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September 24, 1991

Mr. Douglas J. Tomchuk
Remedial Project Manager
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
26 Federal Plaza - Room 747
New York, New York 10278

Re: Comments on the Phase 2A Sampling Plan for the Hudson River PCB Reassessment

Dear Mr. Tomchuk:

During the evening of September 11, 1991, you made available to the General Electric Company (GE) copies of the Phase 2A Sampling Plan for the Hudson River Reassessment Remedial Investigation/Feasibility Study (RRI/FS). It is our understanding that you are not soliciting comments on this document. However, GE believes there are serious deficiencies with the EPA approach and these comments must be considered by EPA. It is our understanding that implementation of the work plan is scheduled to begin within the next month.

While we applaud EPA for recognizing the need to collect additional data we are concerned with the lack of public input and also lack of specificity in the work plan. Additionally, GE believes some of the data being proposed for collection by EPA will be redundant with on going GE data collection activities. With respect to the absence of a comment period, this lack of meaningful input is exacerbated by the fact that the majority of the work proposed is not at all of a routine nature. Rather, the methods are essentially research in nature (i.e. radionuclide age dating of sediment cores, performance of a side-scan sonar survey, and collection of a high-volume water sample for analysis of PCB congeners by an unspecified, non-standard analytical technique). If EPA proceeds with these essentially, nonstandard, unproven research investigations, we strongly believe that the costs incurred by you will be potentially nonrecoverable under the National Contingency Plan (NCP). More importantly, we are concerned you will waste what limited budget you do have and still not have the information required to complete the RRI/FS. This will either result in project delays, an unsupportable decision, or both.

Due to the above concerns coupled with the fact as discussed below that GE is and will continue to collect the data that is truly time critical, we strongly urge EPA to allow at least a one month comment period on the proposed work and in addition perform at least an internal EPA peer review (composed of regional and national technical and regulatory experts) of the proposed research efforts.

GE is very supportive of applying the most current technical thinking on the project. However, due to the research nature of the proposed work, GE believes the project would be best served by not only discussing the merits of the proposed work but also allowing sufficient time for EPA to properly plan the data collection effort.

COLLECTION OF DATA BY GENERAL ELECTRIC

The proposed data collection by EPA is redundant with data collected or being collected by GE. In particular, with respect to data collection being proposed by EPA, GE is currently performing a bathymetric survey of the upper river and collecting data on PCB (congener-specific) water column concentrations at a number of upper river locations with time. Additionally, GE has implemented an intensive monitoring program near the remnant deposits that is mandated by the EPA. GE believes duplication of this remnant deposit monitoring effort by EPA would make the costs expended by EPA for the effort nonrecoverable under Superfund.

With respect to the proposed water column monitoring program between Glens Falls and Waterford, GE has collected and continues to collect total and dissolved PCB values at eight (8) stations in the upper river. The vertically stratified composite samples have been collected since April of this year at an initial frequency of three (3) times per week. A significant number of the samples were analyzed by a GC-ECD capillary column methodology (congener-specific analysis). The frequency of sampling will soon change to one sample per week at each station, with all the samples undergoing congener-specific PCB analysis. GE is anticipating continuing this program through next Spring. We believe this data will duplicate the data you are proposing to collect. We would like to provide to you details of this program and to meet with you to discuss the results. In lieu of EPA embarking on a potentially redundant sampling program, GE requests that EPA first consider this important data and then if modifications are needed allow GE to implement the modified program under the oversight of EPA. GE believes this is the most cost and time effective method of gathering the data of concern.

GE is also performing a bathymetric survey of the upper Hudson River. This includes the collection of river bed elevations along transects perpendicular to river flow at approximately 100 foot intervals in the Thompson Island Pool and 1,000 foot interval in the river upstream of the dams in reaches 1-7. Also, transects are being performed in locations to correspond to transect locations used in previous bathymetric surveys (1977, 1983). The field data collection effort should be complete by mid-October. The first data sets (Thompson Island Pool) are currently being processed. GE believes this data could completely replace the bathymetric data set proposed in the Phase 2A sampling plan by EPA. GE would like to meet to discuss this data and make the results available to EPA. EPA should at least postpone collection of this data until evaluation of the current survey is complete.

In addition to the bathymetric data, GE has also established control points along the upper Hudson River so precise vertical and horizontal control can be obtained. EPA should utilize these control points. GE will also make this information available to EPA.

In addition to the data collection described above, GE is performing monitoring at the remnant deposits. GE is performing this monitoring as part of the agreement with EPA entered into under the Superfund program (Civil Action No. 90-CV-575). This agreement requires that GE implement a monitoring plan designed to determine the flux of PCB's in air, surface water, river sediments and biota around the remnant deposits.

On pages 9 and 10 of the EPA Phase 2A sampling plan, the stated purpose of the water column monitoring has as a fundamental component, the need to determine the effect on the water column PCB level of the remnant deposit remediation. Under the remnant deposits agreement between GE and EPA it is GE's job to determine the effects of the remnant deposits remediation on all applicable media. GE expects EPA to act in a consistent and cost effective manner. For EPA at this time to perform water column monitoring is inconsistent with the monitoring arrangements specified in the remnant deposit agreement. GE is also planning to continue it's monitoring as described earlier and will be glad to share the data with EPA. If EPA does proceed with the monitoring, it is GE's opinion that costs associated with the activity will not be recoverable under Superfund.

LACK OF COMMENT

GE continues to be shut out of the technical exchange process with EPA and as a result have minimal meaningful input into the RRI/FS process. GE believes this is contrary to your own policy on the participation of potential responsible parties (PRP's) in the Superfund process (OSWER Directive No. 9355.3-01). The development and proposed implementation of the Phase 2A sampling plan is but only the most recent example. When the conceptual plan for the data collection effort was first proposed to the Science and Technical Committee, I expressed a strong interest in discussing this document with the technical group. I even requested that I be allowed to participate in the Science and Technical Committee so GE could at least have one avenue to participate in the technical dialogue. I made this request since Dr. Dan Abramowicz does not represent GE on this committee but rather is a neutral chairperson. You said you would bring this up with your management. However, instead of allowing another GE representative to participate in the committee you instead changed the role of the committee from a functioning "advisory-type" group to one that you may just bounce ideas off of. To date, I have not formally heard back from you but based on the newly defined role of the Science and Technical Committee, as a sounding board to EPA, it is clear EPA does not believe that the Science and Technical Committee is the proper forum for GE to have a dialogue with EPA and others on the technical project issues. It's nearly one year into the project and GE still lacks a mechanism to discuss technical and regulatory project issues with EPA.

