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Corrective Action Implementation Plan
Sanders Creek Sediment and PISCES Study Work Plan

Revision No.: 0

United Technologies/Carrier - Thompson Road Facility
Syracuse, New York

EnSafe Project No. 0888803666

Prepared for:

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UTC Shared Remediation Services
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August 2007

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August 24, 2007
Date

Reviewed by:

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August 24, 2007
Date

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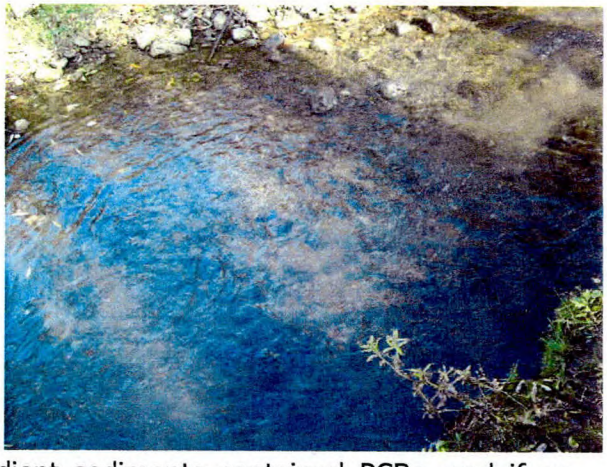
1.0 INTRODUCTION

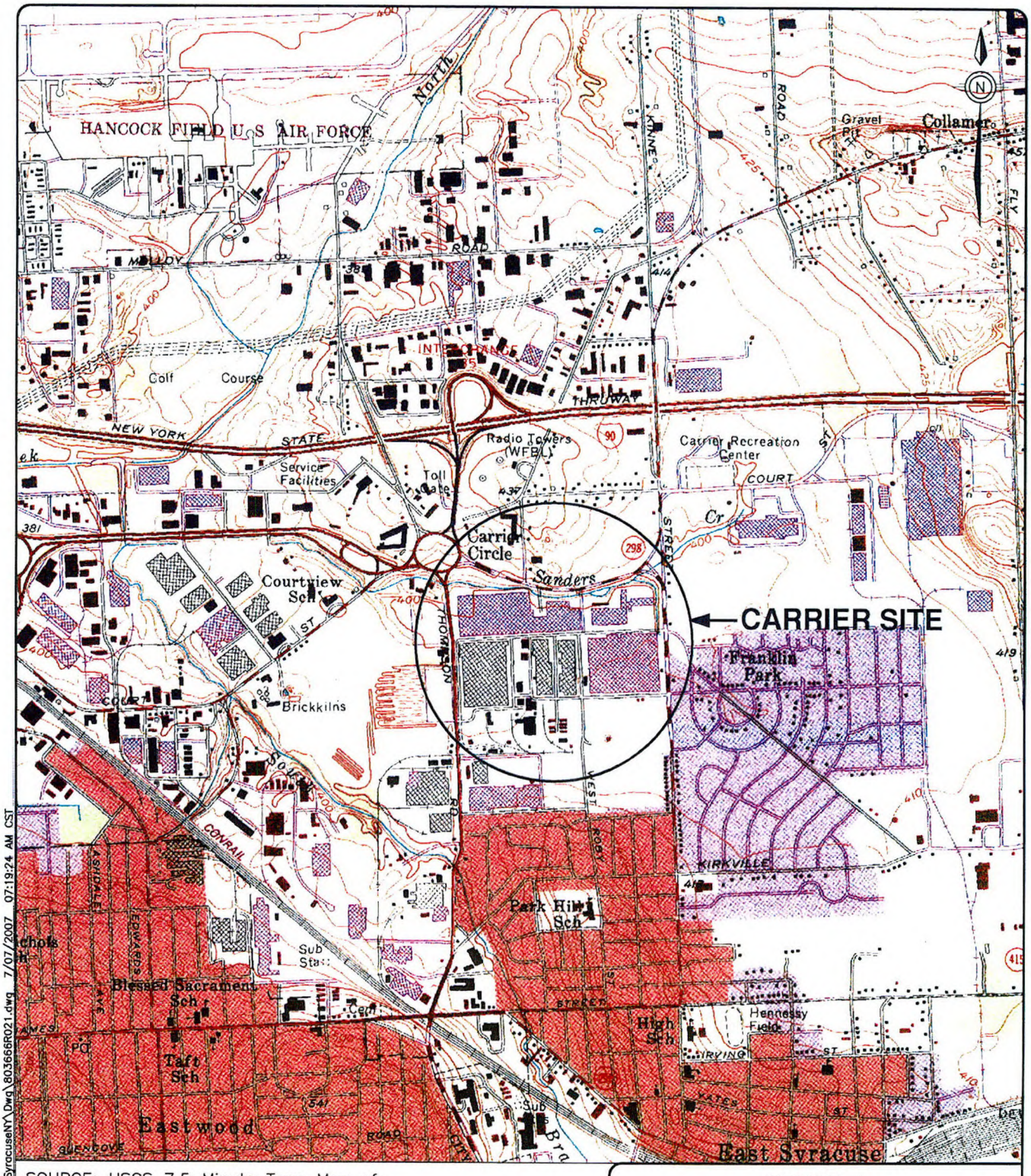
Carrier Corporation (Carrier), a wholly-owned subsidiary of United Technologies Corporation (UTC) has prepared this work plan in response to New York State Department of Environment and Conservation (NYSDEC) correspondence dated June 28, 2007, related to the requirements outlined in the NYSDEC Corrective Action Order - Index Consent Order CO 7-20051118-4 (order) dated February 13, 2006. The order indicated that past sampling results identified polychlorinated biphenyl (PCB) impacts in Sanders Creek and recommended additional investigation. On behalf of Carrier, EnSafe has designed this supplementary work plan to comply with the directives set forth in the NYSDEC letter and to evaluate the nature and extent of PCBs in Sanders Creek. This work plan summarizes the work previously conducted, the proposed investigation strategy, and sampling and analysis to be undertaken as part of the order.

