

*RAP
revision by date
1993*

1. Project Overview

On January 30, 1991, the U. S. Department of State designated Presque Isle Bay as the 43rd Area of Concern (AOC) under the terms of the Great Lakes Water Quality Agreement. That designation required the preparation of a Remedial Action Plan (RAP) for the Bay, to provide a framework for ecosystem restoration and management activities needed to restore impaired uses. A Stage 1 RAP was prepared by the Pennsylvania Department of Environmental Resources (PADER) with the assistance of the Presque Isle Bay Public Advisory Committee (PAC) to identify use impairments in the Bay, sources of pollution, and information gaps. The RAP also identified current remedial actions and possible future actions. The RAP was submitted to the USEPA for review on January 15, 1993 and to the International Joint Commission (IJC) on July 14, 1993, in accordance with the requirements of the Great Lakes Critical Programs Act of 1990. Both USEPA and the IJC have responded with comments, which are included in this report as Appendix A. Responses to those comments are included in appropriate sections of this report.

This report is not intended to replace the original RAP document, but rather to revise and update various portions and make corrections where needed. It is our intent to produce a revision at least biennially to ensure that the RAP is as current as possible. We believe this is a more practical approach than waiting until a Stage 2 RAP is ready before updating the document. It is our understanding that this is the approach being taken by most, if not all, of the AOC's in the US. In addition, the IJC in their Seventh Biennial report recommend that "Governments encourage the publication of periodic updates of activities and goals associated with each Remedial Action Plan to allow improved monitoring of implementation progress..." It is expected that in several areas this report will supersede portions of the original RAP and in those instances this report has precedence.

1.1 Background and Environmental Setting

Obviously, the geographic, geologic and other physical aspects of the Bay have not significantly changed since the RAP was written, and this information is readily available in Chapters 2 and 3 of that document. However, there are several issues which were raised in the review comments that need to be addressed and a few areas where updates are needed.

In the RAP it was determined that the Area of Concern should be defined as Presque Isle Bay (PIB) and its tributary watershed areas. Sources of pollution outside of that area are to be identified and dealt with and a commitment was made to continue investigations in the Outer Harbor area to determine if it should be included in the AOC. Considerable discussion was had concerning this issue over several months of PAC meetings, and this decision reflects the consensus reached. The IJC in its comments again raises this issue in the context of the ecosystem approach. They "urge the RAP team and Public Advisory Committee to continue to investigate if there are use impairments in the waters of Lake Erie in the vicinity of Erie, Pennsylvania, including the Outer Harbor of Presque Isle Bay." They further state that "From an ecosystem perspective, pollutants cannot be transported outside a defined geographic boundary of Presque Isle Bay without being considered." In essence, the IJC is encouraging a continuation of the approach already articulated in the RAP, i.e. deal with the problems in PIB while investigating other areas for possible impairments. While inclusion of nearshore areas adjacent to the Presque Isle Peninsula may become necessary at some future date, it is important to recognize the distinction between these areas and the "Outer Harbor". The Outer Harbor is an artifact of the mapmaker's art and, from an ecological and scientific point of view, is mostly indistinguishable from the open lake. For example, including certain areas near the harbor channel mouth, should sediment contamination be found, may be feasible and appropriate. But simply incorporating the Outer Harbor into the AOC is impractical and counterproductive. It would be impossible to assess all 14 use impairments in any meaningful way, without addressing

lakewide conditions. This is clearly not the intent of the RAP process and it is the reason such an approach was rejected in the original document. Rather than lose time arguing about where the Bay ends and the Lake begins, we have decided to let the original delineation stand and concentrate our efforts on problem identification and remediation.

The IJC also requested that socio-economic data be included in the RAP so that we can ensure that all sectors of the community are included in the process.

(Include section on 1990 Census data)

1.2 RAP process status

The RAP process is divided into three stages involving: 1. Problem identification; 2. Remedial alternative selection and implementation; and, 3. Monitoring and follow up. The expectation is that the program will move from one stage to the next, as each is completed. Unfortunately, the real world refuses to be so neatly compartmentalized, and actual RAP activities span all three stages at once. In some areas, we are still working on problem identification and delineation, while in others, remediation is underway or monitoring is being conducted. For this reason, we believe it is unproductive to try and put each activity into a particular "stage" for reporting purposes. Instead, this report will address activities that have occurred since the RAP was written, regardless of where in the "process" that activity falls.

PADER is currently drafting a separate formal response to the USEPA comments, which will encompass the information contained in this report. There is no separate response planned for the IJC comments, but these will be addressed in pertinent sections of this report where appropriate.

2. Use Impairment Update

The bulk of the RAP document contained a discussion of the 14 use impairments identified by the IJC. Correspondingly, the majority of comments received from the USEPA and IJC were in regard to that section of the RAP. The following sections address specific questions and comments, as well as providing information on activities conducted since the RAP was written.

2.1 Restrictions on Fish and Wildlife Consumption

Both the IJC and the USEPA question the RAP's finding that this use is not impaired, based primarily on the fact that there exist lakewide advisories on carp and channel catfish for PCBs and chlordane. In addition, they note the need for more extensive fish flesh analysis to confirm this finding.

Our approach to this impairment stems primarily from a direct reading of the IJC criteria which states "Contaminant levels in fish and wildlife *must* be due to contaminant input from the watershed." (emphasis added). We relied on existing fish flesh analysis data, water analysis results and sediment chemistry data in reaching our conclusion in the RAP. We also committed to do additional work to confirm this conclusion.

USEPA suggested that we examine a bottom dwelling species to see if fish flesh contamination existed. As part of the Brown Bullhead study (which is discussed more fully in section 2.4), fish flesh analysis was conducted by Cornell College of Veterinary Medicine (Cornell). Five composite samples of skin-on fillets were analyzed for PCBs, pesticides and heavy metals. The results showed PCBs and pesticides to be below detection, and all metals were below FDA standards. Fish tissue was not analyzed for PAH compounds or metabolites. PAH compounds do not usually bioaccumulate at significant amounts in fish tissue because of the fishes' ability to metabolize them. Bile sampling is presently recognized as the standard test

to assess PAH metabolite levels and their effects on fish. See Section 2.4 for a discussion on bile sampling conducted in conjunction with the Brown Bullhead tumor study.

Since the criteria require that the contaminants, in this case PCBs and chlordane, must come from the AOC watershed, we have continued to analyze sediments for these compounds. As part of the Gannett Fleming sediment study completed in March 1993 (discussed more fully in section 2.7), twenty-one locations throughout the Bay and Outer Harbor areas were sampled. In all instances, there was no detection of PCBs or pesticides, including chlordane, above the sample quantification limit. Gannett Fleming has recommended continued sampling for these compounds using even more sensitive tests, and so additional sampling will be done during Spring 1994 as part of our continuing sediment evaluation.

Pennsylvania strongly believes that the existing fish advisories need to be addressed, and has participated with the other Great Lakes states in developing a more meaningful advisory strategy that can be adopted basinwide. The Lakewide Management Plan (LAMP) currently being developed will certainly be examining these lakewide advisories, and we are confident that this issue will not be ignored, even if it is not addressed specifically by the RAP. We are committed to continuing our sampling and analysis of fish, water and sediments. Should sources of the toxics identified by fish advisories be discovered within the AOC, this impairment can be reevaluated. Until such time, we believe we have properly applied the criteria as specified in the guidelines.

2.2 Tainting of Fish and Wildlife Flavor

The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. While continued monitoring is expected, no specific actions are planned in this area.

2.3 Degradation of Fish and Wildlife Populations

As with fish consumption discussed above, the criteria for evaluating this use impairment are fairly specific. Either, fish and wildlife management programs must have identified degraded populations due to a cause within the watershed or, relevant, field-validated, fish or wildlife bioassays with appropriate QA/QC confirm significant toxicity from the water column or sediments. Neither of these conditions is met in PIB. In fact, the Pennsylvania Fish and Boat Commission (PFBC), which is charged with managing the Bay's resources, has described PIB as an exceptional, high quality fishery in its evaluations. In addition, there is no evidence confirming toxicity from water or sediments.

USEPA, as well as some IJC commentators, indicates that since sediment conditions in the Bay no longer reflect the original conditions existing before anthropogenic sources of pollution were introduced, there *must* be impacts on macroinvertebrates and fish and wildlife populations. Therefore, this use and the benthos use should be listed by default as impaired.

While such an approach is intellectually satisfying, in attempting to view the Bay holistically, it ignores the specific criteria outlined for making these determinations by the IJC itself. No one can argue that conditions in the Bay 400 years ago were different, and probably better, than they are today. The founding of the City of Erie, the Industrial Revolution, and continuing urbanization have significantly affected habitat, fish and wildlife populations, and benthic conditions. Most of these changes are impossible to reverse, and realizing this, we believe it is more important to move forward on the things which can be addressed. Continued work on sediments and an evaluation of the benthic community are covered in later sections, and may ultimately impact overall fish and wildlife population health. But at this point, we do not meet the tests specified in the criteria, and therefore maintain that no impairment exists for this use.

It is appropriate to note that some members of the PAC agree with the idea that uses should be considered impaired until it is proven they are not. There is concern that if a use impairment is not identified at the outset, then the opportunity is lost to address possible

problems. The majority of the PAC supports the idea that problems can be addressed as they are identified, and decisions regarding impairments can change. What is important is that the investigation continues and that remediation is initiated wherever problems are identified.

2.4 Fish Tumors or Other Deformities

In 1984 the U.S. Fish and Wildlife Service (FWS) at State College, Pa. began receiving reports of tumored Brown Bullheads being caught by fishermen from Presque Isle Bay in Lake Erie, Erie, Pa. In response to these reports, FWS collected 5 Bluegill, 4 Largemouth Bass, and 48 Brown Bullheads, which were necropsied and the tumorous tissues and organs preserved in buffered formalin. Only the Brown Bullheads showed the presence of skin and lip tumors. Gross observation of the livers did not reveal the presence of tumors in any of the samples taken during this period.

Since the preceding study identified an external tumor problem in the PIB Brown Bullhead population, it was decided that a more intensive survey was needed to determine if liver tumors, not observed by gross examination, might be identified through microbiological studies. Liver tumors are considered rare in natural fish populations unaffected by anthropogenic sources. The presence of liver tumors in fish populations is an indication of environmental contamination of a water body. The IJC uses a liver tumor rate of 2% or greater to determine if a fish tumor impairment exists.

In 1985 the FWS collected an additional 93 Brown Bullheads for necropsy. Histological examination of 81 of 93 Brown Bullheads collected exhibited an incidence rate of 11% oral neoplasms, 2.5% skin neoplasm, and 11% epidermal hyperplasia. No liver neoplasms were observed in the samples collected.

In 1990, during the process of preparing the Background Report on Presque Isle Bay, Potomac Hudson contacted PADER for information on the present status of the Brown Bullhead tumors in PIB. In an attempt to answer their request, 65 Brown Bullheads were examined from Pennsylvania Fish and Boat Commission (PFBC) trapnets. External tumor rates for these fish were extremely high, with approximately 86% of the bullheads observed being tumored.

→ In January of 1991, while in the process of obtaining information on bullhead tumor studies, a contact was made with Dr. Eric May, a veterinarian for the Maryland Department of Natural Resources. Dr. May, himself extremely interested in studying tumor promotion in fish, offered to examine some PIB bullheads. Ten livers and gallbladders from the most tumored (worst case) bullheads were sent to Dr. May for histological analyses. Consequently, four of the ten livers from these fish were determined to have tumors. Consultation by Dr. May with Dr. Harshbarger of the Smithsonian Institute, Washington D.C. confirmed his findings of liver tumors in these fish. This was the first documentation of liver tumors in PIB Brown Bullheads. The results of this sampling prompted the initiation of a histological study to determine the liver tumor rate in the PIB Brown Bullhead population.

A joint study of tumors on Brown Bullheads in PIB was initiated in March 1992. Spearheaded by PADER, it involved the cooperation of the Erie County Department of Health, PFBC, FWS, and the Cornell College of Veterinary Medicine. The purpose of the study was to determine the incidence rate and the causative agents promoting tumors in the fish.

The plan incorporated two distinct aspects of study to evaluate the tumor problem. The first was to conduct a mark-recapture study to determine the life history and distribution of the PIB bullhead population, and the second was a histological study to determine the percentage of bullheads affected by liver and external tumors.

Mark-Recapture Study:

One of the reasons for conducting a mark-recapture study on Brown Bullheads in the Bay was to characterize territorial preferences and seasonal distributions. There are virtually no comprehensive scientific studies regarding these aspects of bullhead biology in the literature. The bullhead is not a glamorous gamefish species that demands serious study by fisheries management personnel. Neither is it highly sought by fishermen in comparison to many other species. This lack of information in the literature left many gaps in trying to assess the mode in which bullheads might encounter contaminants. One of the first questions to be asked was whether the PIB bullheads were residents of the Bay or of Lake Erie. At the start of this study it was not known whether bullheads occupied a small territory for most of their life (e.g. 1 acre), or whether they migrated around the Bay or Lake Erie at random.

During the period of March 29, 1992 to May 6, 1992, a total of 2000 bullheads were tagged and released back to their point of capture from 29 locations in Presque Isle Bay (Map 1). Prior to tagging all fish captured were measured, weighed, and diagrammed. Locations of external tumors and lesions affecting individual fish were recorded on silhouette diagrams. The diagram form included the corresponding fish tag number and capture location along with length and weight of the fish. A photographic log was made of the first 1,000 bullheads tagged. A total of 112 bullheads were recaptured during 1992. A population estimate (Schnabel method) showed the PIB bullhead population to be 31,715 with a 95% confidence level of 24,827 to 40,476.

The results of this study as they apply to the PIB bullhead fishery, tend to show that the majority of bullheads captured were residents of the Bay. A very limited migration of individuals between the Bay and Outer Harbor was observed (Map 1). Migration patterns within the bay developed from recapture data showed a high rate of migration from the Misery Bay and Lagoon area to the Mill Creek area. Several individuals captured at one end of the bay were recaptured at the other end. PIB bullheads tended to be found in small schools rather than as solitary individuals. They also exhibited seasonal distributions as shown by monthly distribution mapping (Maps 2-7). Seasonal distributions of Presque Isle Bay bullheads were compiled by plotting electrofishing runs for each month that had more than 25 individuals per run. These maps showed the bullheads to be concentrated in the embayments and lagoon system in early and late spring and then concentrated around the shipping channel, near the confluence of Mill Creek, during mid to late summer. The reasons for these seasonal distributions are unclear. Possible explanations might be related to light intensity preference, temperature preference (cooler water), or attraction to nutrient inputs from Mill Creek.

Brown bullheads examined for external tumors during the tagging study exhibited a body tumor rate of 64%. Yellow Bullheads examined exhibited a body tumor rate of 13%. Tumor percentage rates for areas with catch rates greater than 100 individuals are shown on Map 10. It is interesting to note that the Mill Creek area (Station 29) had the highest rate of external tumors (82%), and also exhibited the highest levels of Polycyclic Aromatic Hydrocarbon (PAH) levels in the sediment study performed by Gannett Fleming, Inc. (See Section 2.7). These results lend strong support to the identification of the Mill Creek area as a hot spot of environmental contamination that may be promoting tumors in the bullheads.

Histological Study:

A histological study was performed on a random sample of 100 Brown Bullheads from PIB by Dr. Jan Spitsbergen at the Cornell College of Veterinary Medicine, Ithaca, NY. The study was conducted to determine the percentage of external tumors and internal liver tumors on Brown Bullheads within PIB. The results of the study showed an external tumor rate of 64% and a liver tumor rate of 22%.

Part of the histology study included an age analysis of the fish. Fifty of the 100 bullheads necropsied were aged by Dr. Edward Brothers of EFS Consultants, Ithaca NY. The bullheads ranged in age from 8 to 15 years with 36% of the fish being 14 years of age. The length of these bullheads was between 290 mm and 355mm. The results of this study developed into a point of controversy.

Dr. Brothers is noted for his aging of fish by the use of otoliths (a small bone in the head). However, practically all historical work on bullhead ages found in the literature was performed on sections of pectoral or dorsal spines. Scott & Crossman Freshwater Fishes of Canada lists the maximum age of Brown Bullheads at 6 to 8 years. This discrepancy between the ages of the PIB bullheads and published literature accounts presented a problem of determining whether Dr. Brothers or past studies performed by other researchers were correct. Fisheries research personnel opinions varied on this subject. Several researchers felt that otolith aging was a better technique than aging from spines. Others felt just the opposite is true. The crux of the problem is that if Dr. Brother's otolith technique is correct then probably all other aging studies recorded in the literature are wrong.

In order to shed more light on this controversy, a sample of 10 Brown Bullheads ranging in size from (144 mm to 376mm) were sent to Bruce Tezlaff of Southern Illinois University, Cooperative Research Lab. Southern Illinois is known for their research on Channel Catfish, and has used both spine and otolith techniques in aging determinations. Tezlaff agreed to use both techniques on the ten bullheads from PIB. The results of these comparisons showed that the otolith technique appeared to be more accurate than the spine method. Tezlaff felt that some of the annual rings used to age the fish from spines appeared indistinct. However, when the otolith of that same fish was examined, the indistinct rings noted on the spines showed up as distinct annuli. These results appear to support otoliths as a more accurate measure of bullhead aging.

Comparison of otolith to spine aging is significant not only as it pertains to the most accurate aging method. It is significant with regard to bioaccumulation impacts on the PIB bullhead population. These fish can now be viewed as long lived with a greater chance of exposure to environmental contaminants over a longer period of time.

Related Studies:

In addition to the histologic study conducted, 100 tumored Brown Bullheads (live fish) were collected and transported to Cornell agronomy ponds for observation over the summer. This aspect of the study was conducted to examine the possibility of a disease or virus being the cause of tumor promotion. A regression of the tumors could be expected if the tumors were caused by disease or viral transmission. Electron microscopy and transmission studies conducted at Cornell did not detect viral particles, nor were they able to produce tumors on clean fish by injecting them with homogenates made from tumor cultures. Recaptured bullheads from PIB and Cornell agronomy ponds showed that the tumor conditions of the majority of bullheads remained unchanged. These results support the theory that the tumors in PIB bullheads are not produced by viruses or disease, but rather by some type of contaminant.

Bile samples were collected from the gallbladders of 17 Brown Bullheads from three locations within the bay for analyses of Polycyclic Aromatic Hydrocarbons (PAH) metabolites. The bullheads sampled included 3 fish judged to be clean or free of external tumors, and the remaining 14 bullheads tumored. The bile samples were analyzed for three PAH metabolites, naphthalene, phenanthrene, and benzo(a)pyrene (Table 1), by the Geochemical and Environmental Research Group at Texas A.& M. University.

The tumor free fish had significantly lower levels of PAH metabolites in their bile. The PAH metabolites levels in some of the tumored fish were at or above levels capable of promoting carcinogenic or mutagenic effects. The bile results strongly support the theory that PAH's are a cause of tumor promotion in the PIB bullhead population. These results have

prompted a need to do additional PAH bile sampling from selected sites and also other fish species in 1994.