The above problem may not have been as significant if GE was allowed to review and then comment on the work plan for data collection. However, EPA decided that there was certain priority data that must be collected in the Fall of 1991. GE is not opposed to moving forward with data collection in a phased manner. However, due to the nonstandard methods identified by EPA for data collection, the lack of work planning (see discussion below), the high visibility of the project, EPA's commitment to perform the project in a technically defensible way, the availability of data collected by GE, and the lack of support for the proposed data being "time-critical", GE strongly suggests that EPA allow at least a thirty day comment period on the Phase 2A sampling plan. Additionally, EPA should perform an internal peer review of the data collection techniques suggested by your contractor.

GROSSLY DEFICIENT WORK PLAN

The Phase 2A work plan is too general of a document and is insufficient to even comply with the minimal EPA guidance requirements On page 2-12 of the RI/FS guidance (OSWER Directive No. 9355.3-01) it states that for all RI/FS's where field work is planned EPA must have a work plan, a health and safety plan and sampling analysis plan (SA). With respect to the sampling and analysis plan the guidance goes on to state that the SA plan consists of a Quality Assurance Project Plan (QAPP) and a field sampling plan (FSP). Furthermore, the FSP should be written so that a field sampling team unfamiliar with the site would be able to gather samples and field information required. The EPA phase 2A sampling plan does not even contain a QAPP. The method to be used for PCB analysis is not even given.

It is clear, the plan submitted by EPA is at best conceptual and GE believes that EPA should hold itself to the same standard it would use to judge the adequacy of work performed by a potentially responsible party (PRP). If GE were to submit a plan that did not include the a level of detail sufficient to convey the complexities of the work or that failed to include entire sections (i.e. a QAPP), we would certainly, at a minimum, be told to revise the document (probably under threat of penalty) prior to implementation.

The sampling plan is deficient in another significant way. While the proposed data collection methods are described in at least a conceptual way, the actual reason for needing the data is at best described poorly. There is less than one page of text devoted to the objectives of what is probably a $750,000 data collection effort. We believe that an orderly process should be followed where a clear definition of data gaps occur first, then methods for filling the gaps are evaluated to ensure that the objectives of obtaining the data are clearly understood. There should be a clear linkage between the specific elements of proposed data collection efforts and the objectives of the sampling.

As examples of this problem, note the following information EPA proposes to collect.

- Cores will be x-rayed to detect in situ density variations before extrusion of the cores (page 7)

- At each station, data will be collected on water column conductivity, temperature, dissolved oxygen, and Ph, using appropriate probes (page 10)

While GE can speculate on what purpose the data may serve it would seem reasonable that the EPA and it's consultant would explicitly describe what objective the data was intended to fulfill. Basic questions arise such as: Why are the in situ density variations important for preparing the risk assessment? What accuracy and precision are required or dictated by the data need and how will the proposed method of collection meet the requirements? How will the water column data be employed in the risk assessment and what level of accuracy and precision are needed in the analysis?

GE does not believe this is an unreasonable requirement. EPA's own guidance for data collection under the Superfund program recognizes the importance of proper planning for data collection. Specifically, the EPA guidance document entitled: Data Quality Objectives for Remedial Response Activities (OSWER Directive No. 9355.0-7B) defines the EPA process by which data quality objectives (DQO's) are defined. The EPA remedial project manager is responsible for coordinating the DQO development process; and overseeing remedial contractors (page 3-1 OSWER Directive No. 9355.0-7B). DQO's are established prior to data collection and are not considered a separate deliverable. Rather, the DQO development process is integrated with the project planning process, and the results are incorporated into the sampling and analysis plan (SAP), quality assurance project plan (QAPP), and in general terms for the work plan for the site (OSWER Directive No. 9355.0-7B).

The Phase 2A sampling plan does not come close to complying with the agency guidance for DQO's. The plan lacks specificity and is missing entire sections (i.e. QAPP). Given the gross deficiencies with the sampling plan, GE strongly urges the EPA to revise the plan to comply with it's own guidance and to allow comment on the proposed methods since they deviate so significantly from standard EPA procedures.

SPECIFIC TECHNICAL COMMENTS

In addition to the general comments given above, GE has a number of specific comments and questions on the Phase 2A sampling plan. These are included as Appendix A to this letter.

SUMMARY

The EPA has taken on a great responsibility when, contrary to it's own national policies, refused to allow GE to perform the Hudson River RRI/FS. The EPA committed to do a state-of-the-art project. The Phase 2A sampling plan prepared by EPA does not fulfill the commitment made by EPA. Based on GE's review of this data collection plan we have a number of requests and recommendations:

- The EPA should review the significant and relevant data collected or being collected by GE prior to implementing the Phase 2A data collection. GE will meet with EPA at it's convenience to explain and supply the relevant data.

- The EPA Phase 2A sampling plan lacks sufficient detail and specific data quality objectives and as such does not meet EPA requirements for such activities. EPA should modify the document to address the noted deficiencies.

- The EPA needs to allow comment by interested parties on the Phase 2A sampling plan and all other significant documents. This is particularly true since the methods of data collection being proposed are research in nature as opposed to standard methods employed by the Superfund program. The activities are also not insignificant from a cost standpoint ($750,000 estimate) and this large expenditure of money may limit the amount of work EPA will be willing to perform, thus limiting the impact of comments relating to the need for more data in the future.

- The EPA should act in a manner consistent with the remnant deposit agreement with GE which calls for GE to perform the monitoring necessary to determine the flux of PCBs from the remnant deposits to the River. EPA should not perform redundant monitoring or monitoring using different methodologies than those specified in the agreement.

- GE formally requests that it be allowed the opportunity to observe all EPA field activities and to obtain splits of samples. The only thing required by EPA or its contractors is a periodic telephone call or letter describing the upcoming schedule of activities so we can schedule our field personnel.

- GE requests copies of contracts, State-EPA funding documents, or other documents that specify the scope of activities to be performed, the funding or dollars to be supplied by EPA, or the schedule for completion of activities related to work to be performed by the NYDEC, New York Department of Health, Lamont-Doherty Geological Observatory or SUNY-Stony Brook on the EPA RRI/FS.

- GE requests for review and comment copies of the QAPP and PCB analytical protocol for the Phase 2A data collection effort.

- GE again requests access to the Hudson River RRI/FS Administrative Record (AR) and requests that a copy of these comments be placed into the AR.

Your timely response to these comments and recommendations would be appreciated. Please let me know if you plan to proceed with your field efforts as presented in the plan. We would like to meet with you as soon as possible to discuss sharing the relevant GE data. If you have questions or require clarification on any of the comments I can be reached at (518) 458-9108.