2.0 BACKGROUND

Sanders Creek is a small, freshwater stream that is immediately north of several manufacturing buildings in the northern portion of Carrier Corporation's Thompson Road, Syracuse, New York, facility (the facility) (Figure 1). The creek width and depth vary, and most of the creek is three feet deep or less. Sanders Creek is usually less than six feet across, with some larger, deeper pools observed at isolated locations (EnSafe 2007). Sanders Creek habitat was determined to be marginal due to disturbances by human activities and natural forces over time, resulting in reduced bank protection tree cover, and riparian buffer zone, as well as increased bank erosion (EnSafe 2007). The effects of nearby human activities lead to increased water velocity during heavy rain events, bank sloughing, bottom scouring, and ultimately limited aquatic habitats.



Sampling conducted by the NYSDEC indicated that the PCBs are bioavailable in the creek and that they are at levels of concern in the stream, and sediment sampling conducted in July 2001, December 2003, and November 2006 identified PCBs in the sediment (EnSafe 2007). In November 2006, EnSafe conducted sediment sampling from Sanders Creek according to the methods and procedures outlined in the NYSDEC approved work plan (*Sanders Creek Sediment and Fish Sampling Work Plan, Rev No.: 1* — EnSafe 2006) to determine if downgradient sediments contained PCBs, and if so, their possible source. Table 1 summarizes the detectable sediment PCB analytical results. Sediment PCB results are similar to historic PCB concentrations for samples collected previously by both NYSDEC and Carrier. Sediment concentrations ranged from nondetect to 8.22 mg/kg, with one duplicate sample result of 36.9 mg/kg for Aroclors 1254 and 1260 (EnSafe 2007).



SOURCE: USGS 7.5 Minute Topo Map of:
SYRACUSE EAST, NY 1957; Photo-revised 1978

0 2000 4000
SCALE IN FEET

FIGURE 1
SITE LOCATION MAP
CARRIER CORPORATION
SYRACUSE, NEW YORK

REQUESTED BY:	J.G.
DRAWN BY:	E.R.
DWG DATE:	07AUG07
DWG NO:	803666R021

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Table 1
Sanders Creek Sediment Sample PCB Results
Carrier Thompson Road Facility
Syracuse, New York
August 2006