In addition to the histological study performed by Cornell, 10 Yellow Bullhead livers and gallbladders were examined by Joyce Evans, a pathobiologist for the Maryland Department of Natural Resources at the Cooperative Oxford Laboratory. The livers and gallbladders were collected from fish captured in PIB trapnet and electrofishing operations conducted by PADER in April 1993. Yellow Bullheads collected during the 1992 sampling had exhibited an external tumor rate of only 17% as compared to the Brown Bullhead external tumor rate of 64%. The differences in tumor rates between the two species is significant since both were captured from similar habitats within the bay and have similar life styles. These differences in external tumor rates led to speculation that there might also be differences in liver tumor rates. The ten Yellow Bullheads livers examined by Joyce Evans were diagnosed as being free of tumors. Although the sample size of Yellow Bullheads is small compared to the number of Brown Bullheads examined, it does raise questions as to why the tumor rates are so different between the two species. These findings support the idea that genetic differences in species may play an important role in determining a species' susceptibility to environmental contaminants. E

Sediment Study:

Another source of carcinogenic tumor promotion may be naturally formed nitrosamines. Dr. Spitsbergen has speculated that these compounds may be promoting tumors in PIB bullheads. N-nitroso compounds are potent carcinogens and can form spontaneously in natural waters and sediments in the presence of nitrite from decomposing plant material and organic precursors such as amines, ureas, and amides. Laboratory studies have shown acute toxicity to freshwater aquatic life occurs at concentrations as low as 5,850 ug/l.

In 1992, nitrosamine sediment samples were collected from ten sites within the bay to determine their presence or absence. N-nitrosodimethylamine (NDMA) and N-nitrosodi-N-propylamine (NDPA) were found to be present at all ten sites, but below levels of published carcinogenicity. In 1993, sediments were sampled at 9 locations within the bay and lagoon system. Sediment samples were collected biweekly from April 29, 1993 to October 7, 1993, and analyzed for nitrosamines and metals. Nitrosamine analyses showed several sampling sites to have NDMA and NDPA at levels greater than those shown to cause liver tumors in laboratory studies. Additional sediment sampling for nitrosamines will be included in the 1994 sediment sampling plan.

Summary:

The results of the mark-recapture study in conjunction with the histological analyses and tumor regression studies suggests that the cause of tumor promotion in Brown Bullheads from PIB is related to a carcinogenic contaminant or contaminants. The presence of liver tumors in 22% of the fish and the absence of a verifiable disease or virus supports this conclusion. Sediment and bile studies have documented the presence of two contaminants (nitrosamines and Polycyclic Aromatic Hydrocarbons) at levels capable of promoting tumors in fish. Tumor rates generated for specific sites have shown the Mill Creek area as a possible hot spot for PAH contamination, while sediment sampling results have shown several Bay sites to have extremely high nitrosamine levels. Since it appears that the tumor problem is directly linked to the sediment contamination problem, it is hoped that the sediment work planned for 1994 will give more direction to remediation of the tumor problem.

2.5 Bird or Animal Deformities or Reproductive Problems

The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. While continued monitoring is expected, no specific actions are planned in this area.

2.6 Degradation of Benthos

Both the IJC and the USEPA have commented that there is a lack of data regarding this impairment, and suggest additional work be done. It is noted that both believe that in light of this data insufficiency, it is incorrect for the RAP to consider the use not impaired. It is somewhat ironic that based on the very same lack of data, they both conclude that it should be considered impaired. Rather than continuing to debate the logic of these opposite approaches or the impossibility of proving a negative, we have scheduled additional data collection for the Spring of 1994.

Using the "triad" method recommended by USEPA's Assessment and Remediation of Contaminated Sediments (ARCS) project, we will conduct bulk chemistry analysis, sediment biotoxicity testing, and a benthic community evaluation at a number of sites in PIB. As part of the sediment assessment discussed under section 2.7, twenty-one locations will be sampled for bulk chemistry analysis. Of those twenty-one, ten sites have been selected for concurrent sediment toxicity testing, and eight sites have been selected for benthic community evaluation. The sampling sites for each activity are identified in Figure 1.

Hopefully this direct data collection effort will move us out of the realm of speculation about what might be, to the realm of what is. This use will be re-evaluated in light of the results of these investigations.

2.7 Restrictions on Dredging Activity

In their comments, both the IJC and USEPA concur with the RAP's finding that this use is impaired. That finding was based on historic data which was then compared to the USEPA's 1977 Guidelines for the Pollutational Classification of Great Lakes Harbor Sediments. The criteria established by the IJC for this impairment, and the USEPA guidelines noted above, are designed specifically to address the suitability of dredged sediments for open lake, confined or other disposal. A strict application of either criteria does not require a consideration of the effects contaminated sediments may have on other conditions in the Bay and, perhaps more importantly, on other uses such as fish tumors. We believe a broader consideration of sediment contamination is appropriate, and have begun a more in depth look at current conditions. The reader may feel that this is a departure from the approach taken with regard to some of the other impairments, where a strict reading of the criteria was applied. The important distinction is that sediment impairments are due directly to conditions known to exist in the Bay, as opposed to the lakewide conditions affecting other uses. We are able to assess and deal with local conditions and contaminant sources directly.

As noted above, previous evaluations relied on historic data sets which did not cover the entire spectrum of contaminants of concern. The validity of the 1977 USEPA guidelines has been questioned by the scientific community, and they have essentially been abandoned in favor of more modern criteria. The discussion contained in the original RAP document, while valuable for historic background, does not reflect changes in methods and evaluative criteria and is superseded by this report.

The first order of business in tackling the sediment issue was to obtain current samples and analysis. Working with USEPA Region 3, we were able to contract with Gannett Fleming, Inc. to conduct a study of PIB sediment quality. Twenty-two locations were selected in the Bay and Outer Harbor in an effort to get a reasonable cross-section of sediments (see Figure 2). Grab samples were collected from 21 locations (Station 17 was not sampled as it fell within the

dredged portion of the Bay and consisted entirely of coarse sand) using a petite ponar dredge. Samples were analyzed for organics, including PCBs, pesticides, and PAH compounds, as well as metals and other physical/chemical parameters. Sample Quantification Limits (SQLs) were calculated for the parameters tested. The SQL differs from Method Quantification Limits (MQLs) and instrument detection limits in that it considers not only the matrix of the sample, as does the MQL, but also considers interferences. While SQLs tend to be higher than MQLs (which are in turn higher than instrument detection limits), they more accurately depict site specific conditions. Complete results of the analysis are included in Gannett Fleming's report and are not repeated here.

The results of this study showed no detection of PCBs or pesticides above the SQLs. Nine PAH compounds and two phthalate compounds were found. Figure 3 shows the distribution of organic constituents throughout the Bay. The highest concentrations of PAHs were found near the mouth of the Mill Creek Tube and in the areas nearest the City of Erie shoreline. Total organic carbon (TOC) levels were relatively high throughout the Bay, as were oil and grease levels, but there was no readily discernible pattern in distribution. Total organic halogens (TOX) were found at only one location (Station 14).

The distribution of heavy metals in the sediments was also highly variable, with the maximum concentrations found in areas adjacent to the City of Erie. Figure 4 shows the distribution of heavy metals throughout the Bay. It is important to keep in mind that these are total analysis results. The distribution of the physical/chemical parameters is depicted in Figure 5.

The Gannett Fleming report discusses the need for consistent sediment quality criteria (SQC) against which measured values can be compared to determine if more in-depth evaluations are necessary. At this time, there is no single accepted SQC which can be used. New approaches are currently being examined and tested, and it may be some time before there is universal agreement. As noted above, the RAP used only the USEPA 1977 guidelines for comparison. Unfortunately, this is the least reliable and least scientifically supportable of the possible alternatives. Gannett Fleming compares the results of their analysis with eight different criteria (Table 2). It is evident from this comparison that a chemical may or may not be flagged depending on which SQC is selected. This variability among methods makes determining the significance of these results all the more difficult.

What is needed at this point, based both on Gannett Fleming's recommendations and the work of the USEPA ARCS program, is a three-pronged or "triad" approach to evaluating the sediments. The triad approach (scheduled for spring of 1994 and discussed in section 4.1) combines a bulk chemical analysis, a sediment toxicity test, and a macroinvertebrate survey of sediments from the same location at the same time. Such an evaluation will help us to determine the need for and extent of remedial actions.

Based on these most current analysis results, there is every reason to believe that sediment contamination exists in PIB and this use is impaired. The challenge now is to determine whether that contamination is affecting the biota, and if so the extent of the problem.

2.8 Eutrophication and Undesirable Algal Blooms

space The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. The IJC mentions the possible effects of Zebra Mussels, which have yet to be fully evaluated. Activities regarding the mussels are discussed in Section 3.2. No other activities beyond continued monitoring are planned at this time.

2.9 Restrictions on Drinking Water Consumption or Taste and Odor Problems

The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. Continued monitoring is expected, but no specific actions are planned.

2.10 Beach Closings

The IJC notes the need for additional bacterial monitoring in the Bay to support the contention that, with the exception of the mouth of Mill Creek, this use is not impaired. While recognizing that there are no public bathing beaches within the Bay, the IJC was concerned with the large amount of whole-body contact recreation, such as water skiing and sail boarding, that occurs in the Bay.

In August of 1993, with the assistance of personnel from Presque Isle State Park, samples were gathered from three locations on a weekly basis and analyzed for total and fecal coliform bacteria. Chapter 193 of the Department's regulations specifies the criteria to be used in beach closing determinations. When the geometric mean of five consecutive samples is greater or equal to 200 fecal coliforms per 100 milliliters of water; or, a single sample exceeds 1000 fecal coliforms per 100 milliliters of water, the beach is closed. There were no exceedances of the criteria for the six week period studied. In order to confirm the findings from 1993, and to monitor changing conditions in the Bay, we will continue collecting samples in 1994 beginning earlier in the season, and possibly including additional locations.

Continued monitoring, coupled with the City of Erie's ongoing program to correct problems with Combined Sewer Overflows (CSOs), will help to ensure the continued health and safety of those who use the waters of the Bay for recreation.

2.11 Degradation of Aesthetics

The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. Continued monitoring is expected, but no specific actions are planned.

2.12 Added Costs to Agriculture or Industry

The RAP indicates that no impairment exists for this use and the IJC and USEPA have concurred with that finding. Continued monitoring is expected, but no specific actions are planned.

2.13 Degradation of Phytoplankton and Zooplankton Populations

The RAP indicated that the existing information was insufficient to make a determination as to whether or not an impairment existed. To rectify that situation, specific toxicity testing was conducted.

The USEPA contracted with A.T. Kearney, Inc. to conduct the study. The potential impacts of toxics on plankton populations was conducted using a four-day, chronic algal (*Selenastrum capricornutum*) static growth test and a three-brood, seven-day, chronic cladoceran (*Ceriodaphnia dubia*) static renewal, survival, and reproduction test using ambient water collected from PIB. The tests were conducted four times to account for seasonal variations. Samples were collected on September 2, 1992; October 27, 1992; February 24 and 25, 1993 (through the ice cover); and May 24, 1993. Four sampling locations were selected (shown in

Figure 6), three along the mid-line of the Bay and one outside the Bay, and samples collected from approximately two meters down. While the same three Bay locations were used for all sampling events, four different points were used as controls. The physical and chemical parameters of the water were measured at the time of sampling using a Hydrolab®.

The specific test protocols and detailed results are available in the original reports. In summarizing the results of the four sampling events, A.T. Kearney found:

Summer - *Ceriodaphnia* reproduction was significantly greater at Station 2 than at control Station 5, and there was no significant difference in algal growth.

Fall - Algal growth in PIB water was not inhibited, but was significantly inhibited in the Lake Erie sample. Station 3 showed significantly greater *Ceriodaphnia* reproduction than control Station 4.

Winter - There were no significant differences in *Ceriodaphnia* reproduction, but algal growth was significantly less than control Station 7. However, when compared to the inoculum control, the algal growth in the four winter samples was not significantly inhibited.

Spring - PIB samples had greater young production than the Lake control or reference control. Algal growth showed no significant differences between sites, but control Station 8 was significantly less than the inoculum control.

A. T. Kearney concluded that "Based on results from the summer, fall, winter, and spring sampling, water samples collected from Presque Isle Bay do not appear to adversely affect *Ceriodaphnia* reproduction or algal growth." Since no toxic effects are demonstrated by the sampling, we conclude that there is no impairment of the phyto- or zooplankton populations from toxics in ambient waters.

In conjunction with the sediment sampling discussed in Section 2.7, Gannett Fleming also collected phyto- and zooplankton samples from four locations in the Bay. As this was a single sampling event, no specific conclusions could be reached with regard to the overall structure of the plankton community. It was noted in Gannett Fleming's report that the types of organisms found and their numbers are consistent with results obtained by other researchers using similar methods in the Bay. This sampling event does add to the baseline information on plankton and will be correlated with future samples. Plankton will be collected in the spring of 1994 as part of the sediment sample collection effort. Some university researchers are also studying plankton in PIB. As funding becomes available, more aggressive plankton community studies may be instituted as part of the RAP.

The impact of Zebra Mussels on the plankton communities is obvious. While there have been some studies published and further evaluations are on-going, at this point we are merely documenting the changes as the system reestablishes equilibrium. It may be years or even decades before we can determine the overall effect of the mussels on the ecology of not just the Bay, but the entire Great Lakes Basin. The system will almost certainly not return to its pre-Zebra Mussel conditions, and so comparisons to the past are not relevant with regard to impaired uses. Just as other exotic species have become part of the "natural" landscape in the past (few people think of starlings, pheasant or house sparrows as "exotic"), so too will the Zebra Mussels. What this means for native species and how we evaluate these impacts on other conditions or remedial activities in PIB will be considered as we move forward. But, nothing we do as part of this RAP will change the fact that the Zebra Mussel is here to stay. We should not consider a use impaired in the AOC on the basis of a fundamental basinwide changes in the system.

On the basis of new information and analysis of the conditions in the Bay, as well as the Lake, we conclude that this use is not impaired.

2.14 Loss of Fish and Wildlife Habitat

In their comments, the IJC concurs with our finding that this use is not impaired. The USEPA, while not disagreeing with our assessment, indicates that more information on possible habitat loss from City of Erie development should be included. It is clear to everyone working in urban AOCs that there has been historic loss of natural areas as cities developed and spread. The City of Erie is no different and it is acknowledged that the construction of breakwalls, piers, marinas, housing, and dredge and fill activities have changed the face of the shoreline and nearshore conditions over time. While it is unlikely that any of the existing structures will be removed or the shoreline returned to pristine conditions, the current regulatory requirements place strict controls on proposed activities, and effects on existing habitat and conditions are carefully considered before any new actions are taken.

In addition, the IJC has recommended that habitat enhancement projects be pursued, and, in fact, this intention is stated in the RAP. Section 4.3 describes the effort to place fish habitat enhancement structures called "porcupine cribs" in PIB. This will be a joint effort with the PA Fish and Boat Commission and will hopefully occur within the next year. The PADER Bureau of Parks has recently set aside the tip of Gull Point as a bird sanctuary, off limits to all people during the nesting and migration season, in an effort to reestablish colonial and other shorebirds and provide an undisturbed rest area for migrants. While not in the AOC itself, this effort will benefit bird populations throughout the entire area.

Other enhancements are being considered and will be pursued as specific projects are identified.

2.15 Summary

For the most part, reviewers comments and ongoing studies and data collection have confirmed the RAP's evaluation of the impaired uses in PIB. Sediment contamination and tumors in Bullheads are the biggest concerns. Bacterial contamination is present in very restricted areas and will continue to be noted as a limited impairment. We have respectfully disagreed with the reviewers regarding fish flesh contamination, fish and wildlife population effects, and benthic community impacts, more on a philosophical level than a practical level. We believe that the reviewers have, in some instances, misapplied the established criteria and in so doing would place the RAP in the impossible position of proving a negative hypothesis. However, this disagreement will in no way prevent continued investigation into those areas, or the remediation of problems should they be subsequently found. Actions to improve conditions in the Bay are more important than rhetorical discussions.

2.16 Pollutants of Concern and their Sources

The RAP indicated that heavy metal contamination and possibly PAH compound were responsible for the impairments identified. Recent work on both sediments and Brown Bullheads indicates that it is the PAHs which may be the greater pollutants of concern. In addition, fish researchers at Cornell have indicated that nitrosamine compounds may also be contributing to the tumor problems.

Ambient water and sediment samples were collected during the spring, summer and fall of 1993 from nine locations around the Bay (Figure 7). The results (Tables 3-11) show that while there are scattered measurements above water quality limits, there are no patterns of water quality problems. Of over 1000 analyses performed only 58 exceeded water standards, and none consistently. Of those 58, almost half (26) are due to iron (Fe) and aluminum (Al). The remainder were copper (Cu) 14, lead (Pb) 12, and cadmium (Cd) 6. It can be noted that in a number of cases, excursions of several parameters occur in the same sample. Since these are unfiltered samples, it is possible that turbidity played a role, i.e. the more turbid a sample is, the higher the metal values are likely to be. There also does not appear to be any correlation

→ between the water and sediment values for samples taken at the same location. In essence, a high sediment value does not necessarily mean a high water value. As stated in the RAP, the main source of contaminants appears to be the in-place sediments. While we will continue to collect ambient water samples, our main focus will be on sediment sampling as discussed in Section 4.1.

PAH compounds are implicated by the bullhead studies as a cause of the tumors observed. Sediment analysis indicates the presence of PAHs at levels sufficient to induce tumors in the lab. The question becomes one of identifying the source of these compounds. Are they historic or are there continuing inputs to the system? Are they petrogenic (petroleum) or pyrogenic (fire) in origin? Specific analysis conducted as part of the sediment project discussed in Section 4.1 should help to answer these questions. Since these are not naturally occurring compounds, it may then be possible to eliminate or minimize their sources through remedial actions.

Nitrosamines, on the other hand, can be created through the natural breakdown of other compounds. While sewage and other organic inputs may increase nitrosamine production, there will always be some formed. If further work determines that these compounds are contributing to the bullhead tumor problem, there may be little that can be done in the way of total remediation.

Other sections of this report outline the steps that are being taken to determine the sources and transport mechanisms for the pollutants of concern discussed above. Air deposition, combined sewer overflows (CSOs), and urban runoff can all contribute these compounds to the Bay. A recent study for the Erie County Planning office looked at the contribution of metals, PAHs, and other contaminants to the Bay from pleasure boats. While there are some questions regarding the magnitude of that contribution, it is a source that should be considered in the overall evaluation.

3. Ongoing Activities

During the time between the writing of the original RAP and the preparation of this update report, activities have been initiated or continued which bear directly on improving conditions in the Bay. The following sections describe these activities, and their relation to addressing impairments or adding to the body of knowledge on which future actions may be based.

3.1 Consent Decree with the City of Erie

→ Considerable progress has been made on the 1989 Consent Decree between the Commonwealth of Pennsylvania and the City of Erie (City). The City continues to put forth the manpower and financial resources needed to meet the milestones within the Decree. The following lists ^{five} four of the remedial actions which are required by the Decree, each of which is subsequently discussed:

→ V.A. *Elimination of filter backwash from water plants.*

V.B.1 Prevent known unpermitted dry-weather discharges into the Mill Creek Tube.

V.B.2 Formulate a study to determine the additional sources of pollution into the Mill Creek Tube and alternatives for removal.

V.B.3 Formulate a study to include other sources of pollution (excluding Mill Creek Tube) entering Presque Isle Bay (PIB), its tributaries and Lake Erie and alternatives for removal.

V.C. Perform a comprehensive evaluation of existing and future sewage disposal needs of Erie and tributary municipalities.

→ V.A. *was complete ---*

V.B.1 was completed by the City during the second quarter of 1991 and reported to DER as complete on July 3, 1991. The list of known dry weather Combined Sewer Overflows (CSOs)

was based on CSO inspections performed by the Bureau of Sewers and Bureau of Engineering for the City. Thirty-seven known CSOs were located within the Mill Creek Tube drainage area. Each of these CSO points were inspected weekly and found not to overflow during dry weather conditions.