Yours truly,

John G. Haggard

John G. Haggard
Technical Project Manager

Enclosure

cc: Douglas R. Blazey, EPA (with enclosure)
William McCabe, EPA (with enclosure)
Paul Simon, EPA (with enclosure)
Bob Runyan, EPA (with enclosure)

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APPENDIX A

Comments by the General Electric Company on the U.S. Environmental Protection Agency's Phase 2A Sampling and Analysis Plan

Hudson River Reassessment RI/FS

September 24, 1991

General Electric Company
Corporate Environmental Programs

INTRODUCTION

The General Electric Company submits these comments/questions on the Phase 2A sampling and analysis plan (Hudson River RI/FS) to the EPA. The comments are arranged by page and paragraph or section number. Due to the lack of; detail, a Quality Assurance Project Plan (QAPP) a description of specific analytical technologies, and clear, well define project objectives (i.e. data quality objectives - DQO's) it was difficult to tell if the proposed effects would yield acceptable or useful data. The problem is magnified since the majority of the data collection technologies are best described as research methods.

SPECIFIC TECHNICAL COMMENTS

Page 1, Par. 3: The Quality Assurance Project Plan is not included in the sampling plan. Additionally, a number of critical analytical techniques are not included. GE requests that these missing components be supplied to GE for comment and review prior to implementation of the sampling or analysis.

Page 1, Objective: This section of the work plan is very general and does not appear to meet the basic requirements of EPA DQO guidance. EPA must complete a DQO analysis for the sampling before expending large amounts of EPA's limited resources. Also, EPA claims that certain data must be collected now. GE does not see how this could be true given the large number of potential data needs identified in the Phase I report and the very few data collection activities given here. This seems particularly true of the side-scan sonar survey which could be conducted in the future, if it is really needed (see related comments below).

Page 2, List of Data Gaps: EPA lists 9 general data needs. These "data gaps" as given, are of little use in defining the implementation level data quality objectives that are needed in this type of sampling plan. A number of questions for each data category come to mind.

Item 1 - What is the specific purpose of determining the current PCB concentrations (including congeners) in the sediment? Does EPA want to make any comparison to historical data? Is EPA interested in average concentration (depth integrated) or in surficial levels? Will the congener data be used to evaluate the occurrence and extent of in situ biodegradation (see Item 4)? What analytical method is required? What precision and accuracy is needed and why? Do all measurements have to be congener-specific or can a mix of total and congener-specific analysis be obtained?

Does EPA want to determine the current "Hot Spot" distribution (see Item 9)?

Item 2 - Why is EPA proposing to collect total and congener-specific PCB concentrations in the water column? What method will be employed for analysis? What is the required accuracy and precision and why? Are the sampling and analysis techniques going to allow comparisons to the historical data? What frequency of sampling is needed during scouring events? Is it important to sample the rising and falling limb of the hydrograph?

Item 3 - On what time scale is EPA interested in looking at PCB congener and total variations and why (storm, seasonal, diurnal, long term trend)? What media will be investigated and why?

Item 4 - What specific testing will be performed to determine the rate and extent of in situ biodegradation? Will different approaches be employed in the upper and lower river sediments? Will there be an attempt to determine both aerobic and anaerobic components?

Item 5 - Given the remnant deposits remedy has just been completed, how long does EPA believe it will take for the water quality to show improvements (instantaneously, months, years)? How will EPA collect data sufficient to separate the "risks" from the source above Route 197 and those below Route 197? Should sampling occur along shore, mid-channel, or both? Is it necessary to monitor for PCB congeners or are total PCB levels sufficient?

Item 6 - By estimating current mass in the river, how is EPA evaluating the possible duration of PCB effects on water quality? Is availability for transport an issue? How will EPA determine the mass of PCB's? How accurately does this need to be known?

Item 7 - What is the purpose of estimating shoreline soil and sediment PCB levels? How does EPA define shoreline sediment and soils (on the bank, in the water, above the bank)? How accurately will these concentrations be defined and what spatial resolution will be used? Is this data needed for a part of the river or all the upper and lower river (and why)?

Item 8 - Why does EPA want current airborne levels? Is it possible to estimate values from first principles and water column values prior to deciding whether or not field sampling should occur (i.e. conservative screening study)? What sampling and analytical methods would be used? What detection limit would be required?

Item 9 - Did "Hot Spots" as defined by NYDEC (from the 1977 data) exist? Do they still exist? How does EPA define a "Hot Spot" (PCB level, distribution with depth and spatially)? Will average PCB levels in various river segments be determined? What is the statistical basis for a sampling program? How will this data be used (risk assessment, feasibility study, etc.)?

Page 3, Flood Scenario Data: The additional data required for examining the effects of a major flood are described in a general way and it is difficult to see how the EPA proposed program will yield the necessary data. A number of questions come to mind when considering the items listed by EPA:

Item 1 - Should EPA first determine what spatial distribution of sediment will be mobilized before determining what the mass of PCB's that will be mobilized? What depth of sediment is of concern? Can compositing of samples occur? Do we need total PCB or congener-specific data?

Item 2 - Is it necessary to estimate the contamination characteristics just spatially or is the contamination as a function of depth a concern? If depth is of concern, what depth? How accurately do the values have to be determined (spatial resolution as well as accuracy of point estimates)? What is the flood scenario (magnitude and recurrence interval)? What does the flood hydrograph look like and how important is this? Are the river hydraulics adequately known?

Item 3 - What are the bed scour characteristics of interest and why? Over what portion of the river is this information necessary? Are both bed load and suspended load being considered? What spatial resolution is necessary? How will bed armoring be considered? What depth of bed is of interest? Does scour characterization need to occur for material below the surface? Are any laboratory studies needed?

Page 3, par. 2: It is stated that it is important to perform congener-specific analysis so possible sources of PCB's and the occurrence of biodegradation can be evaluated. GE concurs this is important since the presence of higher chlorinated levels of PCB's are a good indication of non-GE sources. However, the converse test is not true, that being the presence of lower chlorinated levels is definitely due to GE. Firstly, the process of anaerobic biodegradation tends to reduce the level of chlorination of a PCB making a higher chlorinated PCB mixture appear more like a lower chlorinated PCB mixture. Secondly, the lighter chlorinated PCB's were the most widely used. Therefore, concluding based on a congener pattern alone that a PCB is from GE would be indefensible.

Page 3, Par. 4: In May of 1991, EPA performed a test of a research data collection technology (side-scan sonar). In the future, GE requests that EPA at least have the courtesy to notify interested parties of such activities. GE also request an opportunity to overview all field activities. Furthermore, on occasion, if adequate sample volumes are available, GE may wish to split samples for independent analysis. This will require a minimal coordination effort on EPA's part.

Page 4, Sec. 3.1: GE has established an extensive network of control points in the upper river and EPA should utilize this in field work. GE will be glad to meet with EPA and share this data at EPA's convenience. With respect to the datums being employed, GE has evaluated the use of the North American Datum (NAD83) and found problems with this and suggest that NAD27 is more appropriate. The earth is not a true sphere; it is an oblate spheroid. The North American Datum of 1927 (NAD27) used the Clark ellipsoid of 1886 to represent this effect. Many of the control points were surveyed in the mid-to-late 1900's and the errors introduced are well known and recognized today.