ID/Location	Date	GPS Position	Aroclor 1254	Arochlor 1260	Percent Solids	Total Organic Carbon
Station 1						
CARMSTA101 (Station 1, Sample 1) 135 ' Downstream (west) from Court Street Bridge	11/8/2006	43° 05.126' N 76° 05.416 W	ND	ND	57.6	30,300
CARMSTA102 (Station 1, Sample 2) 40' West of Court Street Bridge	11/8/2006	43° 05.114 N 76° 05.402 W	0.107	0.333	69	7,360
Station 2						
CARMSTA201 (Station 2, Sample 1) 155' Upstream (east) from Court Street Bridge	11/9/2006	43° 05.204' N 76° 05.636 W	0.202	0.646	86.6	2,360
CARMSTA202 (Station 2, Sample 2) 365' East of Court Street Bridge	11/9/2006	43° 03.321 N 76° 02.327 W	ND	ND	72.6	7,370
CARMSTA203 (Station 2, Sample 3) 588' East of Court Street Bridge	11/9/2006	43° 02.964 N 76° 01.761 W	ND	6.870 J	81.6	7,970
CARMSTA204 (Station 2, Sample 4) 838' East of Court Street Bridge	11/9/2006	43° 01.503 N 76° 03.296 W	0.0694	0.0776	80.1	1,200
CARMSTA205 (Station 2, Sample 5) 1018' east of Court Street Bridge	11/9/2006	43° 01.489 N 76° 03.272 W	0.405	2.160	82.7	6,110
Station 3						
CARMSTA301 (Station 3, Sample 1) 113' East of Thompson Road	11/8/2006	43° 05.207' N 76° 05.344 W	1.280 J	8.220 J	66.3	22,700
CARMSTA302 (Station 3, Sample 2) 400' East of Thompson Road	11/8/2006	43° 05.221 N 76° 05.674 W	0.141	0.481	57.3	40,400
CARMSTA302 (Station 3, Duplicate of Sample 2) 400' East of Thompson Road	11/8/2006	43° 05.221 N 76° 05.674 W	7.050 J	36.90 J	75.1	28,400
CARE110906A (Equipment Blank) Blank collected from Hand Auger	11/9/2006	NA	ND	ND	NA	NA

Notes:
All results are reported in milligrams per kilogram (mg/kg) except percent solids which is reported in percent.
ND - Not Detected
NA - Not Analyzed
J - Data review indicates sample results potentially biased high.

Fish samples were also collected. Tissue concentrations ranged from 1.4 mg/kg to 8.8 mg/kg (EnSafe 2007). During the November 2006 ecological survey, only seven fish species were encountered in the creek (in order of frequency): creek chub, longnose dace, white sucker, pumpkinseed, fathead minnow, largemouth bass, and bullhead catfish (EnSafe 2007). Only one two game fish species were observed (one largemouth bass and one bullhead catfish), so long-term, frequent fishing is not likely to occur in this Sanders Creek based on the low abundance of game fish species. Further, fishing is catch and release only in the Onondaga watershed due to historic contamination in the watershed (USEPA 2007). Thus, the focus of the investigation is on ecological effects and concentration gradient within the creek, as opposed to investigating human exposure via fish tissue ingestion. Other potential sources of contamination will be considered when making risk management decisions regarding Sanders Creek.

3.0 INVESTIGATION STRATEGY

As previously discussed, historical sampling results indicate that PCBs are present in fish tissue at Sanders Creek (EnSafe, 2007). The extent of PCBs in Sanders Creek will be investigated by collecting additional sediment samples as well as evaluating the potential for bioaccumulation using a Passive In-situ Chemical Extraction Sampler (PISCES) study, as recommended by NYSDEC, or similar semi-permeable membrane sampling methods. The sampling event in this work plan is proposed to determine bioaccumulation potential and possible source areas where accumulation would be most likely to occur, as well as reference information for evaluation purposes. Information obtained will be used to determine if additional actions in Sanders Creek will be necessary to protect human health and the environment.