V.B.2 required the City to determine the extent of pollutants in the Mill Creek Tube and to evaluate both structural and non-structural alternatives to reduce these pollutants. The pollutants to be identified included those from sources other than dry weather CSOs. Malcolm Pirnie, Inc. was retained by the City to perform this study. It was labeled the Mill Creek Tube Pollution Study (MCTPS) and commenced in March, 1991.

A two-phased monitoring and sampling program was utilized. The Phase I program was conducted during the Fall of 1991. Five long-term flow monitors and samplers were installed at key locations along the Mill Creek Tube (See Map 8). Samples were collected from three dry weather and two wet weather events and analyzed for 184 parameters at these 5 monitoring locations. The results showed the only pollutants being discharged into PIB from Mill Creek are those associated with domestic sewage, and that the pollutants were present under both dry and wet weather conditions. Certain metals (iron, copper, and zinc) also appeared to be ubiquitous in the Mill Creek watershed.

Phase II reduced the pollutant of concern parameter list from 184 to 38 parameters as a result of Phase I findings. Eight short-term flow monitors and samplers were installed in combined sewers or combined sewer overflows (See Map 8). The Phase II flow monitoring and sampling program was conducted during the Spring of 1992. Again, both dry and wet weather events were sampled. The Phase II monitoring and sampling program confirmed the results of the Phase I study.

Based upon the Phase I and II findings, a Dry Weather Mitigation Program was developed. Besides being illegal, the dry weather discharges masked the true extent of the wet weather pollution problem throughout the City of Erie. Unknown combined sewer overflows, illegal house connections, private sewers, maintenance issues and leaking sanitary sewers were listed as the possible dry weather sanitary contributors. An investigative and sampling program similar to that formulated for V.B.3 (Other Sources of Pollution Study) is currently being used for the Dry Weather Mitigation Program. At least 168 discharges in the Tube are to be investigated and sampled. To date, several large domestic sewage sources have been located and actions taken for their removal. Once this program is completed, the extent of wet weather domestic sewage pollutants in the Tube must be quantified. Structural and non-structural alternatives for addressing the remaining discharges can then be evaluated. A separate Storm Water Management Model (SWMM) is envisioned to be used in this endeavor. These results are then to be incorporated into the SWMM model being run for the Act 537 Official Sewage Plan which encompasses the City of Erie and tributary municipalities.

V.B.3 required the City to focus on other pollutant sources emanating from within the City boundaries (other than Mill Creek) and reaching Presque Isle Bay, its tributaries and Lake Erie. This study was labeled the Other Sources of Pollution Study (OSPS). Twelve discharge locations were strategically chosen and flow monitoring devices and samplers installed (see Map 9). These twelve locations encompassed all the remaining CSOs inside the City. Five sets of samples (two dry and three wet weather events) were analyzed for the OSPS drainage area. The 1992 sampling program results provided the City with an identification of the pollutants entering Lake Erie and Presque Isle Bay. Rather than studying the other sources further through a Request for Proposal, the City opted to perform implementation and rehabilitation to address the identified pollutants themselves.

The results of the sampling allowed the twelve sites to be logged into three categories. Four discharge points (DP 3, 4, 5, & 9) were identified as containing industrial pollutants and pollutants of domestic origin. These four were the initial areas of study. Four discharge points

(DP 1, 8, 10, & 13) were identified as containing dry weather domestic sewage. These four sites were considered additional areas to receive study. The remaining four discharge points (DP 2, 6, 7, & 12) contained domestic sewage pollution evident only during wet weather sampling (to be expected with CSOs). Although no further study is planned for these last four sites, Garrison Run (DP-6) was further investigated and sampling activities conducted as a result of past problems.

To date, the City has made measurable progress in the clean-up of these other sources. Progress reports are supplied to the Department and meetings are held as necessary.

Finally, V.C. involves the formation of an Official Sewage Plan Update for the City under the PA Sewage Facilities Act (Act 537). This plan consists of a comprehensive evaluation of existing and future sewage disposal needs (both treatment and conveyance) of Erie and the tributary municipalities. The Plan is to be submitted in October, 1994. As previously mentioned, a SWMM model will aid in this endeavor.

Many of the surrounding municipalities are updating their Official Sewage Plans at this time as well. In order to facilitate communication and ensure the compatibility of the conclusions of each of these planning efforts, representatives from the City, each of the surrounding municipalities and DER have formed a sewage planning "Task Force." The Task Force has been meeting every two months since May, 1993.

3.2 Zebra Mussels

As discussed earlier in this report, the introduction of the Zebra Mussel (*Dreissena polymorpha*) has greatly affected the ecology of the entire Great Lakes system. The abundance of the mussels in the vicinity of PIB has already resulted in a number of noticeable effects. The City of Erie's water intake lines had become so infested with the mussels that a significant reduction in volume was created. After mechanically cleaning the lines, a system was installed to release low levels of chlorine (as hypochlorite) at the mouth of the intake pipe to kill veligers before they had a chance to attach themselves. Monitoring for trihalomethanes was required in several locations throughout the City water system to ensure that this additional introduction of chlorine did not create a new problem. No significant increases were noted.

The filtering activities of the mussels has caused a dramatic increase in water clarity. Visibility which had previously been only to a depth of 3 - 4 feet is now in the 10 - 15 foot range. This increase has allowed deeper sunlight penetration, affecting submergent and emergent plant growth, plankton populations and distributions, and as some PAH compounds are photoactive (e.g. phenanthrene), sunlight reaching the bottom sediments may cause additional toxic effects.

The abundance of the mussels affects the cycling of nutrients in the system, such as when calcium and phosphorus used to produce mussel shells become unavailable for other organisms. The food chain may shift from a pelagic (open water) to a benthic (bottom) system as nutrients are taken in by the mussels and deposited on the bottom.

It is important to re-emphasize the fact that these are not strictly PIB concerns, but rather issues that are being addressed and examined on a lakewide basis. Even so, research being done may ultimately help us in understanding conditions in the Bay. There are some university researchers examining the effects of the mussel on plankton populations in the Bay itself. Paschke and Zagorski (1993) released a study comparing phyto- and zooplankton populations before and after the Zebra Mussel invasion. Generally, the average population, especially of phytoplankton, decreased with the advent of the mussels. More specific statistical tests were hampered by a lack of data, and a genera specific evaluation has yet to be conducted. It may be that certain types of plankton are affected more than others, and therefore community structures may change as time goes on. The RAP needs to be cognizant of these findings as they become available in order to separate these biological effects from toxics or other stressors.

3.3 Boat Capacity Study

The Erie County Planning Department received a grant to investigate the effects of boating on PIB and to try and determine the boat carrying capacity. They contracted in 1993 with Greenhorn and O'Mara to conduct a survey of boaters, a census of boats on the Bay, and limited collection of water quality samples in some of the marinas. At this point, the report has not yet been finalized. Preliminary drafts suggest that the Bay has not yet reached its physical carrying capacity. Additional boats and boat slips could be accommodated, based on traffic and safety considerations. Not as clear were the conclusions regarding environmental effects.

Direct sampling of marinas during various times did not show any specific effects from boat usage. There were, however, some concerns inferred from the boater survey and a knowledge of boats and boating practices. The effects of using various cleaners and paints were estimated as was the effect of boat exhaust. Two-cycle engines release far more pollution to the air and water than do four-cycle engines. Some of that pollution is in the form of PAH compounds, which as previously noted are significant pollutants of concern in the Bay. While the study provides a gross approximation of the PAH loading from boats, it is not the number itself which is significant, but the identification of a potential source which may need to be addressed.

4. Future Actions

4.1 Sediment Sampling and Analysis

Because previous studies in Presque Isle Bay were focused largely on the bulk chemistry of the sediments, these results can only be used in general terms when analyzing this impairment and are insufficient for comparison to Sediment Quality Criteria (SQC) where it exists. The next step in the evaluation of the contaminated sediments is to identify the magnitude and extent of the problem in conjunction with a determination of the impact these pollutants are having on the macroinvertebrates and plankton in the Bay. This comprehensive, integrated assessment, known as the "Triad Approach", was developed by USEPA's ARCS Program and includes chemical analyses of the sediments, toxicity testing and a benthic community survey. While each of these components provides information about different aspects of the contamination problem, an integration of these test results allows for a better understanding of the amounts and effects of toxic substances that are present.

In conjunction with USEPA Region III, USEPA ARCS Program and Battelle Ocean Sciences, PADER will be conducting a full-scale sediment study using the triad approach in PIB in May 1994. As discussed under section 2.6, this study will assess all three components for a similar location and sampling time. Sediments collected will also be analyzed to determine the extent of the pollution problem that is from anthropogenic versus natural sources, and to determine the associated sediment size ranges, especially the silt/clay fraction.

Through the use of the USEPA R/V Mudpuppy sampling vessel, cores will also be taken at the 21 sampling locations in the Bay and outer harbor. Sediment core samples will provide a profile of contaminant deposition in the Bay, indicating whether the pollutants are historic in nature or represent ongoing discharges. Such data is critical when considering remediation options because it indicates the depth to which action must occur. In addition, we are exploring the possibility of dating the core samples to provide information on deposition rates and age of specific periods of deposition.

We hope that this comprehensive, integrated assessment approach will more clearly define the magnitude and extent of the sediment contamination problem and guide us in our remediation decisions.

4.2 Fish Collection and Tumor Analysis

Work plans scheduled for 1994 are based on obtaining the necessary funding to accomplish these tasks. As of this writing, it appears that funding will be available from USEPA's RCRA program to support this effort. Additional histological and bile sampling will be conducted on Brown Bullheads, Yellow Bullheads, White Suckers, and Bowfin from selected sites. Species of bottom feeding fish other than just Brown Bullheads will be examined to determine external and liver tumor rates. It is possible that some species of fish may possess liver tumors without developing external tumors. Bowfin have been noted in previous studies from contaminated sites to develop liver tumors without the presence of external tumors. Bile samples will be extracted at the time of histological examination for PAH metabolite analyses. The results of the bile sampling will be used to verify previous bile sampling results showing elevated levels of PAH metabolites in tumored fish as compared to untumored fish. Fingerprinting of PAH metabolites may help in determining the source and type of PAH contamination within Presque Isle Bay. If PAH sources or sites can be determined then it may be possible to develop a remediation plan for the source or site.

4.3 Habitat Enhancement Project

Two years ago, the Pennsylvania Fish and Boat Commission (PFC) was contacted to get their thoughts on fish habitat enhancements which could be constructed within PIB. Coarse brush structures along and near the northwest shore (Presque Isle State Park) were suggested as possibly being appropriate. The coarse brush structure suggested is the PA Porcupine Brush Crib. The Porcupine Brush Crib is designed to provide cover to young-of-the-year, juvenile and adult gamefish and panfish. It has a long submerged life span and is easy to construct and place. A program known as Adopt-a-Stream was recommended as the best vehicle to get a project such as this into action. Adopt-a-Stream is a cooperative program which provides technical assistance and planning, construction supervision, and a limited amount of materials to the cooperator of an approved project on qualified waters.

Presque Isle State Park and Save Our Native Species (SONS) of Lake Erie filled out the Adopt-a-Stream application and submitted it May 28, 1993. Dave Houser, Chief of the Adopt-a-Stream Section has indicated the application for the project is currently under review. All feedback he has gotten regarding this project has thus far been positive. However, to institute, other approvals such as an Army Corps of Engineers 404 Permit will be necessary. The PFC intends to visit PIB this Spring to evaluate the site and more specifically determine the optimum number and placement areas for the cribs. The project could conceivably come to fruition later in 1994. Worst case would be construction and placement of the cribs in 1995.

4.4 Environmental Monitoring

In addition to the specific sample collection and monitoring activities outlined in this report, PADER is also attempting to initiate a more rigorous plan for routine environmental monitoring. This will involve bringing the Department's mobile laboratory unit to PIB on a regular basis, and collecting air, water, and biological samples for screening. The mobile lab is equipped with a gas chromatograph/mass spectrometer unit, as well as standard wet chemistry capabilities. By coordinating sample collection with real time analysis, a large amount of data can be collected to establish baselines and help determine if progress is being made.

PADER also plans to collect additional bacterial samples on a weekly basis to continue the evaluation begun in 1993. While it is believed that there is no health or safety problem

associated with whole-body contact recreation in the Bay, we believe it is prudent to continue monitoring the ambient conditions.

4.5 Pollution Prevention and Source Reduction

PADER has a continuing program to promote pollution prevention and source reduction (PP/SR) throughout the state. Recently instituted regulatory programs, such as the residual waste regulations and Clean Air Act amendments have included these components. Facilities are being asked to develop PP/SR plans as part of their normal operating requirements. PADER has worked with USEPA to promote the 33/50 program in the Erie area and continues to encourage industry participation. Technical and financial assistance are available through PADER initiatives as well as university cooperatives.

A program to alert homeowners and other individuals to the importance of not discharging polluting substances to storm drains which flow to PIB is being developed by local citizens. This initiative will involve painting messages on area storm drains to identify them as potential sources of pollution. The work will be conducted by volunteers with materials supplied by PADER or other sponsors.

5. Public Participation

5.1 Public Advisory Committee (PAC)

A key component of any RAP strategy is the involvement of the affected public in decisions and actions. From the outset in 1990, it was obvious that a public forum, similar to the then existing Erie Harbor Improvement Council (EHIC), was necessary to ensure that the public had access to RAP information and activities, and could advise PADER in the creation of the RAP itself. With the permission of the Mayor of Erie and the Erie County Executive, who had created the EHIC, PADER took over responsibility for the Council and converted it into the PIB Public Advisory Committee (PAC). Prior to the conversion, the EHIC discussed its existing membership in an effort to ensure that all constituencies were included in the RAP discussions. Stakeholders not represented on the EHIC were contacted and invited to nominate a PAC member. A review of the PAC membership list included in the original RAP document clearly shows that a wide spectrum of interests is represented. The EHIC met one Monday morning a month, and that schedule was continued for the PAC. After the RAP was submitted to USEPA in 1993, the PAC began meeting once every two months.

The primary responsibility for preparing the RAP and ensuring its submission to USEPA and IJC in accordance with the Great Lakes Critical Programs Act of 1990 falls on the Commonwealth. To fulfill that responsibility, PADER needs to provide an opportunity for community involvement in the process, so that a consensus can be reached among conflicting interests. The role of the PAC, as the name implies, is to create that opportunity and allow advice to be given to PADER on RAP related activities.

In addition, the PAC provides PADER with the means to quickly and efficiently disseminate information to a wide audience. As each portion of the RAP is produced, it is distributed to the PAC members for review. It is their obligation to evaluate RAP activities in the context of the groups they represent, and report comments back to PADER directly or at subsequent meetings. Minutes from all meetings are kept as part of the permanent record of RAP activities, and provide a record of discussions and dissenting opinions. From these comments and discussions, a consensus position or recommendation is developed. It is important to note that there is no direct voting process involved, and consensus does not mean that everyone agrees. It is probably fair to say that no one agrees with everything the RAP says or recommends. The ideas and opinions in the RAP documents reflect the PADER writing team's best synthesis of the technical information, advice from the PAC, IJC, USEPA and others, and resource or legal considerations.

5.2 Public Outreach

Admittedly, this is one area where the RAP can be made stronger. Even though documents are readily available and meetings are open to the public, there is limited knowledge about the RAP or related activities in the general populous. There needs to be a more focussed effort to educate the general public as to the importance of the RAP, the activities going on around them, and most importantly, the ways that they can become involved and assist the effort.

To correct this problem, PADER with the help of the PAC is organizing a public information committee. The charge to this group will be to develop public display and presentation materials, school programs, brochures and other means to generate public awareness and interest.

Through the use of Pennsylvania's Great Lakes Protection Fund money, PADER is contracting with the Northwest Tri-County Intermediate Unit to conduct training for teachers in environmental issues, with a specific emphasis on Lake Erie and PIB. Using the Lake as the laboratory, these teachers will hopefully gain a better appreciation of the ecosystem approach to environmental problems and weave that theme into classroom instruction.

An environmental curriculum for grades K - 12 is under development by the Benedictine Sisters' Glinodo Center. Again it is hoped that by creating awareness in the schools, we can generate interest elsewhere.

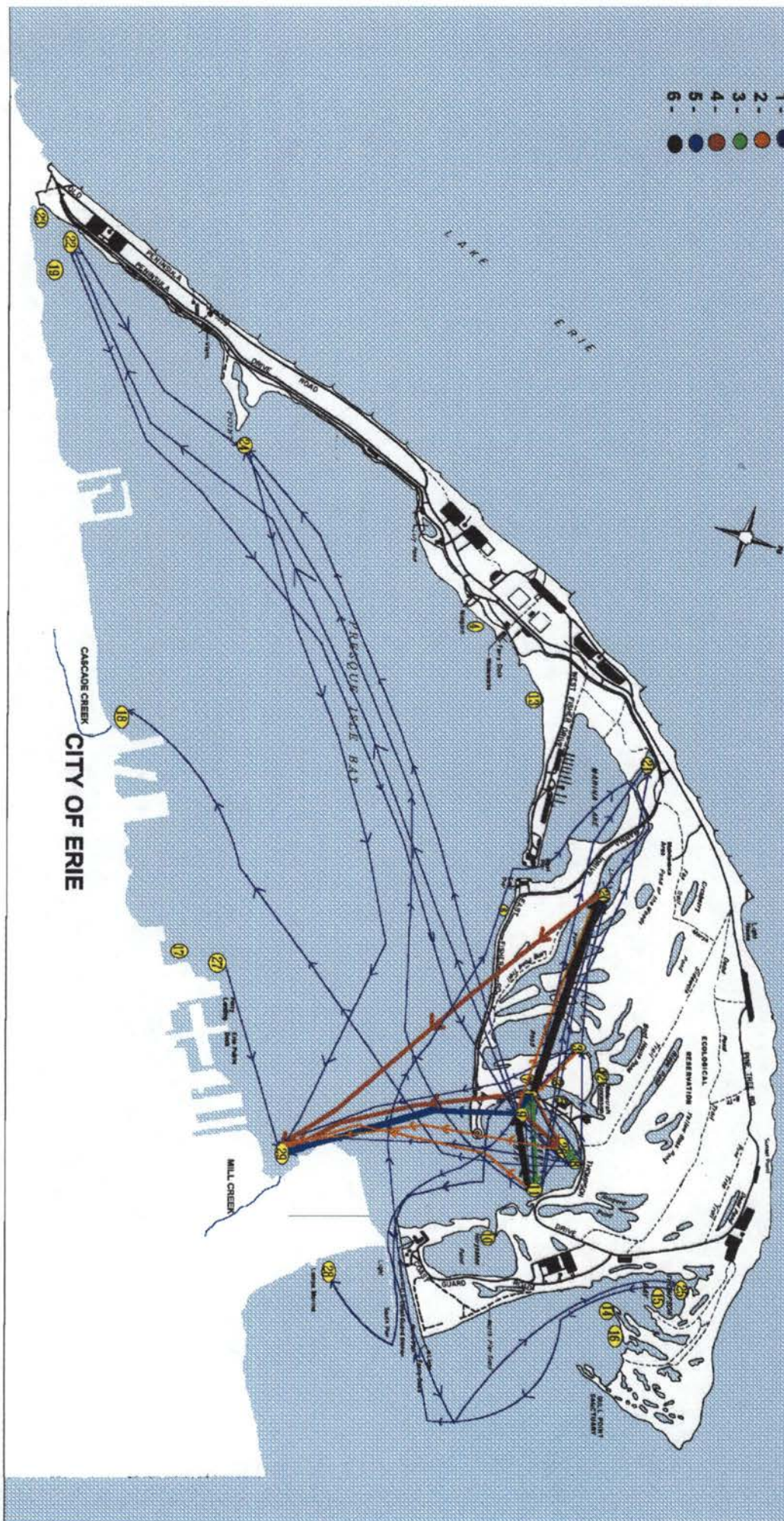
6. Conclusion

As should be clear from the foregoing report, much has been accomplished in the past two years. Areas where data gaps were identified or conclusions were unclear have received attention in the form of additional studies and evaluation. To date, the USEPA has provided over \$300,000 in grants to pursue sediment, fish and plankton evaluations. In addition to funding, they have provided technical advice and will be sending the RV Mudpuppy to assist in sediment sampling this spring. PAC members, municipal and county officials, PADER and other state and federal employees, and concerned citizens have all contributed, many on a voluntary basis, to help move this process forward. The heart of the RAP process is this spirit of cooperation and community. There is still much work ahead and many decisions yet to be made, and undoubtedly there will be disagreements on the best way to proceed. Hopefully, the solid foundation we have laid can be built upon as this process proceeds to ensure that our ultimate goal, restoring Presque Isle Bay, will be achieved.