By contrast, the more accurate NAD83 is based upon both earth and satellite measurements. If no historical data existed for the Hudson River project, and we were not interested in spatial trends, the NAD83 projection would be an excellent selection. However, we have a vast historical database that references NAD27. The following data sets reference NAD27 ground control: 1977 shoreline maps, NYSDEC 1977 sediment data; 1983 EPA sediment data, and the 1977 and 1983 bathymetric surveys.

Conversion programs between NAD27 and NAD83 are ineffective. They distort and propagate errors that may exist in NAD27. For the Upper Hudson errors in converting between NAD27 and NAD83 can be as great as 50 feet.

Page 4, Section 3.2: EPA proposes that a nonstandard indirect technique be employed to study the morphology and sediment texture distribution (i.e. side-scan sonar). A exploratory survey was conducted and the results are presented in

Appendix A-2 of the Phase 2A sampling plan. Additionally, EPA is proposing a bathymetric survey and a sub-bottom profiling survey. EPA should not perform the bathymetric survey but should rather use the data being collected by GE. It appears that the sub-bottom profiling survey will be used to determine the thickness of sediments and the side-scan sonar will yield data on sediment textures and bed morphology.

With respect to the side-scan sonar, EPA does not present **any** information on this technology. It does not appear that the technique has ever been employed in similar situations. It has been used in geotechnical construction activities where gross textural and spatial changes are required. The exploratory survey performed in May of this year yielded, at best, qualitative results on bed morphology and did not yield any confirmed information on sediment texture distribution. Even the conclusions in the report (appendix A-2) as given by Dr. Roger Flood are tentative: "We stress that these data have been in hand for only about three weeks, and that our statements here are thus only preliminary, subject to revision, and designed to provoke discussion into the underlying causes of sediment and PCB variability". This is certainly not a vote of confidence for the technology, yet it is the only information offered by EPA to support the use of this technology..

Some of the conclusions of the survey report seem exaggerated. With respect to the ability to differentiate sediment types and contaminant areas it seems to be inconclusive. It did appear to show bed morphology. The report did not show that the sub-bottom profiling system had any utility in the river.

The problems and potential limitations of this technology was also discussed at the July 11, 1991 meeting of the EPA Scientific and Technical Committee. A transcript of the meeting was prepared. The relevant portions related to the presentation by Dr. Flood are enclosed. During the discussion a number of important points were brought up:

1. What is measured by the technology is the reflectivity of the river bottom.

2. The reflectivity depends on a number of variables including surface slope, presence of gas, sediment grain size and presumably other factors such as density, stratification, etc.

3. The cost of the survey is estimated to be approximately $200,000.

4. Two sonic frequencies are used; 100 kilohertz and 500 kilohertz. The 500 kilohertz frequency has a wavelength of approximately 3 millimeters. The 100 kilohertz wavelength would have a wavelength of approximately 5 times greater (15 millimeters).

5. The grain sizes of interest, in terms of a strong correlation to PCB, are very much smaller that the wavelengths being used, so a useful relationship with frequency might be difficult to develop.

6. A rule of thumb is that the depth resolution for side-scan sonar is approximately 1 wavelength (3-15 millimeters).

7. It is not clear what the relationship between frequencies, reflectivity and grain size are for the sediment in the Hudson.

8. It is not clear side-scan sonar can differentiate grain size in enough detail to allow those "fine-grained" sediments that may have a relationship to PCB to be differentiate from the grain sizes that do not.

9. Work like that proposed by EPA is an active area for research for people who use sonar.

Based on the discussion during the meeting on July 11, the lack of useful results for the exploratory survey and, the lack of documentation presented by EPA, it is difficult to be optimistic that an additional, costly, extensive side-scan sonar or sub-bottom profiling survey will yield any significant useful information on the distribution of sediment texture within the river that will have relevance to the PCB content of the sediment. Additionally, the technique will only "see" material to a depth of approximately 0.1 - 0.5 inches. A significant threshold issue then is to determine how important vertical variability of the sediments might be in the Hudson River. GE strongly recommends that EPA not move forward with this technique at this time. The unconfirmed conclusions of the field test should be supported by real data. If EPA has additional data that would support the use of this technology, it is suggested they make it available (administrative record?) to interested parties and try to answer the following questions:

1. Does a relationship between texture and PCB composition exist?

2. Has the use of multi-frequency sonar been used to differentiate sediments in the size range of interest?

3. Does the property being measure (reflectivity at two different frequencies) have a theoretical connection to grain size?

4. Is the relationship between the reflectivity and the grain size and the grain size and PCB content significant?

5. What is the benefit of having detailed river bed morphology? Would this be an issue for the feasibility study or for the risk assessment?

6. What do we know about vertical variability of the texture in the sediment column?

   EPA needs to clearly define the data quality objectives for this study and to carefully evaluate whether the techniques proposed to fill the data needs will work. The proposed sub-bottom profiling survey and side-scan sonar survey point out the problems that can occur not only when the data needs are poorly defined, but also when the methodologies to fulfill the data needs are poorly documented or researched. GE hopes EPA does not consider the costs of the exploratory research program recoverable under the Superfund program.

Page 7, Section 3.3: The use of confirmatory sampling is a required part of properly designed geophysical survey program. However, GE believes EPA should not implement this portion of the program at this time until further investigation and documentation of the geophysical techniques occur.

Page 7, Section 3.3, Bullets: The following specific comments and questions apply to the specifics of the confirmatory sampling:

- What classification scheme will be employed to classify sediment texture?

- The x-raying of cores will occur. Where is this procedure documented/validated and what will the density variations be used for (i.e. why do this?)?

- Why will redox potential be measured in the confirmatory core? How will the redox potential be measure? It might be useful to measure the redox potential in cores that have congener-specific PCB analysis to see if a correlation with Eh and PCB alteration (biodegradation) pattern exists. The use of Eh probes can be very difficult when solids are present and if the data is really needed, EPA should consider measuring both ferrous and ferric iron (or another couple)content of sediment pore water.

- Please provide a copy of the grain-sized distribution measurement technique for review and comment.

- What is the purpose of measuring total carbon and total nitrogen on 250 confirmatory sediment samples? What is the purpose of measuring total carbon on 50 confirmatory core samples?

- The samples are to be stored for a year and then either discarded or air dried for long-term storage. Would the samples be better preserved if they were frozen? If the samples contain greater than 50 ppm of PCB can these samples be stored greater than one (1) year? Can they be discarded? How will EPA handle investigatory-derived waste during this investigation?

- The plan states "required" sample handling procedures for Superfund sites will be followed, including chain-of-custody forms, etc. This lack of detail is clearly inadequate to meet the EPA requirements as specified in RI/FS guidance (see earlier discussion).