3.1 Sediment Sampling

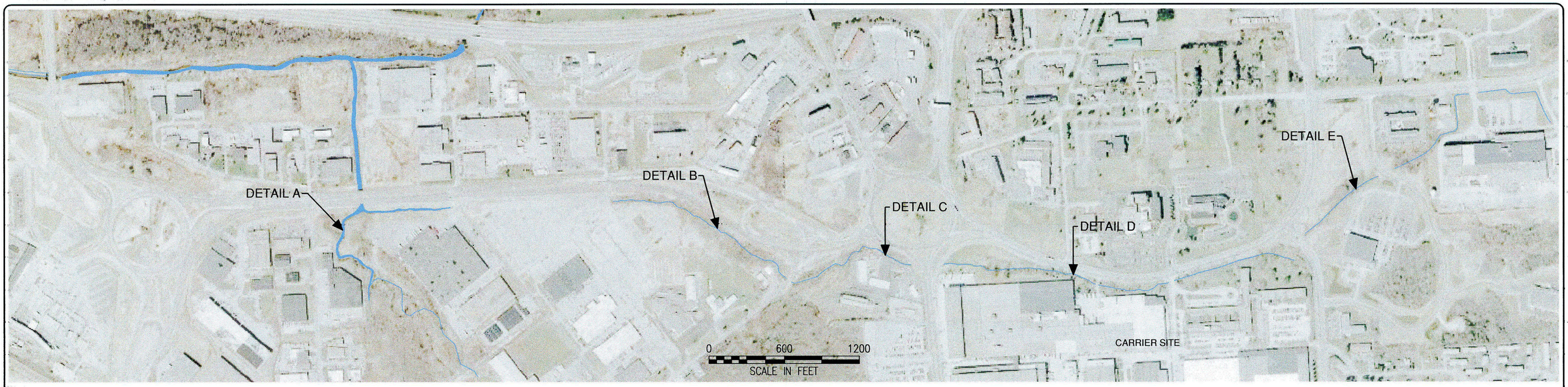
As outlined in the NYSDEC letter, this plan presents further sediment sampling activities and a PISCES study to determine the nature and extent of PCB-impacted sediments in Sanders Creek. Areas of collection for sediment samples will focus on the depositional environment of the stream. Composite samples will be collected in stream locations of ponded or slow moving water. In order to gain a representative sample set over the entire interval of stream, grab samples also will be collected on stream bars in areas of sediment deposition where the stream channel is more lenticular and water is faster moving, and in other areas of the stream based on in-field observations of the sampling personnel. Composite sediment samples from two to three locations within a five foot diameter will be collected from the 0- to 6-inch depth interval and analyzed for PCBs (all Aroclors). See Figure 2 for proposed sampling locations.

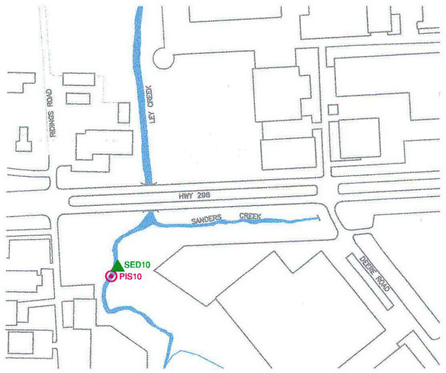
3.2 Sampling to Evaluate Bioaccumulation Potential

As outlined in the NYSDEC letter, this plan presents further sampling activities using measurements of PCB concentrations in the water column by means of a PISCES investigation. PISCES samplers will be placed at locations throughout the study area. Samplers will also be placed upstream and downstream of Sanders Creek and Ley Creek (south branch) (See Figure 2).

3.3 Proposed Sampling Locations and Rationale

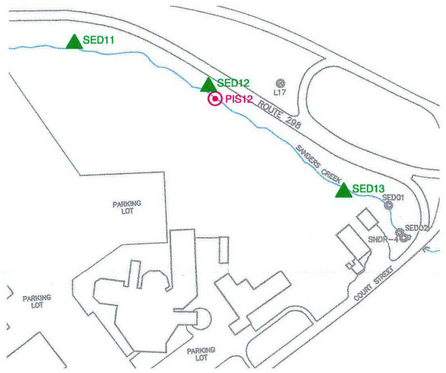
Proposed samples are summarized in Table 2.





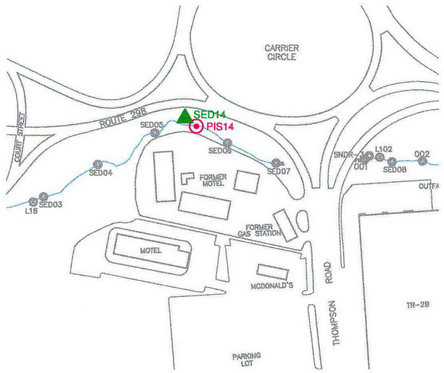
DETAIL A

UPGRADIENT CONFLUENCE OF SANDERS CREEK AND LEY CREEK SOUTH BRANCH
SCALE: 1"=500'