MAP 1. PRESQUE ISLE BAY BULLHEAD MIGRATION ROUTES FROM 1992 TAGGING STUDY.

NO. FISH - COLOR

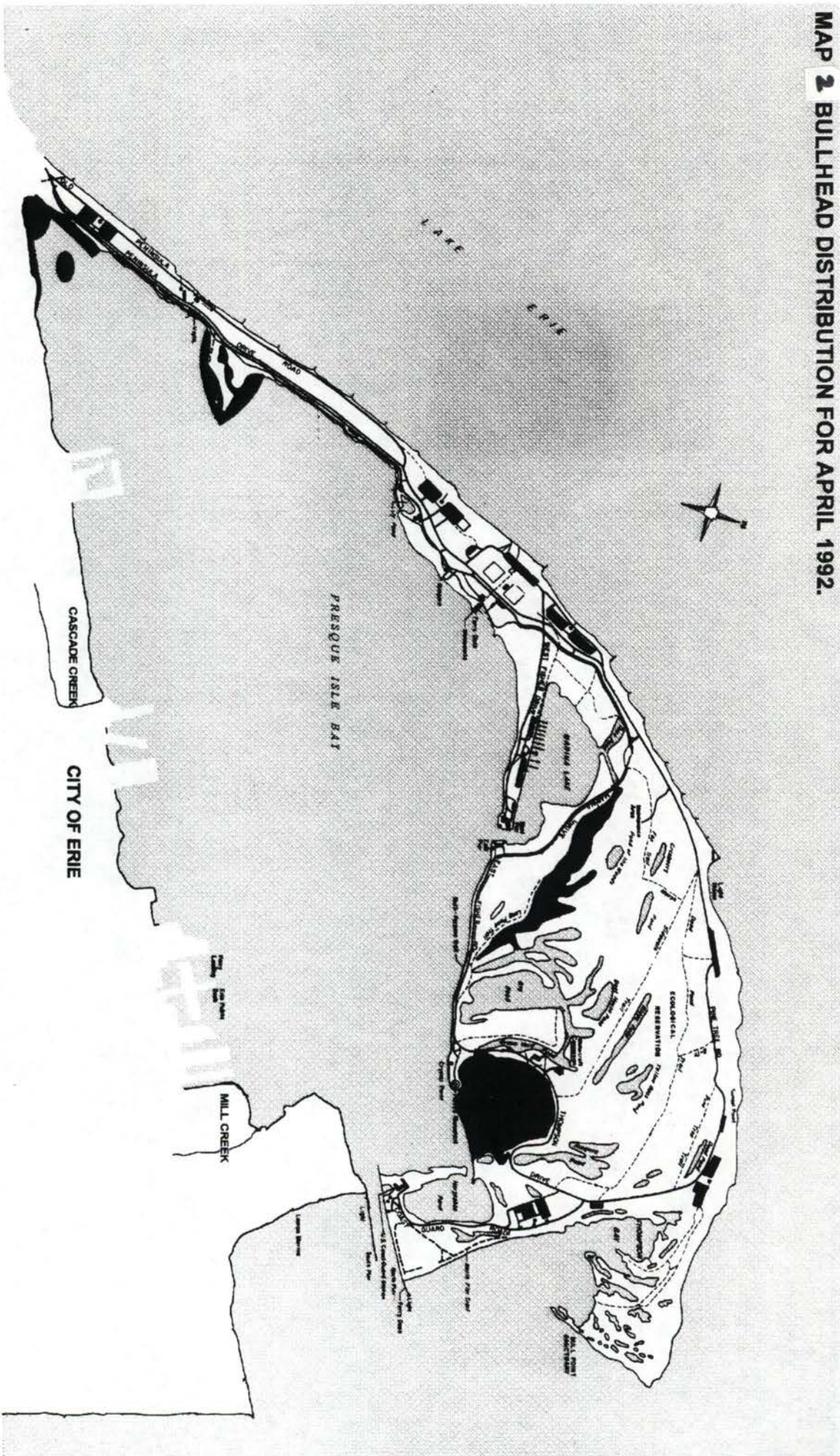
- 1 -
- 2 -
- 3 -
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- 6 -



MAP 2 BULLHEAD DISTRIBUTION FOR APRIL 1992.

The map illustrates the distribution of bullheads in Presque Isle Bay and the City of Erie. Key features include:

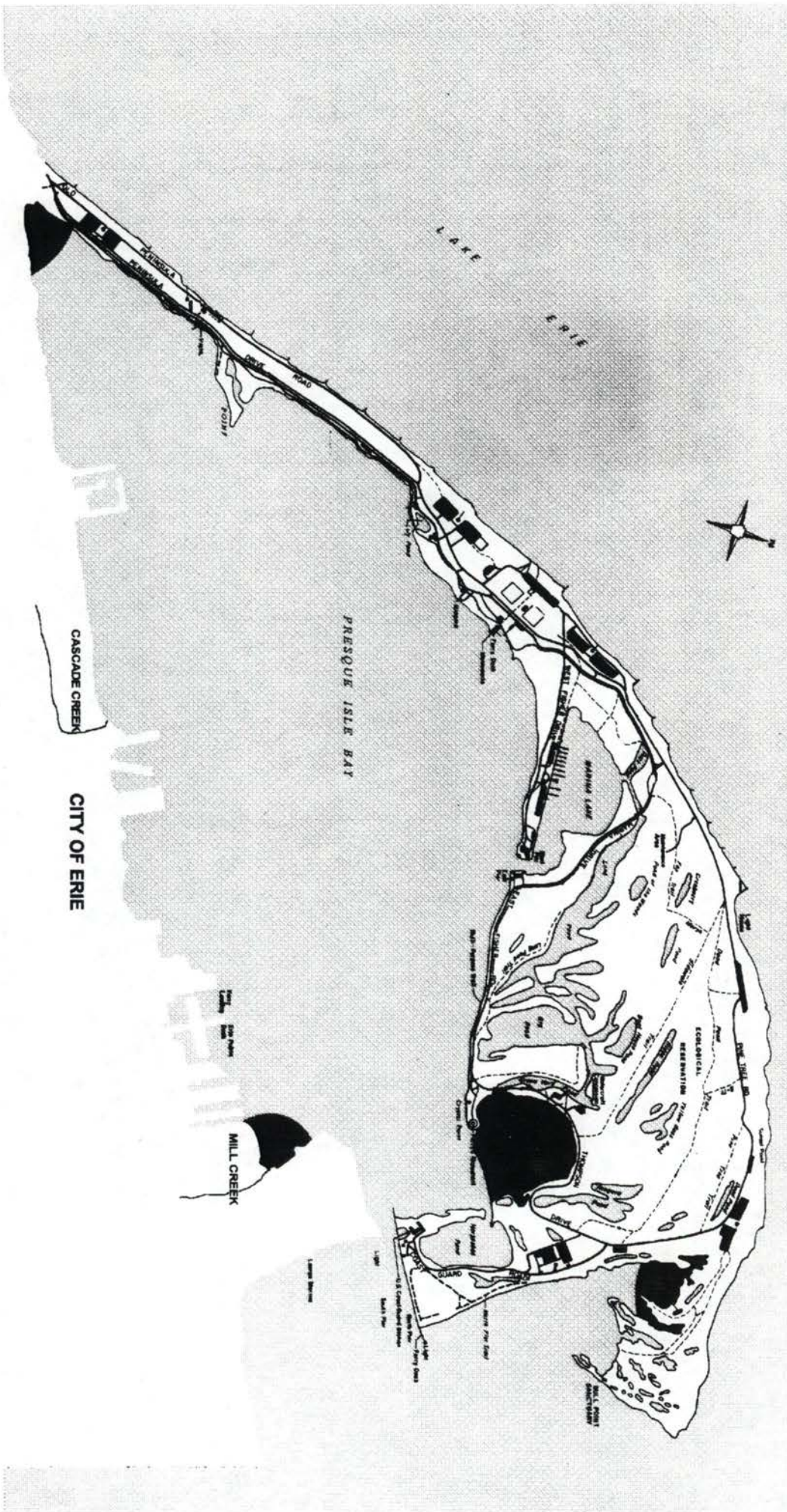
- Geographic Features:** Lake Erie, Presque Isle Bay, Mill Creek, and the City of Erie.
- Land Use and Infrastructure:** Presque Isle State Park, Mill Creek, and various land use areas.
- Scale and Orientation:** A scale bar indicates distances up to 1 mile. A compass rose shows North at the top.
- Bullhead Distribution:** Shaded areas indicate the presence of bullheads in April 1992.



MAP 3 BULLHEAD DISTRIBUTION FOR MAY 1992.



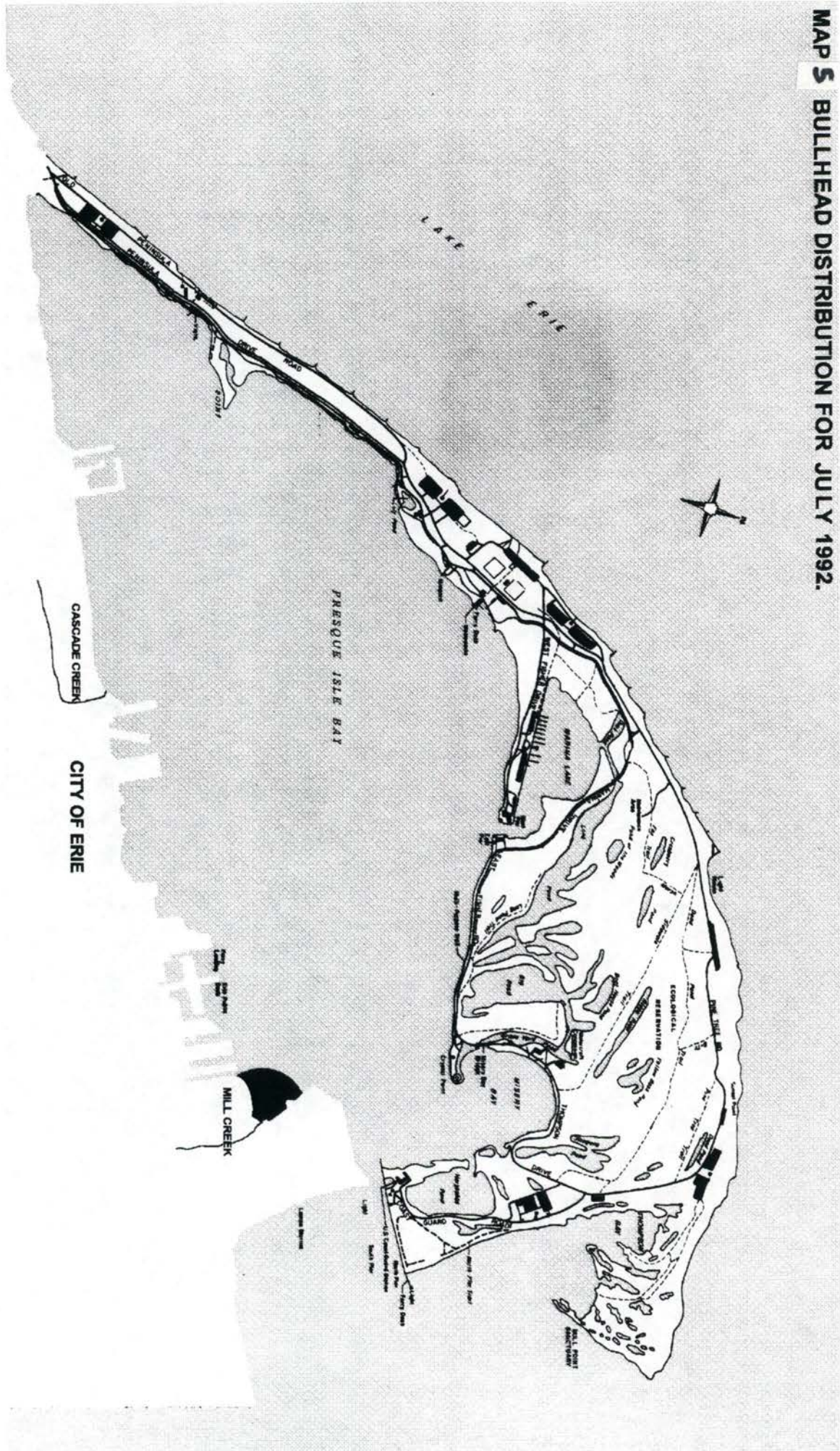
MAP 4 BULLHEAD DISTRIBUTION FOR JUNE 1992.



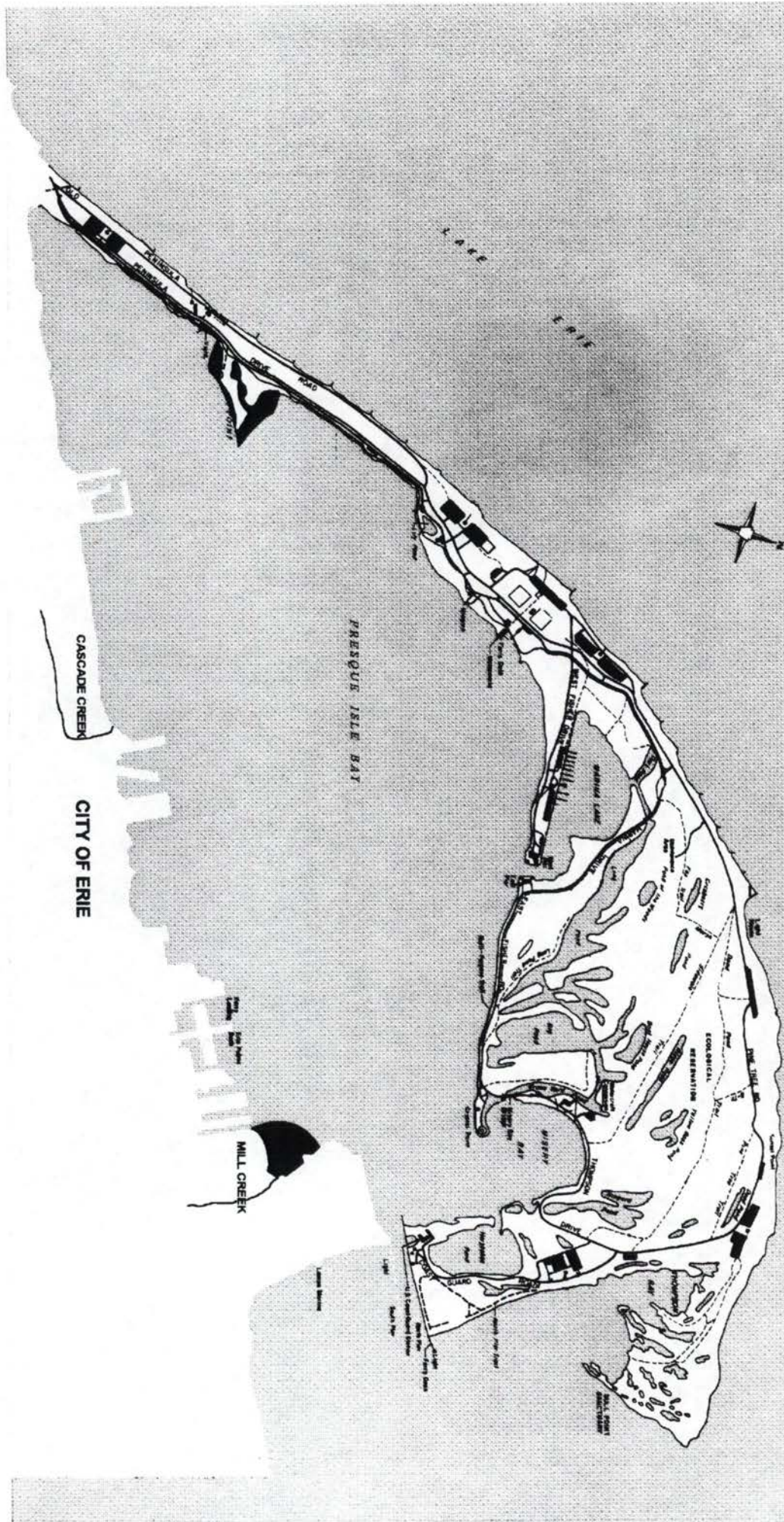
MAP 5 BULLHEAD DISTRIBUTION FOR JULY 1992.