<u>Page 8, Section 3.4:</u> The capabilities of the high resolution coring program seem to be over sold. One use is stated as being to finger print, based on congener mixtures and "determine the relative contribution of various sources to the total PCB loads at any given location in the River". There is no explanation on what technique will be used to conclude that a given PCB mixture in a given strata comes from a particular source. The difficulty on just determining the type of Aroclors that may have been present is difficult since environmental PCB samples are effected by biological, chemical, and physical process that make it difficult to determine what the original source might have been. Additionally, there was so much use of PCB in the Hudson Valley from numerous sources that it will be impossible to determine, from PCB measurements alone, what the type of PCB was and what the actual source was. It would appear that what the data will give is the <u>relative</u> change in PCB in <u>relative</u> time at a single location in the river. GE believes extrapolation of conclusions to the entire river or to absolute PCB loading levels or to absolute time is a difficult task that will require additional data beyond that from isolated sediment cores within the river.

Page 8, Par. 3: Cores should be taken in areas suspected to be PCB sources, particularly in the lower river. It is not clear where in the river cross section the cores will be taken. Will they be taken as close to a potential shore source as possible, or near the channel? What selection criteria is being used?

Page 9, Par. 3: What method of PCB analysis will be used? What is the purpose of the total carbon, total nitrogen, total organic carbon, and grain size distribution? Will any duplicate cores be obtained?

Page 9, Par. 3: If "uninterpretable" cores are obtained, GE believes the raw data should be reported. Data that does not fit a conceptual model often show the model may be inappropriate or need refinement.

Page 10, Par. 1: EPA proposes to determine the effect of the recent remnants remediation on water column PCB levels by performing a limited number of sampling events. As previously communicated to EPA, GE believes that this information is necessary to determine the "base load" of PCB's so that a proper "baseline" risk assessment for the river sediments (reported purpose of the RRI/FS) can be prepared. The program proposed by EPA may be too limited to achieve the stated objective. Particularly, the time frame during which monitoring will occur is very limited and conclusions concerning the effectiveness of the remnants remediation will be based on a very limited data base and therefore suspect.

An additional problem is that EPA has already agreed that GE should perform the monitoring in the vicinity of the remnant deposits. GE is also monitoring on at least a weekly basis at eight (8) stations in the upper Hudson River. In light of this, monitoring by EPA will be redundant and GE should not be asked to reimburse costs incurred by EPA or its representatives in performing such monitoring. EPA should allow GE to continue both monitoring programs and utilize the data in the RRI/FS.

Page 11, Par. 2: Monitoring on only seven occasions is of limited value. A long term monitoring program should be developed and implemented and coordinated with the on going U.S. Geological Survey (USGS) program, the GE remnant deposits monitoring program and, the GE upper river monitoring program. The existing data base has shown significant seasonal variation in PCB concentrations and a monitoring program limited to a small portion of one year will be of limited value. What is the exact purpose of the monitoring?

Page 11, Bullet 3: What procedures will be followed for the measurement of pH, DO, and specific conductance. Why will this parameters be measured? What QA/QC will apply?

Page 11, Bullet 4: It is stated that 20 liter water samples will be obtained for the analysis of PCB's. Appendix B has a bit more detail on the sampling procedure. With respect to this the following questions/comments apply:

- Physically, how will the samples be collected (pump, jars, etc.)?

- The historical USGS data is based on depth integrated samples at specific river points. The method proposed by EPA is to take separate samples along the river cross section and composite the samples. This change in sampling procedure may make the data sets noncomparable. Additionally, the use of depth integrated sampling of the main channel should yield data more representative of the entire upstream section of the river (PCB flux) as opposed to isolated near shore areas where one sample may only be representative of the very small area where the sample was taken. If it is EPA objective to investigate individual sediment areas and determine flux of PCB from these areas a significant change in the sampling plan will be required.

- The purpose of using 20 liter samples is not discussed. Presumably this will be done to try to lower the PCB detection limit. What is the detection limit that will be achieved by the method in question? Has the method been validated? Which laboratory will be contracted to handle the large sample? Is this an accepted EPA method? GE has been able to utilize more routine methods in a commercial laboratory to achieve acceptable levels of detection.

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In the Matter

- of the -

Meeting of the Scientific and Technical Committee

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Holiday Inn
Latham, New York

July 11, 1991
1 p.m.

PRESENT:

DAN ABRAMOWICZ
DONALD AULENBACH
JIM BONNER
RICHARD BOPP
BRIAN BUSH
KEN DARMER
DONALD DAVIS
ALBERT DiBERNARDO
ROGER FLOOD
EDWARD GARVEY
JOHN HAGGARD
NANCY KIM
TYLER MADDRY
BOB MONTIONE
GEORGE PUTMAN
GABRIEL RAGGIO
GYULL RHEE
NEIL SHIFRIN
DOUG TOMCHUCK

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MR. DiBERNARDO: But I think everybody knows where they would want to go from here or what the next thing is.

I think I would like to move on, if we can. For those that forgot, this is Dr. Flood. He is going to talk about the side-scan sonar work that we did and the side-scan sonar work that we propose to do; so Roger Flood.

DR. FLOOD: As stated, I guess the first -- or a first objective of this Phase 2-A sampling program is to conduct some geophysical surveys of the river bottom, and there are a couple of reasons why we see this as an important thing to do.

The first thing -- well, I guess with geophysical surveys or remote sensing, what we're doing is using sound in different modes to show us what's on the bottom, and we want to use this in general to extrapolate measurements which are made at one point through core samples over a larger area which can be more easily sampled using sound or acoustic techniques, so there are a number of objectives that I have listed here.

The first is to show -- give us the present status of the river bottom, to make the site map, if you will, which shows where things are at the present time, so if nothing else, in five years we can see to what extent things have changed through natural processes. This is something we can't say now, how fast the bottom changes through natural processes. This would give us something that we could comment on that.

Second, we can get some information on what the sedimentation patterns are or maybe more broadly the structural patterns where different kinds of features are on the bottom. In conjunction with sampling, we can tell where different kinds of sediment types are or different kinds of sediments, and through relation to the sampled PCB distribution patterns, both as part of this project and those especially that are well navigated from previous surveys, we can sort of tie these issues together, again in a spatial distribution pattern.

The third thing we can start getting at are sedimentation processes, what kinds of mechanics actually go towards moving the sedimentss on the bottom, controlling where they are actually deposited. We are looking at an artificially created channel mostly. It's monitored, its flows regulated, and all of this has an implication for transporting sediments, and we are especially interested in the potential for resuspension both by sort of the yearly events that we have talked about and the more unusual or rare event that's going to happen at some time in the future.

A fourth item is that only certain parts of this entire sort of hot spot area, as it were, has been actually sampled to give us information on sediment type and also PCB distributions. We want to be able to use remote sensing data, which is much, much more quickly acquired, in order to understand what the sediment distribution patterns, and perhaps as we -- well, as we go through the process, we'll understand more about the PCB distribution patterns, but what these are in unsampled areas, and then we will as one of the tasks take samples in these areas in order to expand our understanding of the geophysical records.