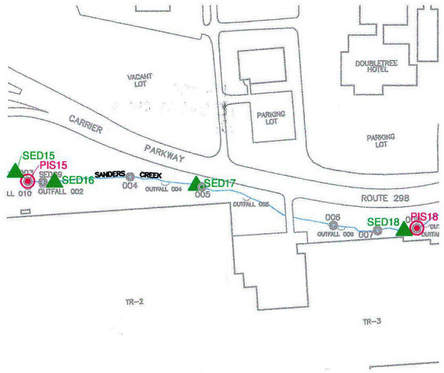
DETAIL B

DOWNGRADIENT FROM COURT STREET
SCALE: 1"=500'



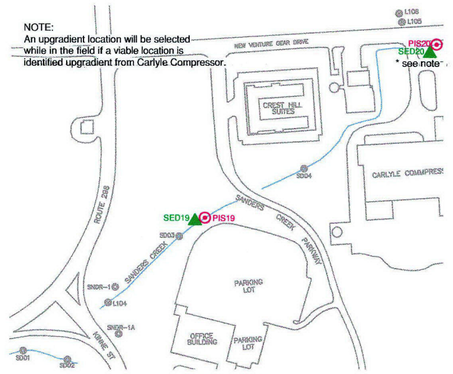
DETAIL C

DOWNGRADIENT FROM THOMPSON ROAD
SCALE: 1"=500'



DETAIL D

STATION 3
POOL AREA DOWNGRADIENT FROM OUTFALL 010
POOL AREA DOWNGRADIENT FROM OUTFALL 011
SCALE: 1"=500'



DETAIL E

UPGRADIENT SANDERS CREEK
SCALE: 1"=500'

LEGEND

- NYSDEC CRAYFISH SAMPLE LOCATION (2003)
- NYSDEC SEDIMENT SAMPLE LOCATION (ONONDAGA LAKE NPL SITE) TRIBUTARY SAMPLING, NYSDEC 1998 DATA)
- CARRIER SEDIMENT SAMPLE LOCATION (2001 AND 2006)
- PROPOSED PISCES SAMPLE LOCATION
- PROPOSED SEDIMENT SAMPLE LOCATION

FIGURE 2
PROPOSED SAMPLING LOCATIONS
JULY 2007
CARRIER FACILITY THOMPSON ROAD
SYRACUSE, NEW YORK

REQUESTED BY:	B.M.
DRAWN BY:	E.R.
DWG DATE:	23AUG07
DWG NO:	803666R022

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MEMPHIS, TENNESSEE

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Table 2
Proposed Sample Location Summary

Proposed Sample	Figure 1 Detail	Rationale
SED10	Detail A	Upgradient in Ley Creek to determine if upgradient PCBs are present
PIS10	Detail A	Co-located with SED10, upgradient in Ley Creek to determine if upgradient PCBs could accumulate in fish tissue
SED11	Detail B	Downgradient in Sanders Creek to determine if a concentration gradient of PCBs in sediment is present
SED12	Detail B	Downgradient in Sanders Creek to determine if a concentration gradient of PCBs in sediment is present
PIS12	Detail B	Co-located with SED12; to determine if PCBs could accumulate in fish tissue downgradient from Court Street
SED13	Detail B	Downgradient in Sanders Creek to determine if a concentration gradient of PCBs in sediment is present
SED14	Detail C	Downgradient in Sanders Creek to determine if a concentration gradient of PCBs in sediment is present
PIS14	Detail C	Co-located with SED14; to determine if PCBs could accumulate in fish tissue downgradient from Thompson Road
SED15	Detail D	Downgradient from previous SED09 location where elevated PCBs were reported in a duplicate sample; to determine if a concentration gradient of PCBs in sediment is present and to verify the presence of contamination
PIS15	Detail D	Co-located with SED15; to determine if PCBs could accumulate in fish tissue downgradient from this location and to determine if this location would contribute more to accumulation relative to other locations sampled
SED16	Detail D	Downgradient from the site and slightly upgradient from previous SED09 location where elevated PCBs were reported in a duplicate sample; to determine if a concentration gradient of PCBs in sediment is present and to verify the presence of contamination
SED17	Detail D	Upgradient from previous SED09 location where elevated PCBs were reported in a duplicate sample; to determine concentration gradients of PCBs in sediment and to verify the presence of contamination
SED18	Detail D	Downgradient from Outfall 011; to determine if a concentration gradient of PCBs in sediment is present and to verify the presence of contamination
PIS18	Detail D	Co-located with SED18; to determine if PCBs could accumulate in fish tissue downgradient from this location and to compare the contribution of PCBs in PISCES samplers at this location to other locations sampled
SED19	Detail E	Upgradient from the facility; to determine if a concentration gradient of PCBs in sediment is present
PIS19	Detail E	Co-located with SED19; to determine if PCBs could accumulate in fish tissue at this upgradient location and to compare the contribution of PCBs in PISCES samplers at this location to other locations sampled
SED20	Detail E	Upgradient from the facility and Carlyle Compressor; to determine if a concentration gradient of PCBs in sediment is present; this location will be determined in the field if a viable locations is identified north of New Venture Gear Drive; otherwise, it will be eliminated
PIS20	Detail E	Co-located with SED20; to determine if PCBs could accumulate in fish tissue at this upgradient location and to compare the contribution of PCBs in PISCES samplers at this location to other locations sampled; this location will be determined in the field if a viable locations is identified north of New Venture Gear Drive; otherwise, it will be eliminated