The map illustrates the distribution of bullheads in Presque Isle Bay and Lake Erie. Key features include:

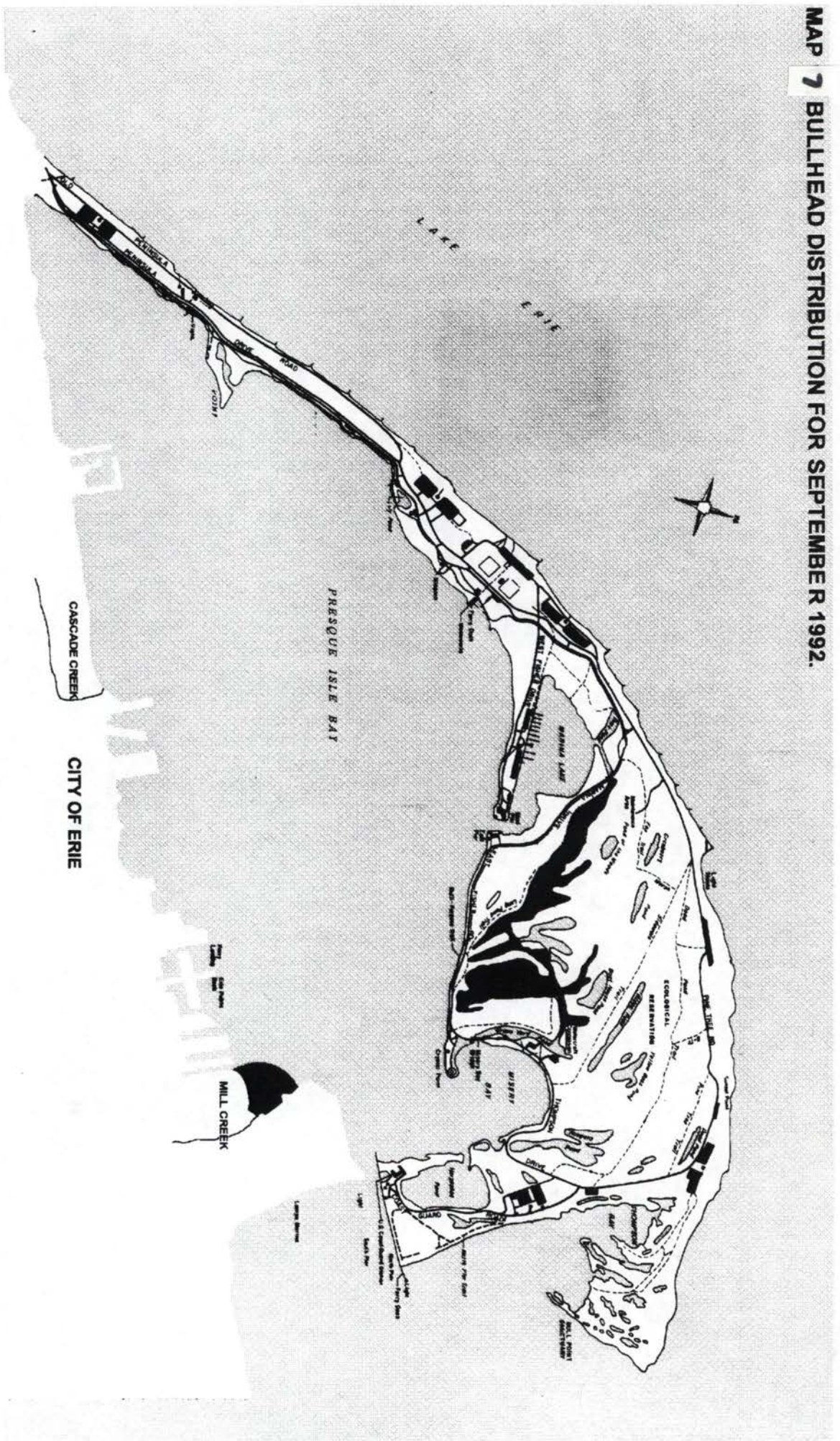
- Geographical Labels:** LAKES ERIE, PRESQUE ISLE BAY, CITY OF ERIE, CASCADIA CREEK, MILL CREEK, BULLHEAD LAKE, BULLHEAD BAY, BULLHEAD POINT.
- Infrastructure:** A network of roads and trails is shown, including a road labeled 'ROAD' and a trail labeled 'TRAIL'.
- Water Features:** Various water bodies and creeks are depicted, including Bullhead Lake, Bullhead Bay, and Bullhead Point.
- Map Elements:** A north arrow is located in the upper right corner. A scale bar is provided at the bottom left, indicating distances of 0, 100, and 200 feet.

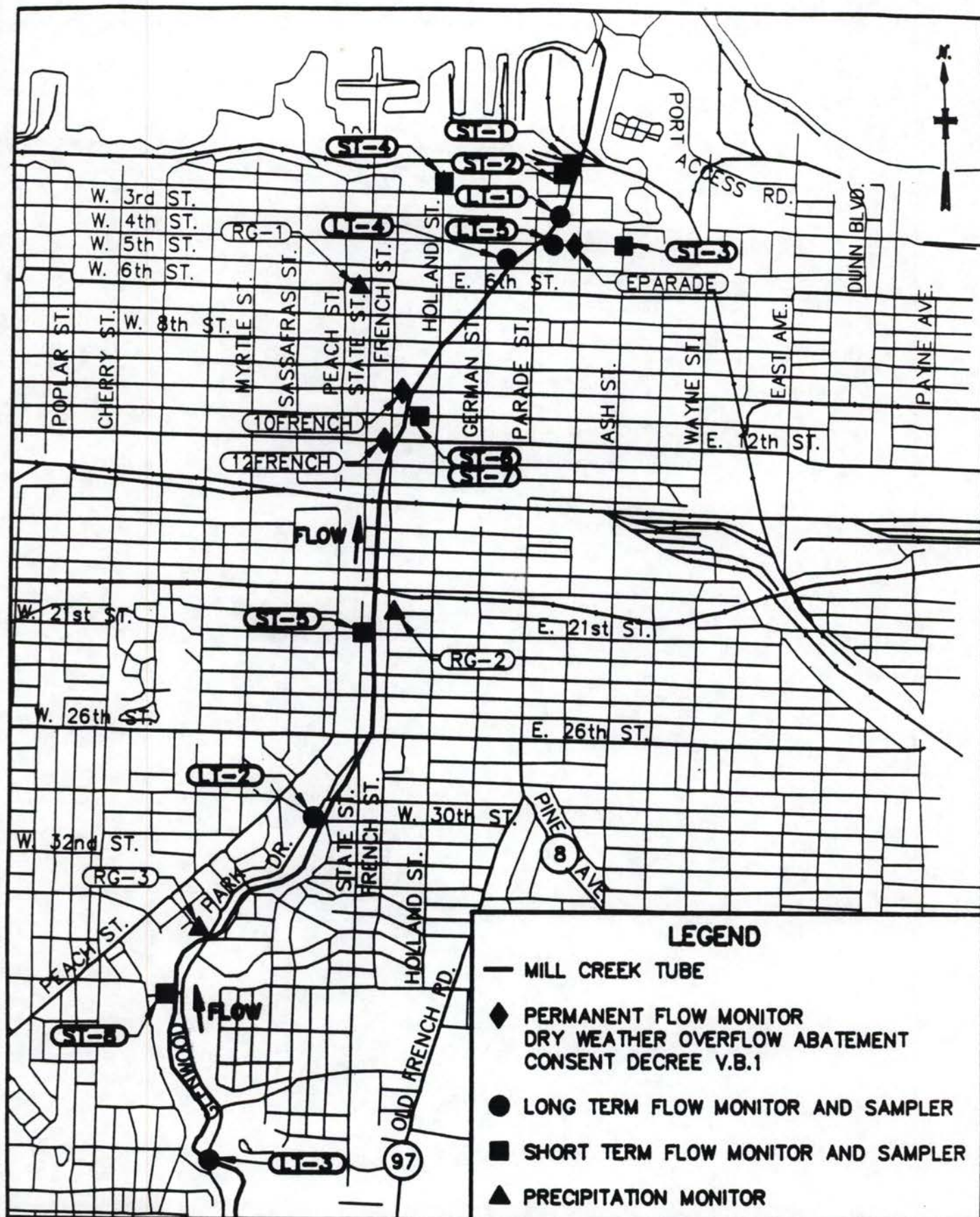


MAP 6 BULLHEAD DISTRIBUTION FOR AUGUST 1992.



MAP 7 BULLHEAD DISTRIBUTION FOR SEPTEMBER 1992.





**MALCOLM
PINE**

ERIE-85A

**CITY OF ERIE
MILL CREEK TUBE POLLUTION STUDY
MONITORING SITE LOCATIONS**

CITY OF ERIE, PA.

FEBRUARY 1993

Map #8

**CITY OF ERIE
MILL CREEK TUBE POLLUTION STUDY****LOCATION OF LONG-TERM FLOW MONITORS AND SAMPLERS**

Monitor I.D.	Location	Flow Monitor	Sampler Location
LT1	Discharge of Mill Creek Tube	X	X
LT2	Inlet of Mill Creek Tube	X	X
LT3	Mill Creek upstream of City of Erie	X	X
LT4	East 5th Street 54" combined sewer and 36" overflow	X	X
LT5	East 4th Street 60" storm sewer	X	X
10FRENCH	East 10th Street 24" combined sewer and 24" overflow	X	
12FRENCH	East 12th Street 24" combined sewer and 18" overflow	X	
EPARADE	East 4th Street 36" combined sewer and 36" overflow	X	
NOTES: Shading indicates combined sewer and overflow monitoring locations (Project 1233) LT = Long-Term monitor location			

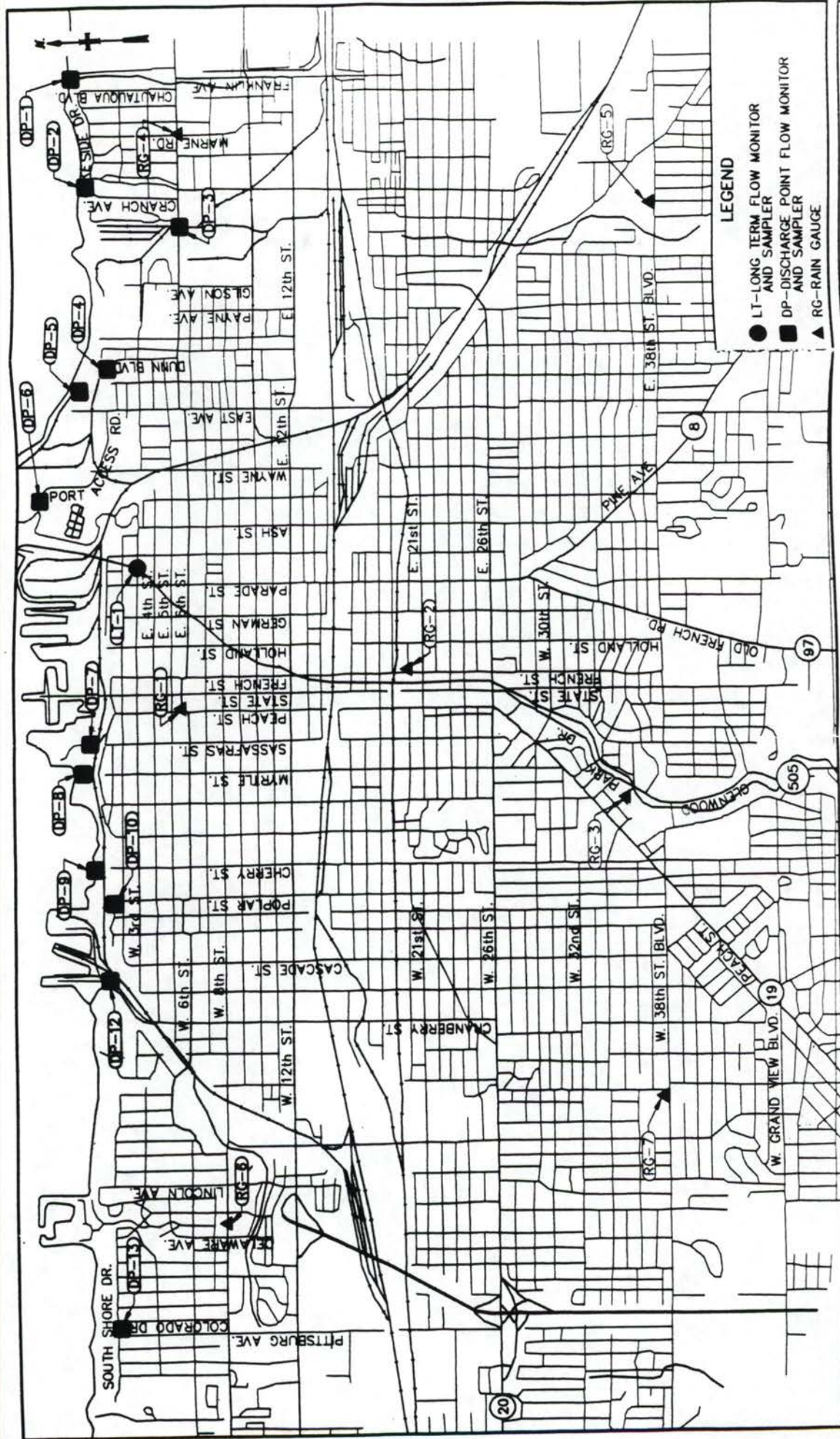
**CITY OF ERIE
MILL CREEK TUBE POLLUTION STUDY**

LOCATION OF SHORT-TERM FLOW MONITORS AND SAMPLERS

Monitor Identifier	Monitor Location	Location Justification	Flow Monitor	Sample Location
ST1	57" West Side Interceptor CSO	Downstream of LT1	X	X
ST2	33" Front St. and Wallace St. Storm Sewer	Storm Water; Downstream of LT1	X	X
ST3	36" East 4th St. and Ash St. Combined Sewer	Upstream of EPARADE	X	X
ST4	15" East 2nd St. and Holland St. Combined Sewer	Average: Peak Flow CS Ratio	X	X
ST5	18" East 21st St. and State St. Combined Sewer	Average: Peak Flow CS Ratio	X	X
ST6	15" 11th Street Combined Sewer	Possible Low Intercept Ratio	X	X
ST7	15" 11th Street Combined Sewer	Possible Low Intercept Ratio	X	
ST8	66" 38th Street Storm Sewer	Storm Water; Upstream of LT2	X	X

NOTES:

CSO = Combined Sewer Overflow
 CS = Combined Sewer
 ST = Short-Term monitor location
 LT = Long-Term monitor location



CITY OF ERIE
 OTHER SOURCES OF POLLUTION STUDY
 MONITORING LOCATIONS
 CITY OF ERIE
 OCTOBER 1992

MALCOLM PERE

ERI-01-F21

**CITY OF ERIE
OTHER SOURCES OF POLLUTION STUDY**

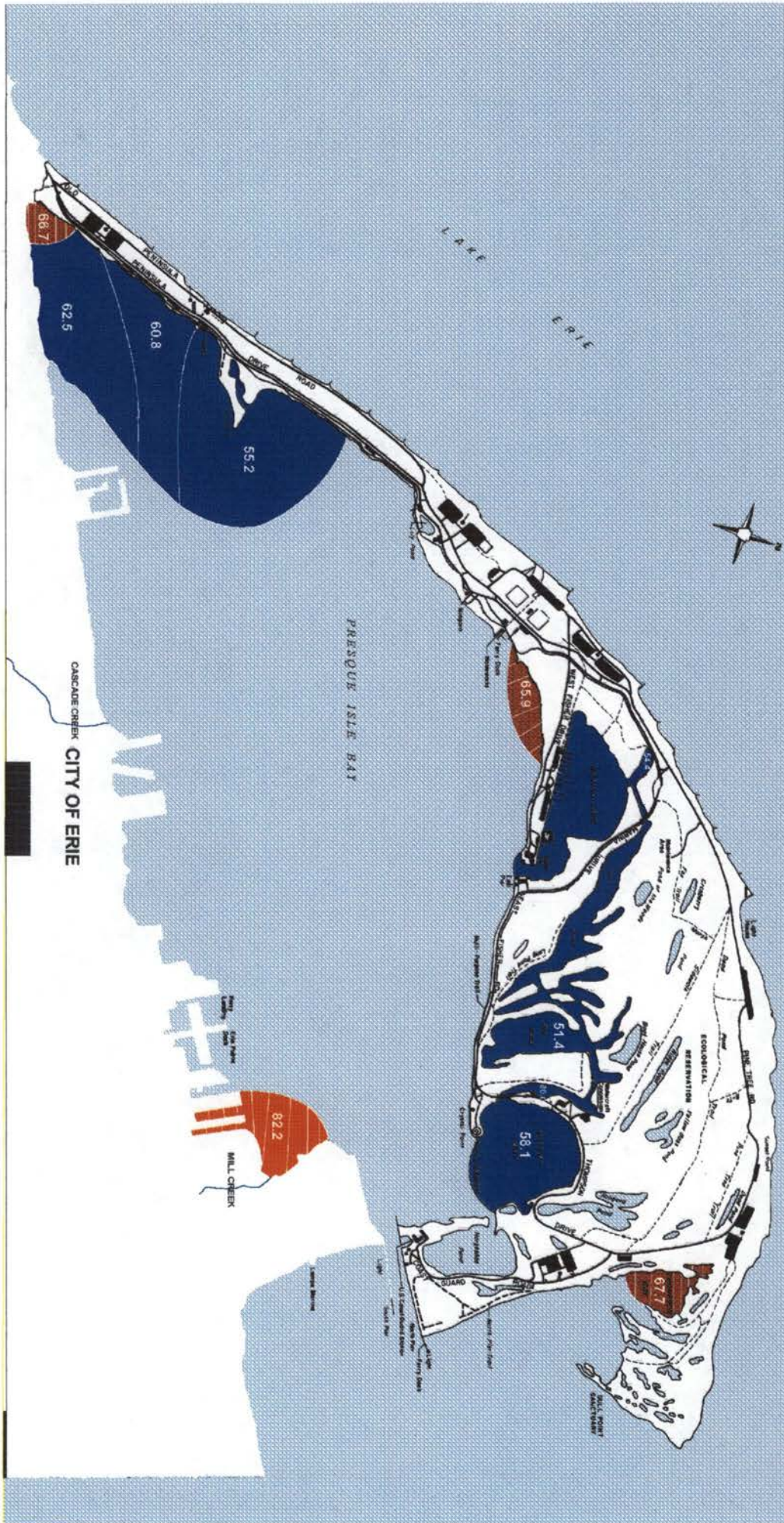
LOCATION OF SHORT-TERM FLOW MONITORS AND SAMPLERS

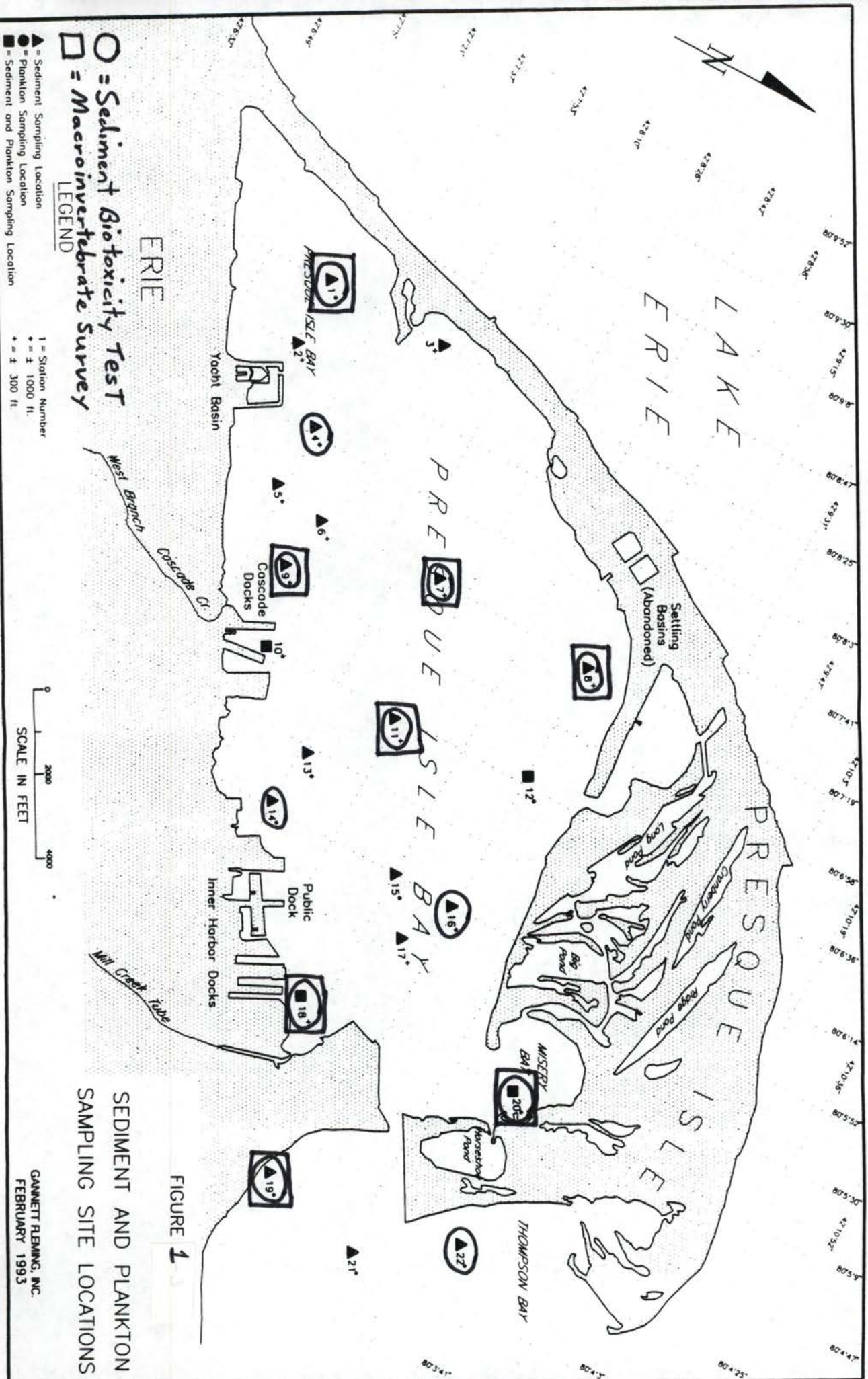
Monitor I.D.	Location	Associated Upstream Overflows
DP1	McDaniel Run Channel	PS # 046, 047 and East Lake Road west of Chautauqua Blvd.
DP2	84" Cemetery Run	PS# 044
DP3	Motch Run Channel	Storm Water
DP4	54" Dunn Blvd. Storm Sewer	PS# 043
DP5	36" East Avenue Storm Sewer	PS# 042
DP6	96" Garrison Run Enclosure	PS# 049, 050, 052, 053, East 23rd St. between East Ave. & Pennsylvania Ave. and intersection of 24th Street & Pennsylvania Ave.
DP7	48" Sassafras Street Storm Sewer	PS# 035, 037 and north of West 2nd St. between Peach St. and Sassafras St.
DP8	4' x 5' Myrtle Street Storm Sewer	PS# 036
DP9	48" Cherry Street Storm Sewer	PS# 033 & 034
DP10	54" Poplar Street Storm Sewer	PS# 039
DP12	Cascade Creek Channel	PS# 038
DP13	42" Colorado Drive Storm Sewer	PS# 032
LT1	Mill Creek Tube Discharge	PS# 002 thru 031 and East 22nd St. & French St.