And the next item that I have listed here are what are some of the possible considerations for -- maybe dredging isn't the way to say it but certain kinds of remedial actions -- in all of this is there that we need to know?

For instance, a sediment thickness, if there's rock right at the surface, we have to consider that. If there's an area of high concentration which is a thick sediment layer, then there is a different kind of interpretation or recommendation.

As Al pointed out, in May we did a one-day demonstration project through EPA that showed us what the bottom of the river is like with scales that we could manage sort of on one day, and in order to put some of these kind of comments more in context, I want to show that, some of the results of that, briefly.

One of the problems is pretty

well known, I think, in terms of sediment variability. This is a stretch of the river just down from Ford Edward, I think. It's about here someplace [indicating]. This is a summary that Ed prepared, I think --

MR. GARVEY: Actually from the New York --

MR. ABRAMOWICZ: It's backwards.

DR. FLOOD: North is on this side.

MR. GARVEY: It's actually based on the DEC survey of core top classifications.

DR. FLOOD: I will back up one step. The section on that chart is right here [indicating], and in our one-day project we went down two times with the sonar and collected a little more high-resolution data sort of in that corner.

The general problem is that there is a lot of sediment variability, as we can see here. We have a lot of areas characterized by gravels, fine sand, fine sand with wood chips, clays, little -- we've got a little spot there; coarse sands, gravel with wood chips, coarse sand -- anyway, all within a very small area we can see all different kinds of sediment types and even a few that didn't fall into this classification, but there's very little reason for understanding either how to connect these samples into patterns or what has created the patterns, and that's, I think, a critical lack of understanding for being able to assess what's going on because there's no -- in a statistical sense maybe we see something, but there's not very much understood past that.

MR. ABRAMOWICZ: Perhaps I missed something. Is that based upon using your side-scan sonar technique?

DR. FLOOD: No, no.

MR. ABRAMOWICZ: That was just the historical data.

DR. FLOOD: This is historical. This is presenting some of the problem, and a similar kind of thing that -- PCB distributions. It's not the best reproduction but we get very high values and low values sort of right next to each other.

Right here, that's characteristic of the whole region, and sort of what to make of that, how do you take one sample or a bunch of samples and extrapolate it to a larger area? How do you know what kind of approach to take to analyze -- to understand resuspension? These are places where we think the geophysical framework will help.

To do this, the primary tool is the side-scan sonar. This is an acoustic device that I show here sort of in a cartoon form. It's operated by a survey vessel, or there's a tow-fish pulled by a survey vessel. The tow-fish transmits sound off to the side. The very narrow band along the track of the fish sends sound out to the side.

The sound -- it will make one ping that would go out to the side. The sound reflects off the sediment, reflects off obstacles and comes back towards the tow-fish, and for any given scan, we get areas of higher reflectivity and areas of lower reflectivity or shadows, so as the survey vessel moves along, the fish moves forward, pings again, sends out a sound beam to the side. As the fish moves along, you end up covering the whole area with sound, and you get returns from much of the area in a picture like this.

MR. ABRAMOWICZ: Question.

DR. FLOOD: Yes.

MR. ABRAMOWICZ: My understanding is that this is an easy way to differentiate, you know, gravel, larger particles from finer particles, but that it's significantly more challenging to try to differentiate, say, fine sands from silts or something like that, particles of similar sizes but very different compositions.

DR. FLOOD: As you can see, what we've got back here is a map of sound reflectivity, and we have to consider what goes into reflectivity in order to get sort of to the end product.

Just to address that, a typical sonar works at 100 kilohertz. The sound pulse -- the sound wavelength is about one and a half centimeters on a 100-kilohertz unit, but the pulse -- I'm not sure exactly how long it is but it is a number of cycles, so it would be a -- there is a pulse maybe about this long made up of wavelengths about this long [indicating] that's sent out and bounces back.

We can do this at more than one frequency. There is a unit that operates at 500 kilohertz -- actually that operates both at 100 and 500. 500 kilohertz would have a wavelength of just three millimeters now, and its pulse length presumably is also shorter, but the basic character of the sound can be shifted depending on the kind of unit that's available.

The actual reflectivity, the strength of the echo that comes back, can vary with a lot of things, as you pointed out. Sediment type is one thing that will affect just how much sound is reflected back at a given angle. Sediment type here could not just mean sand, silt and clay, but also if we have wood chips, you might expect a different characteristic, return, so there might be some other things that come in here.

Grain size is an important control, especially the relationship between -- or one way of approaching it is the relationship between grain size and the wavelength, so you're right when you're talking about finer-grain sediments, we have -- the particles are smaller than the wavelength, so it does become -- it can be a more difficult process, but if you can count on more than one frequency, you can start to see relationships. Something that's one millimeter here would still be pretty big at 500 kilohertz, although it would look pretty small at 100 kilohertz.

MR. ABRAMOWICZ: Yes, but the success -- you know, the 100-micron type range --

DR. FLOOD: Right. It's difficult but then I haven't heard anyone yet say exactly which part of the sediment is the critical one to map for the PCB problem.

MR. ABRAMOWICZ: We've done a lot of analyses like that actually where we've broken the sediment into a variety of different size fractions using traditional screening techniques and things like that, have mapped total organic content, the PCB distribution, et cetera. These are fairly standard measurements, and as you might not be surprised, it's those finest particles that seem to be enriched in the organic material that show a disproportionately high level of PCB, and we are talking, you know, the less-than-sixty-micron type fraction.

DR. FLOOD: Okay. Well, as you see, and as you say, one cannot -- this is a topic of active research among people who use sonar. It's very difficult to uniquely classify sediments on the sound alone. You have to use some other criteria, but as data sets develop, as we have sediment samples within a sonar grid, we can develop an understanding that seems to work. If we have gassy sediments -- fine-grain sediments especially in fresh water often have methane bubbles. If they're near the surface, that's going to affect the reflectivity.

If we have thin layers of fine sediments over more reflective sediments, that also can affect reflectivity; so there are a number of things that go on. What seems to work out in many instances is that fine-grain sediments, say, tend to accumulate in certain kind of environments, and one can identify those environments based on the setting; so this is all sort of an iterative process that goes on, and one needs to look at some of the data to start to understand how well it actually works.

Also very important is the slope of the bottom. If the sound -- if the bottom is pointing at the fish, you will get a stronger echo. If it's pointing away, you can actually have a shadow effect. Slope is very important, and the topography sort of between grain size and -- in the vicinity of the wavelength can be important; so there are a number of things that go on, and it would be nice if we had a specific property of the sound return that was based on PCBs but that's not -- I would not expect that to happen.

MR. MADDRY: Is there a way to separate some of those variables out? It looks like you get the same reflectivity from different combinations of those, in other words, like looking at patterns of the data or something.