3.4 Sediment Sample Collection Methods

Sediment samples will be collected from each location using stainless steel spoons, trowels, or hand auger. For each sampling location a sample from the 0- to 6-inch interval will be collected. In the event that a sample cannot be obtained from the 0- to 6-inch interval at the designated sampling location, an alternate, adjacent sampling location (within 10 feet of the original location) will be chosen and sampled. When this situation occurs, the 0-to 6-inch sample from the original location will be returned to the creek from where it was gathered and the sampling container properly discarded.

All samples will be homogenized by mixing the sampling interval in a stainless steel bowl prior to placing the representative sample in the laboratory-supplied sample jar. A two-person field crew is required for health and safety as well as for documentation purposes. One person will collect the samples and the other will properly document sample location and sample character (color, grain size, other) and will provide sample containers and chain-of-custody for the sampling event. No field screening will be performed for this event. Sample locations will be marked for subsequent surveying by a New York State Registered Land Surveyor.

3.4.1 Sample Analysis

Samples collected will be analyzed using U.S. Environmental Protection Agency (USEPA) Method 8082 for PCBs and TOC using the Lloyd Kahn Method, 1988 by Accutest Laboratories Northeast in Dayton, New Jersey, which holds an NYS analytical laboratory certification.

3.4.2 Surveying of Locations

After sampling of each location is complete, all locations will be surveyed from a U.S. Coast and Geodetic Bench Mark, U.S. Geological Survey Bench Marks, a site benchmark, or other equivalent. The National Geodetic Vertical Datum or site benchmark elevations for ground surface will be surveyed to an accuracy of ±0.1 foot vertically and ±1.0 foot horizontally by a New York State Registered Land Surveyor.

The horizontal position of each sampling point will be located using the New York State Plan Coordinate System or a site grid coordinate system that can easily be translated into the State Plan Coordinate System. Following completion of the survey, each boring will be incorporated into computer-generated site maps based on the surveyed coordinates.

3.4.3 Documentation

All notes, descriptions, and observations will be recorded in a project field logbook.

3.4.4 Equipment Decontamination

With the exception of PISCES samplers, all small sampling and otherwise intrusive equipment will be decontaminated manually in accordance with the following procedures:

- Wash equipment with tap water and laboratory (phosphate-free) detergent using a brush, if necessary, to remove particulate and surface film.
- Rinse with tap water.
- Rinse with distilled water.
- Air dry.
- If necessary, wrap in aluminum foil to prevent recontamination prior to use.

3.5 Passive In-situ Chemical Extraction Sampler (PISCES) Study

In accordance with the NYSDEC Corrective Action Order, a PISCES Study will be conducted in order to determine the potential and source of PCB contamination in Sanders Creek. This semi-quantitative method is accepted by NYSDEC and is intended to simulate the uptake of chemicals from water by fish. PISCES samplers, which are deployed in the creek, absorb PCBs from the water column across a semi-permeable membrane; therefore, these samplers collect a sample over the time of the PCBs dissolved in the water that passes the sampling point.