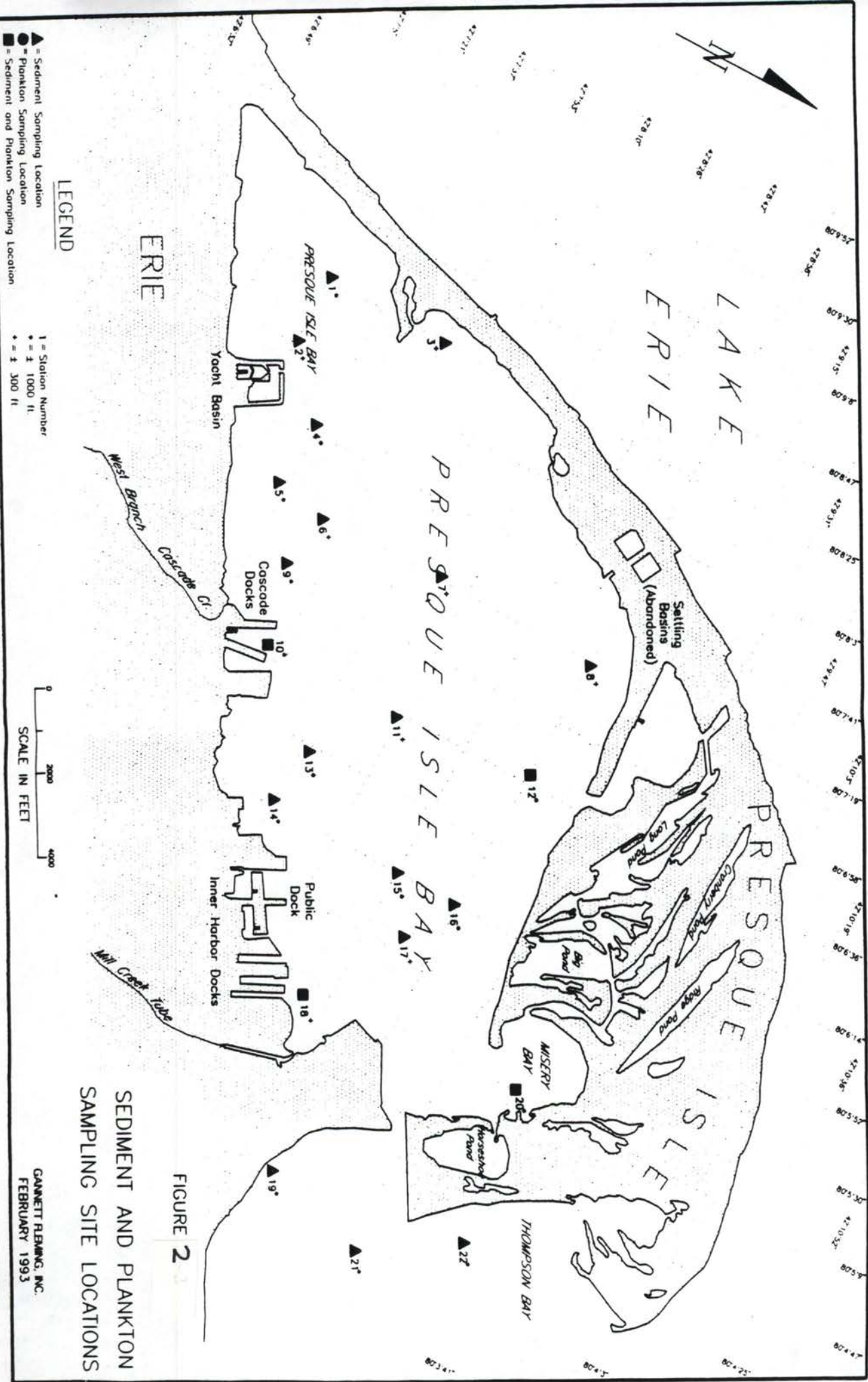
NOTES:

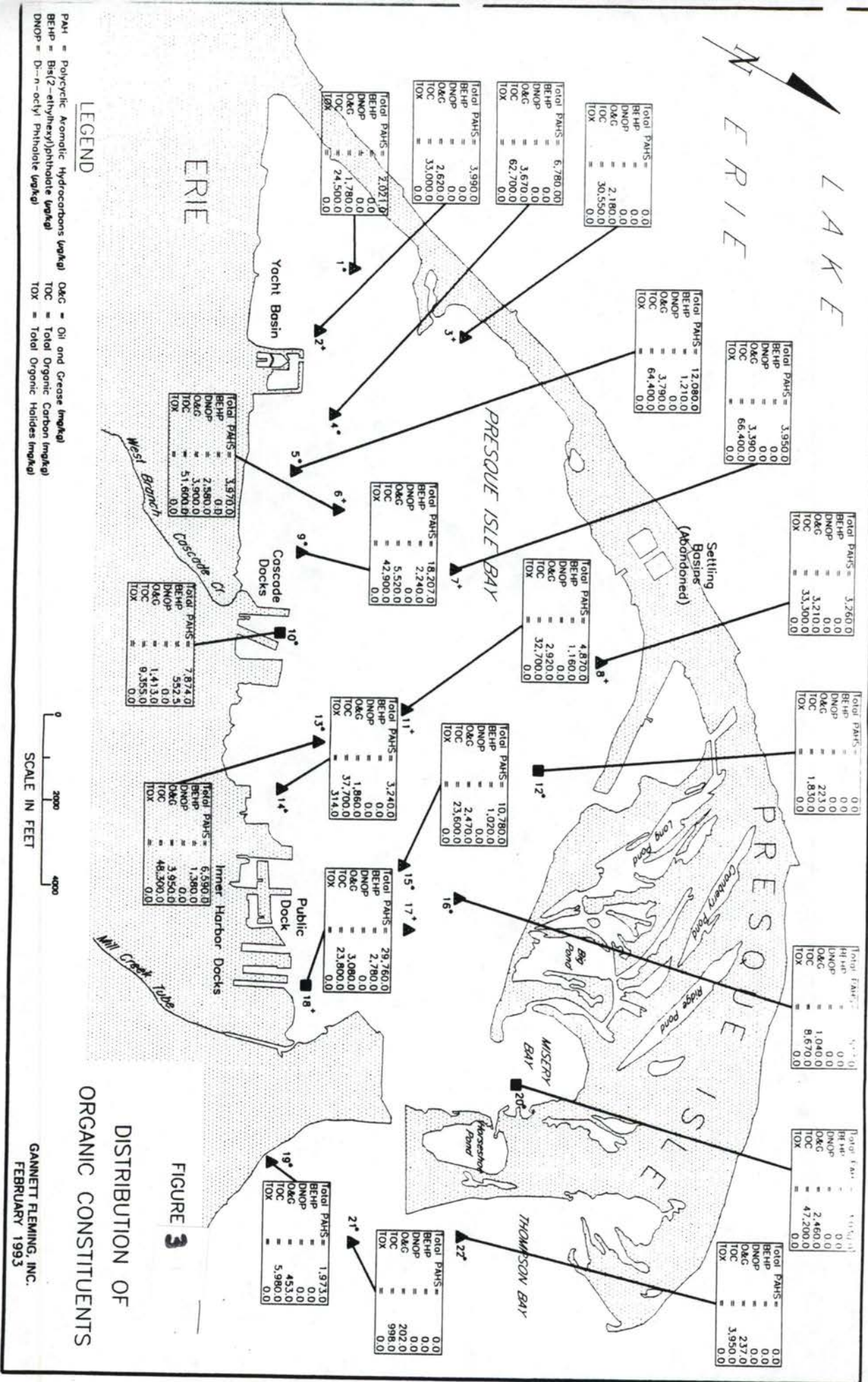
- DP = Discharge Point monitor location
 LT = Long-Term monitor location
 PS# = NPDES Point Secure Number *Secure*
 DP11 = 18" Plum Street Storm Sewer was eliminated from the proposed study list when the City of Erie eliminated the potential overflow by installing a new sanitary sewer line connected directly to the West Side Interceptor.

MAP 10 PRESQUE ISLE BAY BULLHEAD EXTERNAL TUMOR RATES PER SITE FOR 1992.
 (catch rate > 100)

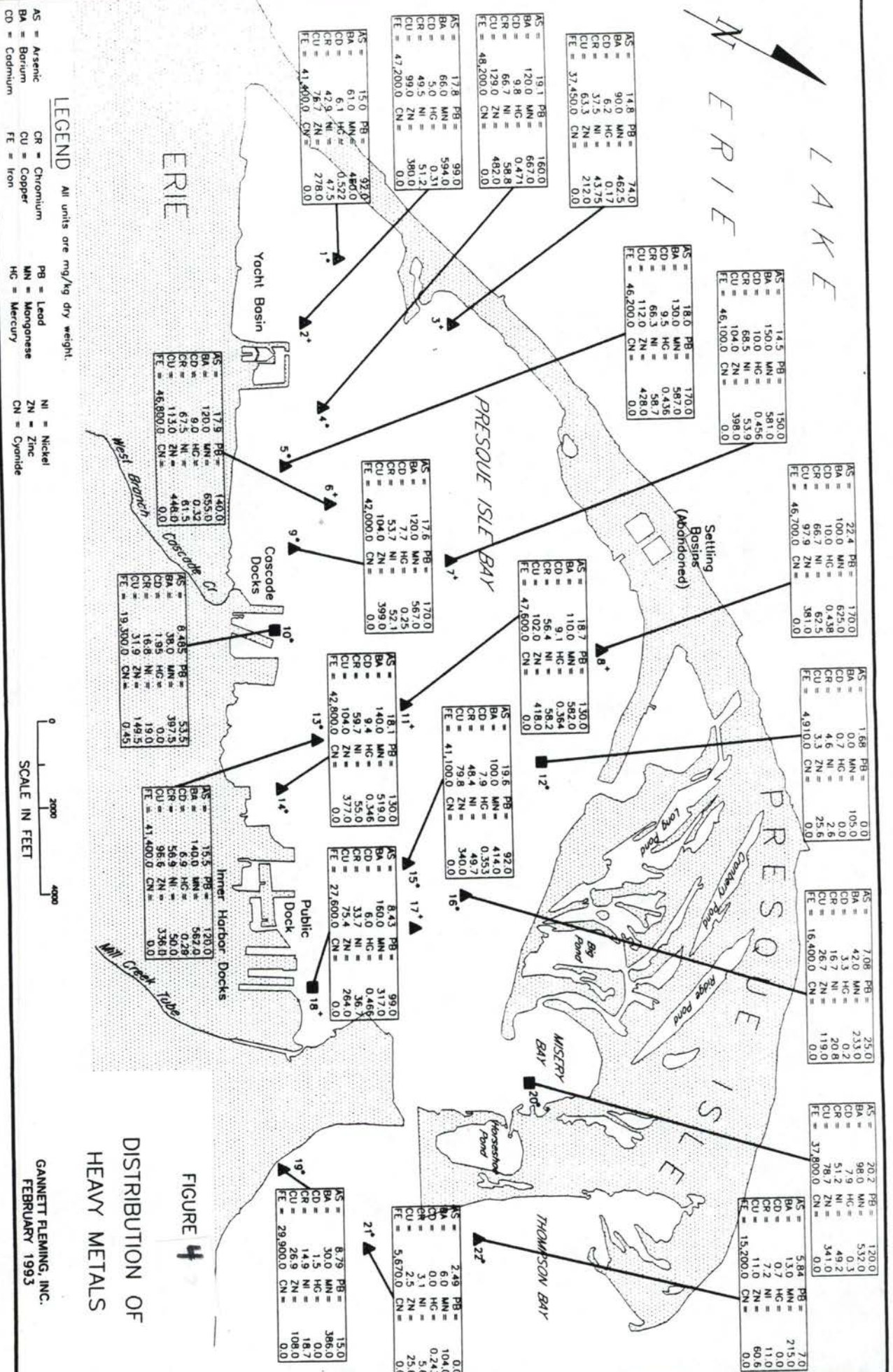








GANNETT FLEMING, INC.
 FEBRUARY 1993



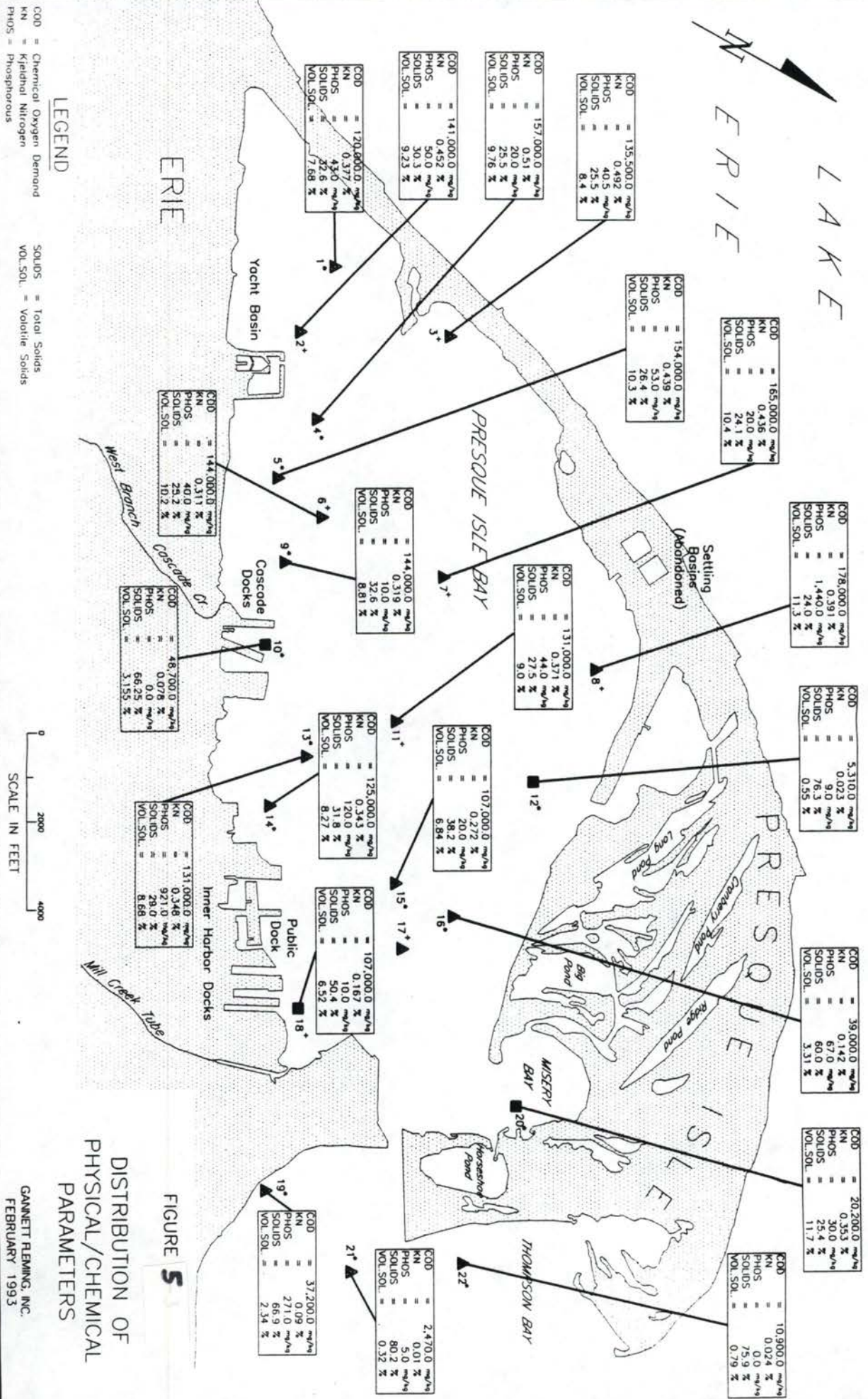


FIGURE 5

DISTRIBUTION OF
 PHYSICAL/CHEMICAL
 PARAMETERS

Figure 6: Locations of Bioassay Sampling Sites

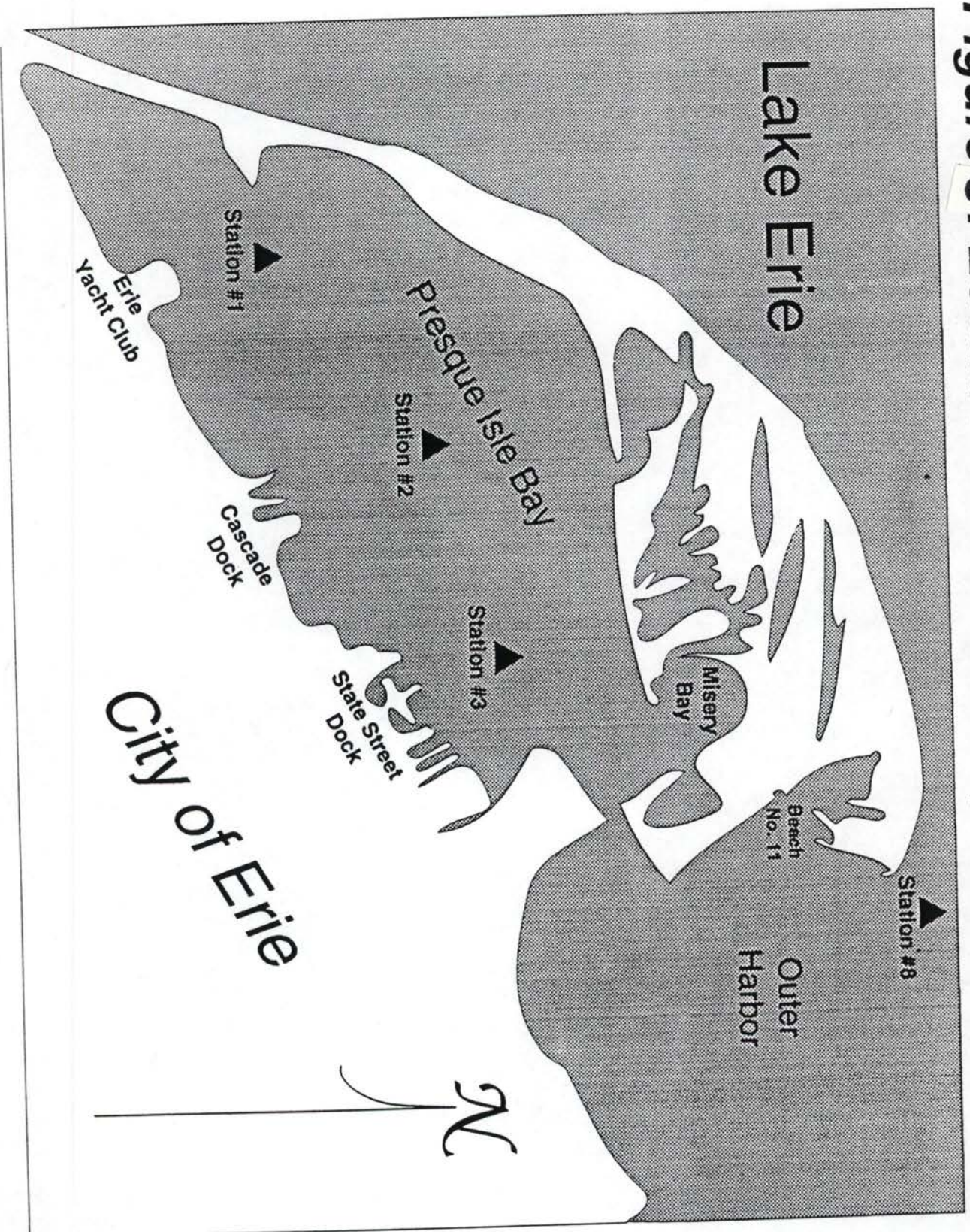


FIG 7. PRESQUE ISLE BAY SEDIMENT SAMPLING SITES 1993.

