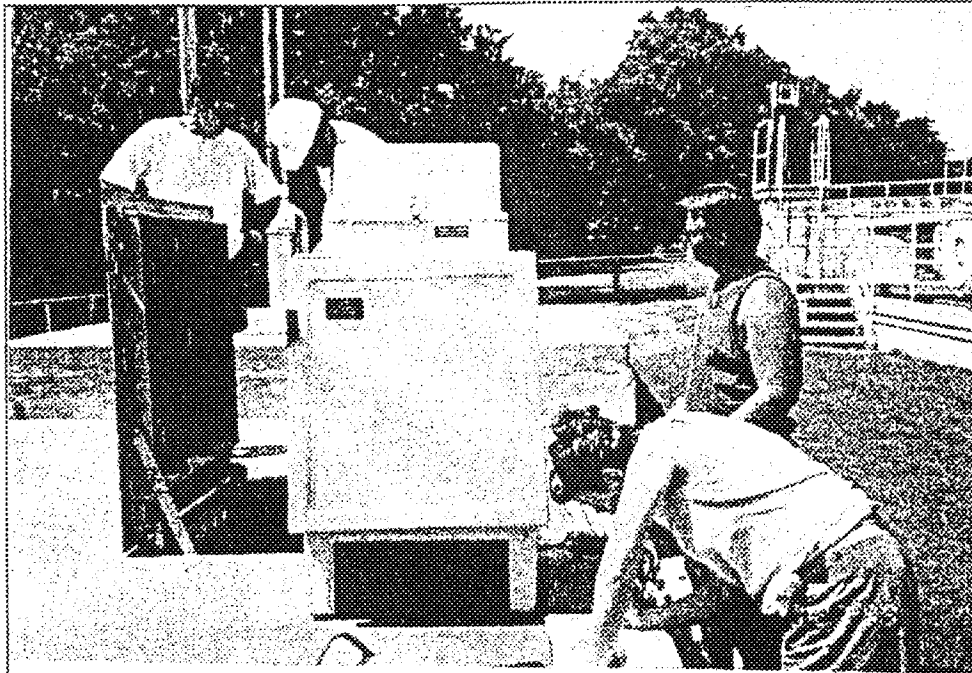


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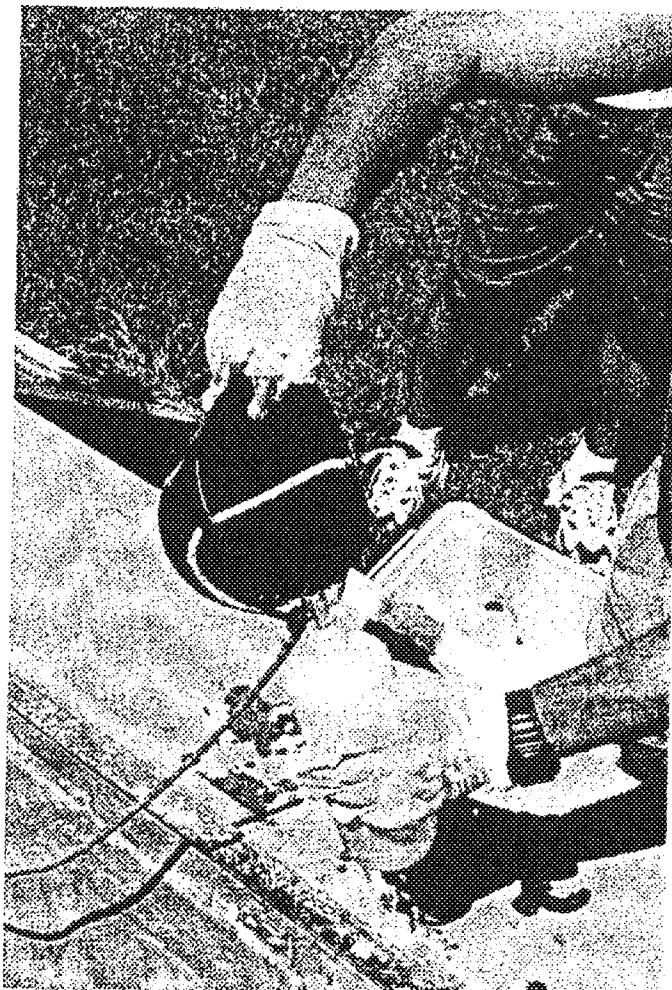


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POTW Final Effluent Day 2 Event # 14



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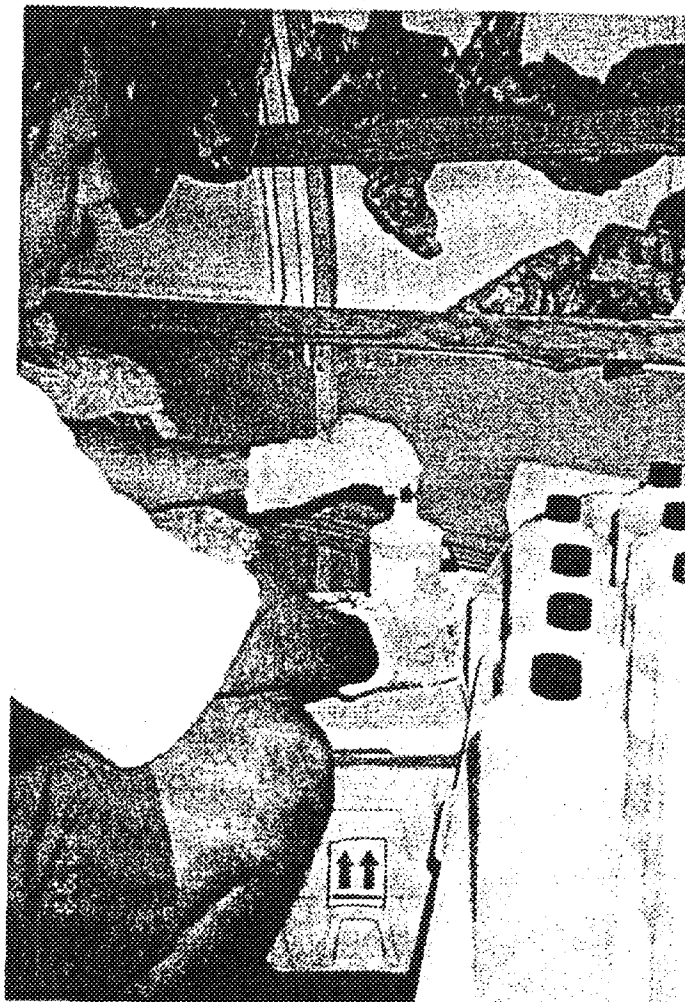
POTW Final Sludge Day 2 Event # 15



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Field Spiking Day 2 Event # 17



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