DR. FLOOD: Well, there are patterns. Having two frequencies helps quite a bit, and also working in a region where we have a number of -- a lot of sediment samples. We don't expect to do this in an area and then not sample. We suggested when we take a sonar image, then go and sample just specific things, make sure we know what they are. Some of the exploratory coring is based on that with PCBs in mind, but we can also do a more rapid sediments analysis.

Also, at least the one time we were on the river, the visibility looked good enough for underwater television cameras to be able to show us some of the small-scale textures, and that would help to bridge some of this kind of problem.

MR. MADDRY: So this technique

is used sort of as an additional package of information.

DR. FLOOD: Yeah, it won't stand on its own.

DR. BUSH: Isn't the intensity of the reflection a third dimension you use?

DR. FLOOD: Well, this is the -- the reflectivity is sort of the ratio between the sound that came in and the sound that went back.

DR. BUSH: Right. That is the type --

DR. FLOOD: Right, and these are the sediment characteristics.

MR. ABRAMOWICZ: What about depth?

DR. FLOOD: Well, depth --

MR. ABRAMOWICZ: I mean, say that you -- I mean, in many of the cores we have taken, the sediment characteristic is by no means uniform throughout the core.

DR. FLOOD: Well, this would be the surficial sediments. The rule of thumb is one wavelength or so, maybe two into the sediments.

MR. ABRAMOWICZ: Oh, so this is just -- I didn't realize that.

DR. FLOOD: This is surficial seg~~ments~~s.

MR. ABRAMOWICZ: This is just going to give us a bit of that very top layer, perhaps a centimeter.

DR. FLOOD: Right, depending what that material is.

MR. ABRAMOWICZ: Oh, okay.

DR. FLOOD: And the information that would come out would be information especially on patterns. You would see where different kinds of reflectivity were. We would see how these pieces went together, and I'll show you some illustrations that I think will make this kind of clear; where there are rock outcrops.

There's a lot of very fissile shale, I guess, that underlies the river and much of the gravel is really these sort of rock outcrops that seem to break. From patterns and sediment types we can start talking about the processes, what appears to have been important in moving sediments, and the sediment -- as we build this database to take advantage of what's been collected in the past, we can worry about patterns -- distribution patterns of things related to the sediments, and this is an iterative procedure, this kind of thing, that we put forward models, acoustic models. We sample. We look --

MR. DiBERNARDO: Did you want to elaborate on the subbottom profile?

DR. FLOOD: Well, that's -- the third -- the vertical dimension would come from the subbottom profile and there are -- at least in this part of the river, the main Thompson Island Pool, as we know, many of the sediments are ? really quite coarse, and we are interested in distribution patterns near the surface, so we have been looking at some of the profiling techniques that, one, could give us the resolution we needed in core sediments, and there are some on the market, especially a swept-pulse system, that should give us the high resolution that we are considering using.

The other thing, especially in terms of -- let's see, I have this written out in one place.

This was just what I said. In terms of especially mud, especially in estuary situations, one can use an echo sounder that works at two different frequencies, say 200 kilohertz and 50 kilohertz, with the idea that the 200-kilohertz sound bounces off the very top of the sediments and the 50 kilohertz might -- will go through the mud and bounce off the stronger layers underneath, and so this gives us the potential for seeing where there is mud, especially near the edges; but this would be the third dimension where the sonar is sideways. I didn't want to get too much into the details.

density?

MR. ABRAMOWICZ: I missed the third dimension somehow.

DR. FLOOD: The third dimension is depth.

MR. ABRAMOWICZ: Yeah, thank you. Is it a different technique you are using to try to get that vertical profile?

DR. FLOOD: Yes. The side profile -- that's a different sheet, but the sonar looks out to the side. What you do is you take the profiles. You essentially point --

MR. ABRAMOWICZ: It's a sonar technique but you aim it straight down.

DR. FLOOD: You aim it straight down. The frequencies that are used to map the surface frequencies are rapidly attenuated in the sediment, so they do not go very far.

MR. ABRAMOWICZ: Yeah, that was obviously then my next question. What kind of depth do you predict?

DR. FLOOD: This -- well, it depends very much on the sediment type, and --

MR. ABRAMOWICZ: What are the typical ranges of depth that you get for different sediment types?

DR. FLOOD: For fine grain you should be able to see thirty or forty meters.

MR. ABRAMOWICZ: Thirty or forty meters?

DR. FLOOD: With a continental margin fine-grain sediment. Now, we don't have thirty or forty meters of fine-grain sediment but that's a typical kind of penetration that can be expected with the systems, so when we talk about the exact kind of sediment here, I think we have to say when the sediments are very coarse, I think we might get a meter penetration with the right kind of system, and that's the area that's of interest.

MR. ABRAMOWICZ: You just -- why don't you go ahead.

MR. RHEE: What is the resolution of particle sizes when you go through that depth?

DR. FLOOD: This particular system, which is new to the -- newly developed, should give a resolution of ten centimeters between layers.

MR. RHEE: No, particle size.

DR. FLOOD: No, you wouldn't determine particle size.

MR. ABRAMOWICZ: No particle

size information.

DR. FLOOD: Well, the particle size information comes from actual sampling. What we are interested in here is in the actual thickness of the material that's present, where there is only this much material or there's this much material.

MR. ABRAMOWICZ: Okay. So this is a probe just to kind of estimate how much sediment there is in a general area but not to characterize it in any real detail.

DR. FLOOD: The characterization would come through an analysis -- from the bottom profiling what we would see are a series of reflecting horizons, so if we had a river bottom, say, like this, what one might expect is that there would be -- one possible thing one might see are reflecting horizons that look like this, and in most instances -- well, most of the time these kinds of -- reflections like this is a time line that is a whole discipline of interpreting subbottom profiles, but just as an example, if we saw a characteristic like this, we would say that the sediments have been building out from the side, but perhaps here there's been a scour event and rather older sediments are quite close to the surface.

One might also see something that looked like this as a kind of layering, and in this case one would interpret that sediments -- that this area has been building up but not going -- so if one sampled here, one might sample into older layers, so these are tools to help to understand the sedimentary environment more than -- they will never replace the specific analysis, I believe.

However, they are very important for giving us a way of extrapolating one measurement to an area that's larger.

MR. ABRAMOWICZ: But that assumes that that one representative sample was representative of that larger area.

DR. FLOOD: But the information that says that, I would -- from my perspective one should be able to determine on these kinds of scales whether it is.

MR. MONTIONE: Clarification. What you're saying is that the subbottom profiling in lieu of frequency, you can determine the total depth to sediment as well as major changes in the sediment in there.

DR. FLOOD: Yes.

MR. PUTMAN: What's the limit of resolution on determining stratigraphy, let's say? Obviously if the particle sizes are quite different, you're not going to see a reflector horizon.