Using passive-water-column sampler methodology to detect PCBs has many advantages over sampling sediment and fish tissue, such as:

- Lower detection limits
- Dissolved PCB concentrations are an indirect measure of bioavailable PCBs in the aquatic environment
- PCB concentration variability measured in water-column samples is not affected by external factors such as grain size or organic carbon content (in sediment samples), or weight, age, sex, and lipid content (in fish-tissue samples) (Colman, 2002).

Sediment samples will be analyzed for PCBs by Aroclor analysis, and the results will be used to compare total PCBs at each location to other locations in the creek to identify areas where bioaccumulation would be more likely to occur. This information will be used to identify potential sources.

The methods of Litten 1993 and Breault et al., 2004 will be used to collect PCB samples with PISCES passive water-column samplers. Before the samplers are deployed, they will be rinsed with phosphate-free detergent followed by a deionized water rinse; they then will be allowed to air dry, will be rinsed with acetone and subsequently rinsed three times with hexane. The polyethylene membranes will be pre-cleaned by 7-hr Soxhlet extraction (solid-liquid extraction using Soxhlet apparatus) with hexane. Once cleaned, the samplers will be wrapped in hexane-rinsed aluminum foil until they are deployed.

PISCES samplers will be filled with 0.2 L of hexane and hung from buoys anchored to the creek bottom. After approximately 17 days, the samplers will be collected, and their contents will be decanted into 250-mL amber glass bottles, which will be analyzed by the laboratory.

3.5.1 Sample Analysis

Samples collected will be analyzed using U.S. Environmental Protection Agency (USEPA) Method 8082 for PCBs by Accutest Laboratories Northeast in Dayton, New Jersey, which holds an NYS analytical laboratory certification.

3.5.2 Surveying of Locations

After PISCES samplers are collected, locations will be surveyed from a U.S. Coast and Geodetic Bench Mark, U.S. Geological Survey Bench Marks, a site benchmark, or other equivalent. The National Geodetic Vertical Datum or site benchmark elevations for ground surface will be surveyed to an accuracy of ±0.1 foot vertically and ±1.0 foot horizontally by a New York State Registered Land Surveyor.

The horizontal position of each sampling point will be located using the New York State Plan Coordinate System or a site grid coordinate system that can easily be translated into the State Plan Coordinate System. Following completion of the survey, each boring will be incorporated into computer-generated site maps based on the surveyed coordinates.

3.5.3 Documentation

All notes, descriptions, and observations will be recorded in a project field logbook.

3.5.4 Sampling Times

Fish tissue samples within Sanders Creek were previously collected in November 2006. It is recommended that the PISCES study adhere to this fall month sampling (September through November) in order to best mimic chemical uptake by fish.

4.0 DATA INTERPRETATION

As previously discussed, this supplemental sampling event includes additional sediment sampling to determine the extent of contamination in sediment and the nearby watershed as well as passive sampling techniques to determine bioaccumulation potential and possible source areas where accumulation would be most likely to occur.

4.1 Sediment Sampling

Sediment sampling results will be combined with data collected previously to evaluate the extent of PCBs in sediment in the watershed. Sediment data will be normalized using total organic carbon and will be compared to corresponding criteria in accordance with NYSDEC Technical Guidance for Screening Contaminated Sediments (NYSDEC 1999). Upgradient sediment results will be used to determine if PCB concentrations are consistent with areas unaffected by Carrier's facility. Additionally, concentrations will be reviewed and combined with historical data to determine if a total PCB concentration gradient is evident in Sanders Creek.

4.2 PISCES Sampling

Based on previous fish tissue investigations (EnSafe 2007), PCBs are present in fish tissue in Sanders Creek. PISCES sampling results will indicate locations where bioaccumulation is occurring and will provide information to compare areas in the stream. PISCES sampling will also provide upgradient information that will be used to determine if PCB accumulation is consistent with fish tissue in areas unaffected by Carrier's facility. Water column and fish tissue concentrations will be estimated using calculations and methods outlined in Breault et al., 2004.

PCB data will be used to make management decisions and establish remedial goals.

5.0 HEALTH AND SAFETY PLAN

All PCB sediment and PISCES sampling activities will be conducted in compliance with the site-specific health and safety plan, to be prepared prior to conducting activities outlined in this work plan. The health and safety plan has been prepared by EnSafe specifically for the activities described herein for the facility.