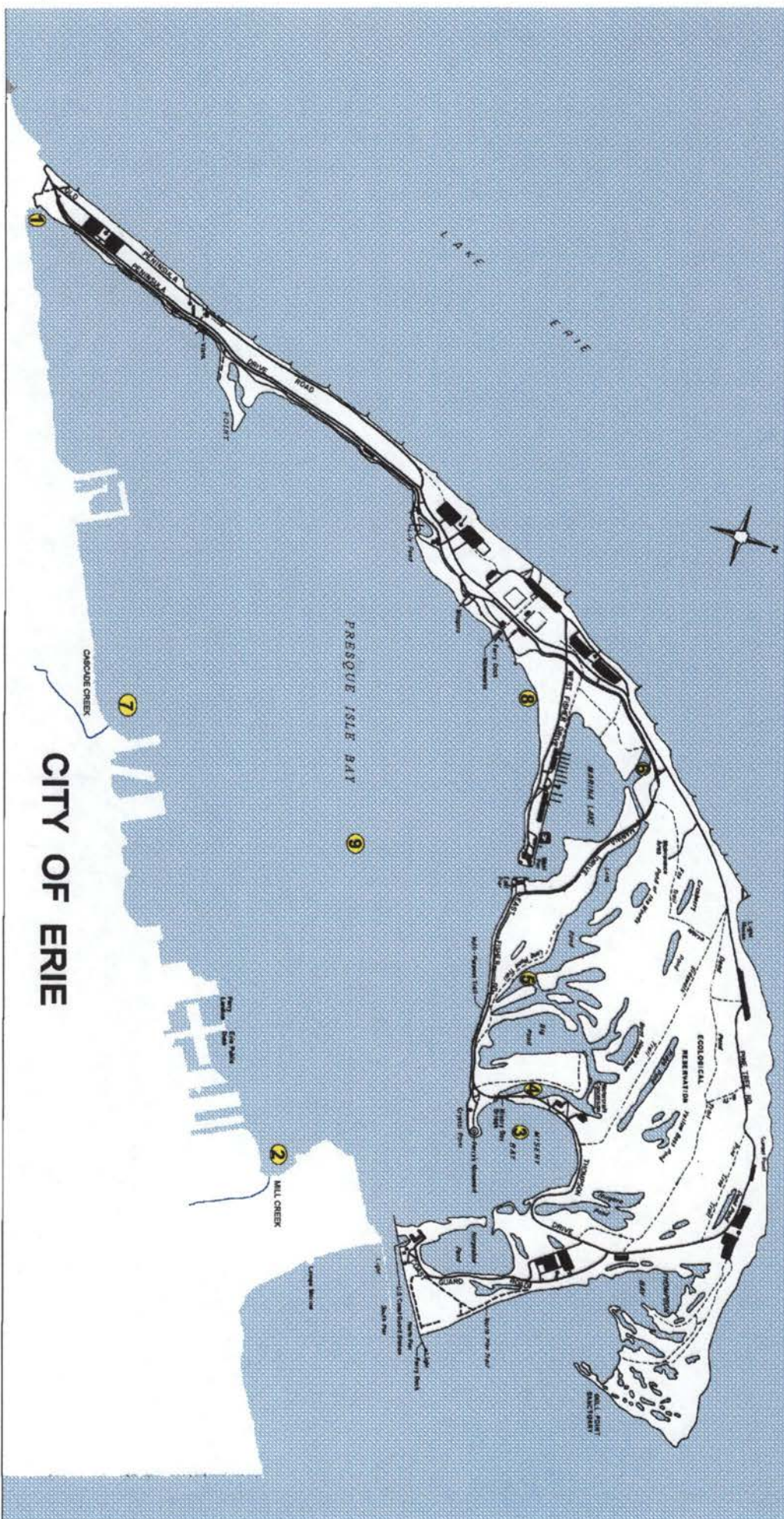


Table 1 Presque Isle Bay Brown Bullhead Bile Analyses Results for PAH Metabolites, Collected on May 4&5, 1992.

Sample No.	Collection Site	Length	Weight	Sex	(PAH Metabolites Ng/G)		
					Nap	Phen	BAP
1C (Clean)	Misery Bay	303mm	397g	-	39,000	10,000	<100
2C "	" "	307mm	426g	-	52,000	15,000	140
3C "	" "	333mm	483g	-	34,000	9,700	<100
1A (Tumored)	Point	360mm	795g	-	*110,000	33,000	260
2A "	"	345mm	568g	M	94,000	27,000	190
3A "	"	355mm	454g	-	88,000	23,000	220
4A "	"	301mm	312g	-	*190,000	57,000	*550
5A "	"	345mm	511g	-	84,000	40,000	210
6A "	"	304mm	256g	F	59,000	18,000	210
7A "	"	307mm	312g	M	69,000	23,000	190
8A "	"	330mm	454g	M	74,000	27,000	200
9A "	"	317mm	426g	M	70,000	22,000	140
10A (Severe Tumors)	Lagoons	360mm	540g	-	*120,000	37,000	230
11A (Tumored)	"	293mm	284g	-	*130,000	78,000	*420
12A "	"	310mm	369g	F	86,000	37,000	220
13A "	"	318mm	398g	-	*130,000	38,000	270
14A "	"	340mm	511g	-	83,000	24,000	<100

* Capable of tumor promotion at this concentration.

Nap = Naphthalene

Phen = Phenanthrene

BAP = Benzo(a)pyrene

TABLE 2

VARIOUS SEDIMENT QUALITY CRITERIA OR GUIDELINES THAT ARE EXCEEDED
FOR CHEMICALS DETECTED IN SEDIMENT SAMPLES

PRESQUE ISLE BAY, ERIE, PENNSYLVANIA

Chemical/Analyte	EPA'S SQC (EPA, 1993)	EPA'S Threshold Concentration (EPA, 1985)	State of Washington SQCS ⁽³⁾	State of Washington SCS ⁽³⁾	ER-M Value (Long & Morgan, 1991) ⁽⁴⁾	ER-M Value (MacDonald, 1992)	AET Value (Long & Morgan, 1992) ⁽⁴⁾	EPA Disposal Criteria (EPA, 1977)
Benzo(a)anthracene	---	No	No	No	Yes	Yes	Yes	---
Benzo(a)pyrene	---	No	No	No	No	Yes	Yes	---
Benzo(b)fluoranthene	---	---	---	---	---	---	---	---
Benzo(g,h,i)perylene	---	---	Yes	Yes	---	---	---	---
Chrysene	---	No	Yes	No	No	No	Yes	---
Fluoranthene	No	---	Yes	No	Yes	No	Yes	---
Indeno(1,2,3-cd)pyrene	---	No	Yes	Yes	---	---	---	---
Phenanthrene	No	No	Yes	No	Yes	Yes	Yes	---
Pyrene	---	No	No	No	Yes	Yes	Yes	---
Total PAHs	---	---	---	---	No	No	Yes	---
Bis(2-ethylhexyl)phthalate	---	---	Yes	Yes	---	---	---	---
Di-n-octyl phthalate	---	---	No	No	---	---	---	---
Arsenic, total	---	No	No	No	No	No	No	Yes ⁽¹⁾
Barium, total	---	---	---	---	---	---	---	Yes ⁽¹⁾
Cadmium, total	---	No	Yes	Yes	Yes	Yes	Yes	Yes ⁽¹⁾
Chromium, total	---	Yes	No	No	No	No	---	Yes ⁽²⁾
COD on solid sample	---	---	---	---	---	---	---	Yes ⁽¹⁾
Copper, total	---	No	No	No	No	No	No	Yes ⁽¹⁾
Cyanide, total	---	Yes	---	---	---	---	---	Yes ⁽¹⁾

TABLE 2 (cont)

VARIOUS SEDIMENT QUALITY CRITERIA OR GUIDELINES THAT ARE EXCEEDED
FOR CHEMICALS DETECTED IN SEDIMENT SAMPLES

PRESQUE ISLE BAY, ERIE, PENNSYLVANIA
(Continued)

Chemical/Analyte	EPA'S SQC (EPA, 1993)	EPA'S Threshold Concentration (EPA, 1985)	State of Washington SQC ⁽³⁾	State of Washington SCS ⁽³⁾	ER-M Value (Long & Morgan, 1991) ⁽⁴⁾	ER-M Value (MacDonald, 1992)	AET Value (Long & Morgan, 1992) ⁽⁴⁾	EPA Disposal Criteria (EPA, 1977)
Iron, total	---	---	---	---	---	---	---	Yes ⁽¹⁾
Kjeldahl Nitrogen, total	---	---	---	---	---	---	---	Yes ⁽¹⁾
Lead, total	---	Yes	No	No	Yes	No	No	Yes ⁽¹⁾
Manganese, total	---	---	---	---	---	---	---	Yes ⁽¹⁾
Nickel	---	Yes	---	---	Yes	Yes	---	Yes ⁽¹⁾
Oil and Grease	---	---	---	---	---	---	---	Yes ⁽¹⁾
Phosphorus, total	---	---	---	---	---	---	---	Yes ⁽¹⁾
Solids, total	---	---	---	---	---	---	---	---
Solids, total volatile	---	---	---	---	---	---	---	Yes ⁽¹⁾
Total Organic Carbon	---	---	---	---	---	---	---	---
Total Organic Halogen	---	---	---	---	---	---	---	---
Zinc, total	---	No	Yes	No	Yes	Yes	Yes	Yes ⁽¹⁾
Mercury, total	---	No	Yes	No	No	No	No	No

--- = Not Available

(1) = Exceeds guideline for heavily polluted sediments (EPA, 1977).

(2) = Exceeds guideline for moderately polluted sediments (EPA, 1977).

(3) = Source: Ginn and Pastorok, 1992

(4) = Source: EPA 1992__

Table 3. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 1.

Description	Dates Sampled									
	5/4	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	15.2	12.9	19.1	21.2	27.8	24.6	23.3	22.3	18.8	13.0
pH	7.4	7.8	7.4	7.4	7.8	7.7	7.9	7.7	6.6	6.9
DO	8.1	11.2	12.5	12.4	7.2	10.4	6.9	2.1	2.7	7.6
Sp Cond	355	375	385	405	310	350	317	373	390	385
(WQ Chem)										
AS ug/l	< 4.0	< 4.0	< 4.0	<100.0	<100.0	<100.0	<100.	-	<100.	<100.0
BA "	500.0	111.0	44.0	55.0	51.0	57.0	40.0	-	76.0	59.0
CD "	< 0.2	< 10.0	<10.0	14.0	< 10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
CR "	< 4.0	< 50.0	<50.0	< 50.0	< 50.0	< 50.0	<50.0	<50.0	<50.0	< 50.0
CU "	< 50.0	< 10.0	<10.0	53.0	< 10.0	< 10.0	68.0	<10.0	<10.0	< 10.0
FE "	871.0	1660.0	908.0	1210.0	523.0	866.0	265.0	497.0	1760.	253.0
PB "	< 4.0	< 50.0	<50.0	50.0	< 50.0	< 50.0	<50.0	<50.0	<50.0	126.0
MN "	111.0	169.0	141.0	143.0	153.0	80.0	52.0	131.0	463.0	< 50.0
NI "	< 50.0	< 25.0	<25.0	43.0	27.0	25.0	<25.0	<25.0	<25.0	< 50.0
ZN "	12.0	16.0	<10.0	< 10.0	< 10.0	16.0	<10.0	20.0	21.0	< 10.0
AL "	483.0	855.0	250.0	590.0	207.0	390.0	<135.0	157.0	709.0	205.0
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	-	<1.0	<1.0
(Sed Chem)										
AS MG/KG	15.4	19.2	< 2.0	70.9	12.2	16.5	12.0	15.2		<3.0
BA "	63.0	80.0	72.0	65.0	53.0	65.0	80.0	73.0		88.0
CD MG/K	< 2.6	< 3.0	< 2.7	< 2.5	< 2.2	< 2.6	< 2.9	< 2.5		<2.7
CR "	28.5	28.7	28.9	28.4	25.9	26.7	38.9	34.7		30.8
CU "	56.0	68.0	68.2	61.6	48.0	59.6	72.3	67.8		70.2
FE "	28000.0	29500.	29700.	28100.	23900.	30900.	35400.	31400.		30300.
PB "	61.0	86.3	67.0	63.0	61.5	71.9	72.0	69.0		71.8
MN "	786.0	987.0	960.0	778.0	608.0	902.0	1020.0	97.2		973.0
NI "	43.0	38.7	17.0	15.0	18.1	24.0	25.0	20.0		23.0
ZN MG/KG	190.0	215.0	202.0	191.0	162.0	200.0	243.0	24.3		239.0
AL "	10100.0	9840.0	9970.0	9830.0	8640.0	9810.	13400.	11500.		10500.
HG "	0.21	0.162	<0.1	0.164	< 0.1	0.153	0.132	0.127		0.149
(Nitrosamines)										
NDMA ug/kg				92.	600.	0.0	0.0	0.0	3360.	
NDPA "					18.	0.0	368.0	39.8	74.0	

Table 4. Water Quality and Sediment Chemical Results for Presque Isle Bay Nitrosamine Sampling, 1993, Station No 2.

Description	Dates Sampled									
	4/29	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	10.3	13.5	16.7	21.3	24.2	24.4	23.0	24.3	21.9	12.7
pH	7.7	7.8	7.5	7.6	7.6	7.5	7.7	8.0	7.2	7.4
DO	10.8	9.9	9.0	7.4	8.0	6.8	6.5	7.2	7.9	10.7
Sp Cond	321.0	308.0	315.0	308.0	299.0	296.0	325.0	299.0	290.0	288.0
(WQ Chem)										
AS ug/l	< 4.0	< 4.0	< 4.0	<100.0	<100.0	<100.0	<100.	-	<100.	<100.0
BA "	26.0	24.0	43.0	33.0	23.0	27.0	28.0	-	30.0	28.0
CD "	< 10.0	<10.0	< 10.0	13.0	< 10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
CR "	< 50.0	<50.0	< 50.0	< 50.0	< 50.0	< 50.0	<50.0	<50.0	<50.0	< 50.0
CU "	< 10.0	<10.0	10.0	31.0	< 10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
FE "	136.0	65.0	1780.0	440.0	285.0	124.0	266.0	379.0	745.0	87.0
PB "	< 50.0	<50.0	< 50.0	50.0	< 50.0	64.0	<50.0	<50.0	<50.0	121.0
MN "	16.0	15.0	42.0	24.0	20.0	23.0	45.0	50.0	35.0	10.0
NI "	< 25.0	<25.0	< 25.0	45.0	< 25.0	< 25.0	<25.0	<25.0	<25.0	< 25.0
ZN "	< 10.0	11.0	28.0	< 10.0	10.0	< 10.0	10.0	22.0	19.0	< 10.0
AL "	135.0	135.0	1070.0	347.0	172.0	135.0	<135.0	312.0	307.0	158.0
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	<1.0	< 1.0
(Sed Chem)										
AS MG/KG	2.5	19.1	< 1.0	3.0	1.5	3.9	2.5	4.0	3.1	2.0
BA "	24.6	101.0	16.0	52.0	19.5	28.0	56.0	44.0	58.2	16.0
CD MG/K <	1.4	3.2	< 1.3	1.8	< 1.4	< 1.4	< 1.8	< 1.4	< 1.6	<1.3
CR "	9.8	39.6	6.0	12.2	5.3	11.0	17.0	11.2	14.2	5.5
CU "	14.8	72.0	8.5	29.5	8.5	14.5	28.5	21.5	27.8	7.6
FE "	7380.	30000.	5410.	8980.	4240.	10200.	12000.	8790.	10300.	5300.
PB "	23.5	122.0	15.0	46.2	14.0	30.0	50.0	33.0	42.6	23.0
MN "	100.0	624.0	68.8	109.0	52.4	121.0	150.0	120.0	168.0	74.8
NI "	12.0	52.9	6.0	8.7	6.3	9.4	14.0	11.0	12.0	7.8
ZN MG/KG	59.2	283.0	45.0	95.4	41.1	81.0	122.0	92.9	121.0	46.4
AL "	2490.	11800.	1720.	2920.	1520.	3010.	4210.	3180.	4020.	1780.
HG "	< 1.0	0.291	0.296	0.227	<0.1	0.121	0.106	0.113	0.18	<0.1
(Nitrosamines)										
NDMA ug/kg				0.0	1080.	0.0	0.0	0.0	5144.	
NDPA "				0.0	0.0	0.0	337.8	21.0	56.0	

Table 5. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 3.