DR. FLOOD: The reflection comes because there's a change in what's called acoustic impedance in the sediment, and that's the -- it's the product of the density and the velocity, so when there is a change in acoustic impedance, then sound is reflected. If all the sediments are identical, then you won't get a reflection.

So this was a tool for allowing us to think about how much sediment is actually present as well as to learn something about the sedimentation patterns.

MR. PUTMAN: But what's the limit of resolution? How different do the reflective layers have to be in terms of the density contrast or whatever?

DR. FLOOD: A tenth of a meter.

MR. PUTMAN: A tenth of a meter.

DR. FLOOD: If they're much closer than that, it's unclear that individual horizons will be resolved.

MR. MADDRY: Have you been able to relate the acoustical impedance to the type of sediment that contain PCBs? Have you used this to determine volume --

DR. FLOOD: Well, the velocity -- there's sort of a -- finer-grain sediments tend to have lower velocities than coarse-grain sediments. Coarse-grain sediments, I believe, have -- coarse-grain sediments have a higher density than, generally speaking, fine-grain sediments, so one would expect to see impedance contrast between coarse- and fine-grain sediments.

MR. MADDRY: It just seems like it would be a very valuable tool. If you have, you know, some of the data on what kind of sediment has PCBs and we're able to relate that to acoustic impedance, then you can get real quick math of what the volume is of all those PCB-invested sediments somehow. Does that make any sense?

DR. FLOOD: I would say that's a use that one would put this towards, yes, and also to the extent where the sediment horizons might show layers coming close to the surface, a sample that's analyzed here might have different amount of material than the one that's analyzed off to the side just because it samples actually a different set of layers, and if, for instance, one could identify a horizon which was, say, related to the '76 flooding or the '73 flooding and understand where those horizons went, then you would go, I think, a long way towards eliminating some of the questions there are.

MR. ABRAMOWICZ: Just a

general question. This seems like an interesting technique, but at least just hearing about it for the first time, it sounds to me like it's more in the research stage at this point, that there are so many potential variables that it is challenging to yield quantitative data.

DR. FLOOD: Well, it gives us -- any drill hole that's drilled for the oil industry is based on this kind of data. The oil industry at the present day would never drill a hole without a seismological profile.

MR. ABRAMOWICZ: But what are they looking for? They're looking for a big batch -- they're looking for a huge hole, right?

DR. FLOOD: That was the old way. Thinks have progressed, and what they happen to be looking for are sediment characteristics, structural characteristics, that make it likely that they will find what they want, but just to say that this is only a research tool, there are many applications where it's taken as a necessary -- a necessary step in a study. Engineers -- a lot of engineering studies on the continental margin where they build -- put up oil rigs are based on seismic profiling supplemented with borings.

MR. BONNER: But in every one of those cases it is basically dramatically different. I mean, you're talking miles there and you are talking centimeters here.

DR. FLOOD: Right, but the --

MR. BONNER: Concept is the same.

DR. FLOOD: The concept is the same, right. Now, the actual -- whether or not -- and the degree to which one will actually see layers depends on the precise equipment which is used, which is -- what we recommended is scale to find the layers that we need to find here.

MR. BONNER: In terms of reliability, is there a scenario where I could come up with Sediment A that has some mixture of fines and coarse fraction and Sediment B that has a different ratio of fines/coarse fraction but in some way that they would generate the same signal? Is that possible to do?

DR. FLOOD: What's seen here is a change from one to the other.

MR. BONNER: What I'm saying is it's an indirect measure, that you could be fooled.

DR. FLOOD: Well, one -- with all of these techniques, one does not believe them -- well, that's probably the wrong word, but it's part of a process. We're not -- I don't think the suggestion is to do this in lieu of anything else. The suggestion is sort of along the lines of how much new insight into the problem will come from another thousand PCB measurements versus what other pieces of information should -- should or could be added to that sediment analysis program that would allow measurements that are made to be understood over a wider area.

Part of the question sort of is at the moment one has to do statistical arguments along these lines to say where different kinds of materials are. Are there approaches that should be used that can allow these kind of boundaries to be drawn much better and also allow the sediment distributions to be understood better in terms of processes, because if that's true, then the association of gravel with some fine sand in certain places and a few wood chips and some coarse sands might be a very logical kind of thing to find in a certain area, and depending on which meter you actually happen to touch with your sample, which is only this big [indicating] you would get a different number.

MR. BONNER: Could your device, your traveling through that little bend in the river there, generate that map as well?

DR. FLOOD: This map -- it could. It could generate something similar to that through an analysis of the reflected sonar records.

MR. MONTIONE: Do you have pilot results to answer a lot of these questions?

DR. FLOOD: Yes.

DR. SHIFRIN: Maybe if you got into some data, it would answer some of these questions here.

MR. DiBERNARDO: I think that

diagram showed if you looked at the various items there's really only three or four major categories. It looks like a lot of different materials but there's fine sand and then there's fine sand with wood chips. I mean, it's fine sand but it's got wood chips, and there's coarse sand and there's coarse sand with wood chips, but --

DR. FLOOD: But there is a sample right here which says clay, this one, and that's right next to gravel and --

MR. DiBERNARDO: I guess my only point --

DR. FLOOD: And according to the Brown results this had no PCB contamination in it, the clay, in this area, so I think that's -- when we talk about these kinds of results, it's towards helping to solve those problems that we're directed to.

MR. ABRAMOWICZ: You just brought up another point I hadn't considered, which is the wood chips. At least in many of the samples we've looked at, wood chips are a nontrivial part of the equation. What would the system do with a wood chip?

DR. FLOOD: Wood chips would have a low velocity. Anything -- wood is a lower velocity than sediment or rock material.

MR. ABRAMOWICZ: But do you think it has a chance to tell the difference between fine sands and fine sands and wood chips and fine silts and fine silts and wood chips?

DR. FLOOD: I think this could. The potential is there. The reflectivity depends on, as I said, many things. Some of it will be directly related to the sediment particles. I think we can see -- there's a suggestion that we can see the gravels pretty well where they're present. When these charts show a lot of gravel, we get a certain kind of return. When they show fine sand in the channel access, we get a different kind of return, so there is, I think, the potential of that, and wood chips is something that would show up.

In order to do the kind of interpretation that I think is required, this has to be put together with the available sample information. To the extent that we can use these that are well navigated, we will use those, realizing that things may have changed, but that's part of the advantage of it and the samples that are collected during this study.

Let me show you a couple of illustrations.

MR. ABRAMOWICZ: Sure.

DR. FLOOD: Because right now I think this is all more esoteric than it needs to be. That's not exactly what I meant, but I think seeing some results would help focus some of the questions.

So as I said, we did -- I'm going to show a record from this area first just to get us a little more familiar with what a sonar record looks like. This is in the vicinity of Lock 7 where the Hudson River comes in south of Rogers Island and then continues down.

Then there are three records in this area that go across -- some examples from the eastern side down into the channel, and then we have some others down here if we get that far.