6.0 IMPLEMENTATION SCHEDULE

The schedule for the activities outlined in this work plan is as follows:

Submittal to NYSDEC	August 27, 2007
NYDEC Review	14 days after Submittal (September 10, 2006)
NYDEC Approval	14 days after Submittal (September 10, 2006)
Preparation/Mobilization for Field Activities	30 days after Approval (October 10, 2007)
Field Activities	30 days after Approval (October 10, 2007)
Lab Analysis	20 to 45 days after completion of field activities (November 25, 2007)
Report generated for submittal to NYSDEC	60 days after receipt of hardcopy analytical data from laboratory (January 31, 2008)

Note: Dates are conditional based upon approval date of Work Plan, site conditions, and other factors.

The report generated will detail the sampling activities and procedures, results, and further actions, if warranted.

7.0 REFERENCES

Breault, R.F., Cooke, M.G., and Merrill, Michael, 2004, Sediment quality and polychlorinated biphenyls in the lower Neponset River, Massachusetts, and implications for urban river restoration: U.S. Geological Survey Scientific Investigations Report 2004-5109, 48 p.

EnSafe Inc., September 2006, Sanders Creek Sediment and Fish Sampling Work Plan, Rev No.: 1.

EnSafe Inc., April 2007, Sanders Creek Sediment and Fish Sampling Report, Rev No.: 0.

Litten, Mead, B., and Hassett, J., 1993, Application of passive samplers (PISCES) to locating a source of PCBs on the Black River, New York: Environmental Toxicology and Chemistry, v. 12, p. 639–647.

NYSDEC, 1999, Technical Guidance for Screening Contaminated Sediments.

U.S. Environmental Protection Agency (USEPA), Onondaga Lake, Downloaded 2007 at URL http://www.epa.gov/region02/water/lakes/onondaga.htm

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Attachment A
Sediment Sampling Procedures

Sediment will be sampled for PCB analysis using stainless steel spoons. Samples will be collected from the stream banks, areas of sediment accumulated within the stream, and low energy areas at the water-stream bank interface. Specific procedures for sediment sampling are as follows:

Before Surface Soil Sampling:

- Don personal protective clothing and/or equipment as required by the HASP included as Section 8 of this work plan.
- Designate the location(s) to be sampled.
- Clear vegetation and other debris from the surface around the boring location.
- Place clean plastic sheeting on the surface near the sample collection location to hold decontaminated sampling equipment.
- Set up a decontamination area for sampling equipment, if required.

During Surface Soil Sampling (0 to 6-inches depth):

- Remove surface debris from the sample location.
- With a stainless-steel device, scrape the sample collection location to obtain a previously unexposed surface.
- For non-VOC samples, use a decontaminated stainless-steel or Teflon-lined sampling device (e.g., spoon, spatula) to collect the volume needed to fill the sample container(s).
- For non-VOC grab samples, completely fill the sample containers directly from the sampling device, avoiding twigs, large rocks, and grass. Secure container with Teflon-lined cap.
- For non-VOC composite samples, empty contents of the sampling device into a decontaminated stainless-steel or Teflon-lined bowl. Collect enough to fill all the containers. Mix sample using a decontaminated stainless-steel or Teflon-lined spoon or spatula. Place the homogenized mixture into the appropriate sample containers. Secure container with Teflon-lined cap.
- Label each sample container and preserve to 4°C.

If a Hand Auger is Used for collecting Sediment Samples:

- Begin augering to the depth required for sampling.

- Record pertinent details about features of the soil or sediments in the field notebook or on a field boring log.

- While advancing the auger to the desired depth, it might be necessary to insert a PVC surface casing to minimize disturbance of the borehole walls.

- Stop augering at the top of the specified or selected sampling depth.

- Collect sample.

    - Place the remaining sample volume into a stainless-steel bowl. If a composite soil sample is required, mix the sample in until thoroughly homogenized and place into the appropriate containers. Label the samples and preserve to 4°C.

    - Record the sample identification number, sample collection depth, and analyses required in the field logbook and/or on the appropriate field forms.

After Soil Sampling:

- Backfill the borehole with any excess soil.

- Record pertinent information in the field logbook.

- Clean site. Place disposable materials in the designated dumpster for disposal.

- Complete the field logbook entry. Entries in the field notebook will be legibly written in indelible ink.