Description	Dates Sampled									
	4/29	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	9.9	14.1	17.4	23.0	26.1	25.1	24.5	24.1	21.8	12.9
pH	7.6	7.8	7.5	7.6	8.9	8.1	8.5	8.3	7.8	7.8
DO	10.3	9.4	7.3	5.9	10.1	8.0	6.4	7.1	9.1	12.2
Sp Cond	318	311	296	289	270	270	270	262	252	282
(WQ Chem)										
AS ug/l	< 4.0	< 4.0	< 4.0	<100.0	<100.0	<100.0	<100.0	-	<100.0	<100.0
BA "	27.0	28.0	32.0	25.0	18.0	28.0	29.0	-	27.0	32.0
CD "	< 10.0	< 10.0	<10.0	< 10.0	<10.0	< 10.0	<10.0	<10.0	15.0	10.0
CR "	< 50.0	< 50.0	<50.0	< 50.0	<50.0	< 50.0	<50.0	<50.0	<50.0	< 50.0
CU "	< 10.0	< 10.0	<10.0	12.0	<10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
FE "	355.0	466.0	469.0	128.0	231.0	541.0	927.0	1060.0	427.0	742.0
PB "	< 50.0	< 50.0	<50.0	53.0	<50.0	< 50.0	<50.0	<50.0	<50.0	81.0
MN "	46.0	30.0	111.0	28.0	48.0	60.0	100.0	116.0	33.0	36.0
NI "	< 25.0	< 25.0	<25.0	< 25.0	26.0	< 25.0	<25.0	<25.0	<25.0	< 25.0
ZN "	< 10.0	10.0	<10.0	11.0	<10.0	< 10.0	20.0	24.0	<10.0	10.0
AL "	252.0	592.0	221.0	135.0	137.0	229.0	385.0	521.0	<135.0	518.0
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	-	<1.0	< 1.0
(Sed Chem)										
AS MG/KG	4.7	3.7	17.9	11.2	20.3	19.5	11.1	22.9	17.2	10.0
BA "	23.0	15.0	93.0	57.0	95.0	90.0	87.0	102.0	83.0	51.0
CD MG/K	< 1.8	< 1.4	6.6	3.8	7.6	8.3	5.0	7.8	6.9	4.6
CR "	9.9	6.3	47.0	30.0	55.4	49.8	42.8	54.2	47.5	25.4
CU "	11.0	8.8	69.1	38.4	83.3	74.4	54.2	78.6	64.0	35.9
FE "	7880.	5990.	26900.	17100.	36700	34500	26300	35700	29500	16100
PB "	21.0	<14.0	93.9	69.6	123.0	116.0	95.8	104.0	93.6	66.0
MN "	120.0	83.4	415.0	281.0	563.0	531.0	447.0	654.0	468.0	265.0
NI "	16.0	13.2	27.6	18.0	40.7	36.8	32.0	37.0	34.8	26.0
ZN MG/KG	64.1	61.0	260.0	178.0	336.0	309.0	234.0	319.0	286.0	183.0
AL "	2330.	1940.	10200.	6650.	13100.	11900.	9580.	11400	10200.	5350.
HG "	< 0.1	<0.1	< 0.284	0.445	0.52	0.571	0.419	0.527	0.532	0.254
(Nitrosamines)										
NDMA ug/kg				2500.	1620.	2000.	0.0	0.0	26240.	
NDPA "				0.	24.	0.	349.8	0.0	304.0	

Table 6. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 4.

Description	Dates Sampled									
	5/4	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	13.6	14.4	18.3	23.5	26.4	25.5	24.4	24.5	21.8	12.9
pH	7.6	7.7	7.3	7.7	8.6	8.2	8.2	7.6	7.5	7.3
DO	9.9	9.4	7.8	7.3	9.3	9.1	7.7	6.7	8.3	10.1
Sp Cond	315.	309.	297.	287.	275.	271.	272.	267.	257.	280.
(WQ Chem)										
AS ug/l	< 4.0	< 4.0	< 4.0	<100.	<100.0	<100.0		-	<100.	<100.0
BA "	<500.0	27.0	32.0	27.0	21.0	26.0		-	27.0	32.0
CD "	< 0.2	< 10.0	< 10.0	<10.0	< 10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
CR "	< 4.0	< 50.0	< 50.0	<50.0	< 50.0	< 50.0	<50.0	<50.0	<50.0	< 50.0
CU "	50.0	< 10.0	< 10.0	<10.0	< 10.0	< 10.0	<10.0	<10.0	<10.0	< 10.0
FE "	275.0	293.0	658.0	280.0	312.0	762.0	660.0	165.0	240.0	
PB "	< 4.0	< 50.0	< 50.0	<50.0	< 50.0	< 50.0	<50.0	<50.0	67.0	
MN "	< 50.0	65.0	69.0	60.0	59.0	111.0	49.0	23.0	19.0	
NI "	< 50.0	< 25.0	< 25.0	<25.0	26.0	< 25.0	<25.0	<25.0	< 25.0	
ZN "	< 10.0	< 10.0	< 10.0	<10.0	< 10.0	< 10.0	<10.0	25.0	10.0	
AL "	189.0	<135.0	<135.0	101.0	<135.0	<135.0	<135.0	<135.0	<135.0	<135.0
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	<1.0	< 1.0	
(Sed Chem)										
AS MG/KG	6.5	9.7	9.7	7.7	7.2	5.7	3.9	7.4	3.7	7.8
BA "	9.6	9.4	14.0	7.59	< 7.0	< 7.2	7.7	11.0	9.0	8.0
CD MG/K	< 1.4	< 1.5	< 1.6	< 1.8	< 1.4	< 1.4	< 1.5	< 1.4	< 1.4	<1.4
CR "	5.1	1.5	7.3	5.46	2.9	4.0	5.1	5.0	4.4	4.0
CU "	3.2	< 3.6	6.9	3.34	< 3.6	< 3.6	< 3.9	3.6	< 3.5	<3.6
FE "	5610.0	1830.0	9160.0	6950.	4660.	5860.	7170.	6690.	5710.	6180.
PB "	< 14.0	< 15.0	< 16.0	10.6	<14.0	< 14.0	<15.0	< 14.0	< 14.0	<14.0
MN "	80.9	32.9	140.0	95.1	88.9	92.3	109.0	109.0	71.4	124.0
NI "	9.5	< 5.8	< 6.2	2.0	< 5.8	< 5.7	< 6.2	< 5.5	< 5.5	6.9
ZN MG/KG	22.7	8.1	37.1	31.1	18.0	28.2	23.4	26.3	22.6	23.0
AL "	1490.0	465.0	2060.0	1520.	1320.	1370.	1630.	1750.	1440.	1280.
HG "	0.122	< 0.1	< 0.1	< 0.1	< 0.1	0.015	<0.1	< 0.1	< 0.1	<0.1
(Nitrosamines)										
NDMA ug/kg				2500.	1620.	2000.	0.0	0.	12926.	
NDPA "				0.	24.	0.	311.2	0.	268.0	

Table 7. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 5.

Description	Dates Sampled									
	4/29	5/19	6/8	6/22	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	12.9	14.6	20.0	24.6	28.2	25.8	24.6	23.6	21.9	15.7
pH	7.4	7.3	7.3	7.2	7.9	7.7	7.8	7.5	6.8	6.9
DO	9.9	6.0	7.2	4.0	5.9	6.8	5.5	3.2	5.9	7.7
Sp Cond	293	315	299	291	294	297	289	289	274	291
(WQ Chem)										
AS ug/l	7.95	< 4.0	< 6.33	<100	<100.0	<100	<100.0	-	<100.	<100.
BA "	34.0	29.0	38.0	73.0	29.0	33.0	44.0	-	39.0	36.0
CD "	< 10.0	< 10.0	< 10.0	<10.0	< 10.0	<10.0	<10.0	<10.0	<10.0	< 10.0
CR "	< 50.0	< 50.0	< 50.0	<50.0	< 50.0	<50.0	<50.0	<50.0	<50.0	< 50.0
CU "	< 10.0	10.0	< 10.0	28.0	14.0	<10.0	<10.0	<10.0	<10.0	< 10.0
FE "	1600.	455.	1380.	16700.	583.0	1530.	4290.0	2150.0	1380.0	624.
PB "	< 50.0	< 50.0	< 50.0	<50.0	< 50.0	<50.0	<50.0	<50.0	<50.0	71.0
MN "	68.0	108.0	119.0	395.0	68.0	122.0	141.0	252.0	88.0	35.0
NI "	< 25.0	< 25.0	< 25.0	<25.0	< 25.0	<25.0	<25.0	<25.0	<25.0	< 25.0
ZN "	< 10.0	10.0	< 10.0	106.0	< 10.0	<10.0	14.0	14.0	<10.0	< 10.0
AL "	304.0	238.0	201.0	2940.	<135.	<135.	625.0	140.0	148.0	153.
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		<1.0	-	<1.0	< 1.0
(Sed Chem)										
AS MG/KG	104.2	20.1	97.5	125.8	114.3	110.4	85.9	111.9	126.5	101.0
BA "	124.0	57.0	110.0	125.0	118.0	110.0	100.0	124.0	130.0	120.0
CD MG/K	< 12.0	3.5	< 10.0	<10.0	<11.0	<12.0	<11.0	< 8.3	< 8.7	<12.0
CR "	55.0	30.0	37.0	42.0	37.8	40.0	40.2	38.1	43.3	42.0
CU "	65.0	39.0	68.0	66.0	70.0	60.0	57.0	55.0	64.6	76.0
FE "	62000.	19800.	51300.	62400.	57300.	58200.	57300.	53600.	61300.	59600.
PB "	151.0	57.0	122.0	176.0	130.0	<120.0	<110.0	87.0	114.0	170.0
MN "	723.0	337.0	747.0	916.0	830.0	875.0	798.0	813.0	977.0	831.0
NI "	55.0	35.0	<41.0	<38.0	<11.0	<50.0	<45.0	<33.0	<35.0	<48.0
ZN MG/KG	259.0	188.0	194.0	250.0	239.0	231.0	237.0	222.0	241.0	257.0
AL "	9700.	7350.	7120.	9490.	15600.	7940.	7850.	7460.	8460.0	8700.0
HG "	0.356	0.281	0.122	0.472	0.368	0.556	0.511	0.463	0.529	0.443
(Nitrosamines)										
NDMA ug/kg				0.0	0.0	1400.	0.0	0.0	0.0	
NDPA "				0.0	22.0	0.0	298.2	0.0	534.0	

Table 8. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 6.

Description	Dates Sampled									
	5/4	5/19	6/8	6/22	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	15.2	14.9	19.0	22.9	27.5	24.4	23.6	23.5	20.5	14.8
pH	7.6	7.5	7.3	7.4	8.2	7.4	7.8	7.5	7.6	7.1
DO	9.5	9.1	7.0	6.1	7.7	5.0	5.1	6.0	12.5	9.4
Sp Cond	310	317	303	300	296	300	296	295	271	299
(WQ Chem)										
AS ug/l	5.8	< 4.0	<100.0	<100	<100	<100	<100.0	-	<100.	<100
BA "	< 500.0	27.0	30.0	36.0	35.0	30.0	40.0	-	32.0	38.0
CD "	< 0.2	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
CR "	< 4.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
CU "	< 50.0	<10.0	<10.0	14.0	<10.0	<10.0	<10.0	<10.0	10.0	<10.0
FE "	1830.	264.	729.0	5680.	722.	784.	2280.0	1140.0	1430.0	449.0
PB "	< 4.0	<50.0	<50.0	63.0	<50.0	<50.0	<50.0	<50.0	<50.0	50.0
MN "	83.0	41.0	43.0	187.0	126.0	66.0	64.0	47.0	130.0	19.0
NI "	< 50.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
ZN "	< 10.0	<10.0	<10.0	23.0	19.0	<10.0	<10.0	13.0	<10.0	<10.0
AL "	330.0	<135.0	<135.0	825.0	135.0	<135.0	152.0	<135.0	<135.0	<135.0
HG "	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	-	<1.0	< 1.0
(Sed Chem)										
AS MG/KG	133.4	170.2	160.4	233.7	49.3	138.5	199.0	158.3	173.2	124.2
BA "	150.0	132.0	150.0	180.0	141.0	145.0	160.0	234.0	161.0	135.0
CD MG/K	8.0	< 8.0	< 9.4	< 7.5	< 7.8	6.9	< 7.0	9.0	< 8.5	8.1
CR "	42.0	40.4	42.0	45.0	50.0	38.1	48.2	51.0	53.0	38.0
CU "	62.0	55.9	75.0	62.0	68.8	59.6	45.4	76.0	69.0	59.0
FE "	79100.	78500.	81200.	113000.	86800.	92800.	117000.	95300.	110000.	85100
PB "	103.0	115.0	146.0	119.0	124.0	118.0	110.0	123.0	120.0	132.0
MN "	1800.	1730.	1730.	2460.	1830.	2020.	2440.	1900.	2310.	1840.
NI "	59.1	56.7	<38.0	<30.0	<31.0	<28.0	<30.0	<36.0	<34.0	<27.0
ZN MG/KG	215.0	198.0	209.0	227.0	219.0	219.0	196.0	249.0	246.0	200.0
AL "	7160.	6460.	7730.	6770.	7300.	6570.	5550.	7930.	8320.	7160.
HG "	0.358	0.294	<0.1	0.405	0.331	0.429	0.393	0.388	0.488	0.329
(Nitrosamines)										
NDMA ug/kg				4760.0	0.0	2000.0	0.0	0.0	0.0	
NDPA "				0.0	22.0	0.0	88.4	86.6	668.0	

Table 9. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 7.

Description	Dates Sampled									
	4/29	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	9.8	13.8	16.0	21.2	23.9	24.0	23.3	23.8	21.2	12.7
pH	7.5	7.4	7.5	7.9	7.7	7.9	8.0	7.8	7.5	756
DO	10.4	9.6	7.4	8.3	6.4	7.1	6.5	3.8	8.9	10.7
Sp Cond	322	308	309	422	294	322	303	402	306	284
(WQ Chem)										
AS ug/l	< 4.0	5.6	<100	<100	<100	<100	<100.0	-	<100.	<100
BA "	26.0	36.0	30.0	39.0	23.0	32.0	29.0	-	29.0	24.0
CD "	<10.0	<10.0	<10.0	13.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
CR "	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
CU "	<10.0	<10.0	10.0	42.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
FE "	169.0	1310.	335.0	982.0	126.0	831.0	368.0	313.0	192.0	79.0
PB "	<50.0	<50.0	<50.0	55.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
MN "	17.0	115.0	49.0	171.0	48.0	143.0	52.0	75.0	34.0	18.0
NI "	<25.0	<25.0	<25.0	48.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
ZN "	<10.0	11.0	17.0	<10.0	11.0	11.0	<10.0	28.0	<10.0	<10.0
AL "	179.0	156.0	218.0	616.0	<135.0	421.0	171.0	185.0	<135.0	<135.0
HG "	<1.0	<1.0	<1.0	6.87	<1.0	<1.0	<1.0	-	<1.0	<1.0
(Sed Chem)										
AS MG/KG	16.4	169.3	12.7	12.5	14.6	14.3	10.5	12.0	12.6	11.7
BA "	102.0	105.0	74.0	78.0	67.0	86.8	78.4	90.0	115.0	72.0
CD MG/K	3.8	<11.0	2.1	2.7	2.8	2.9	3.7	2.8	< 2.6	3.2
CR "	42.3	39.0	25.0	28.4	27.3	29.8	34.9	31.0	62.6	25.3
CU "	86.8	56.0	67.0	72.9	60.1	76.5	72.8	68.7	62.6	66.3
FE "	30700.	53600.	23100.	24700.	22900.	28900.	28300.	26400.	24400.	25100.
PB "	153.0	115.0	91.7	121.0	99.4	125.0	132.0	115.0	78.6	97.0
MN "	455.0	706.0	519.0	527.0	497.0	535.0	534.0	512.0	584.0	563.0
NI "	54.9	49.0	24.6	27.0	32.1	32.2	37.8	34.2	29.0	35.0
ZN MG/KG	290.0	239.0	231.0	219.0	219.0	269.0	274.0	247.0	245.0	234.0
AL "	11100.	8070.	7900.	8640.	7830.	9420.0	9800.0	8730.0	9250.0	7460.
HG "	0.308	0.413	0.145	0.27	0.161	0.264	0.623	0.208	0.253	0.195
(Nitrosamines)										
NDMA ug/kg				14.0	0.0	0.0	0.0	0.0	17858.	
NDPA "				0.0	0.0	0.0	0.0	0.0	708.0	

Table 10. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 8.

Description	Dates Sampled									
	4/29	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp		13.8	16.5	21.5	26.2	24.9	23.7	23.8	20.9	13.4
pH		7.9	7.7	8.3	8.9	8.6	8.5	8.7	7.8	7.6
DO		10.3	9.8	10.1	11.4	12.5	9.9	8.6	9.9	11.0
Sp Cond		310	306	289	257	267	278	279	272	284
(WQ Chem)										
AS ug/l	<4.0	< 4.0	<100	<100	<100	<100	<100.0	-	<100.	<100
BA "	26.0	23.0	25.0	21.0	19.0	22.0	24.0	-	27.0	25.0
CD "	<10.0	<10.0	-	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
CR "	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
CU "	<10.0	<10.0	<10.0	21.0	<10.0	<10.0	<10.0	<10.0	18.0	<10.0
FE "	281.0	36.0	36.0	165.0	25.0	77.0	66.0	58.0	220.0	73.0
PB "	<50.0	<50.0	<50.0	<50.0	<50.0	60.0	<50.0	<50.0	<50.0	<50.0
MN "	20.0	10.0	<10.0	30.0	<10.0	16.0	19.0	22.0	50.0	22.0
NI "	<25.0	<25.0	<25.0	25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
ZN "	<10.0	<10.0	<10.0	<10.0	<10.0	35.0	<10.0	<10.0	22.0	<10.0
AL "	264.0	<135.0	<135.0	<135.0	<135.0	<135.0	<135.0	<135.0	<135.0	<135.0
HG "	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0
(Sed Chem)										
AS MG/KG		5.0	2.0	2.6	3.3	2.7	2.4	3.4	3.2	2.9
BA "		<7.0	<7.0	<7.0	<6.9	<7.2	8.0	8.0	9.0	<6.8
CD MG/K		<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.3	<1.4
CR "		2.9	3.2	6.7	2.2	2.6	3.6	11.0	3.2	2.1
CU "		<3.4	<3.5	<3.5	<3.5	<3.6	<3.6	<3.4	<3.2	<6.8
FE "		3350.	1970.	2500.	2700.	2960.	3500.	2920.	3000.	2340.
PB "		5.6	<14.0	<14.0	<14.0	<14.0	<14.0	<14.0	<13.0	<14.0
MN "		52.0	33.3	51.0	66.8	49.9	76.0	45.0	46.7	61.7
NI "		9.9	<5.6	<5.5	5.5	<5.8	<5.7	<5.5	<5.2	7.5
ZN MG/KG		565.0	14.0	14.0	16.6	15.1	18.1	15.0	15.9	15.8
AL "		1020.0	671.0	833.0	865.0	857.0	1170.0	1110.0	1070.0	916.0
HG "		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
(Nitrosamines)										
NDMA ug/kg				2940.0	0.0	1600.0	0.0	0.0	15268.	
NDPA "				0.0	52.0	8.0	105.0	117.8	1102.0	

Table 11. Water Quality and Sediment Chemical Results for Presque Isle Bay
Nitrosamine Sampling, 1993, Station No. 9.

Description	Dates Sampled									
	4/29	5/19	6/8	6/24	7/6	7/21	8/12	8/24	9/9	10/7
(Field)										
Water Temp	8.4	14.0	14.2	21.4	21.1	24.5	23.0	24.0	21.8	12.5
pH	7.5	7.5	7.4	7.8	8.0	7.7	8.1	8.2	7.5	7.4
DO	10.8	10.0	8.2	8.5	7.6	7.9	6.7	7.2	9.0	11.0
Sp Cond	325	307	296	296	277	289	295	287	281	281
(WQ Chem)										
AS ug/l	<4.0	<4.0	<100	<100	<100	<100.0	<100.0	-	<100.	<100
BA "	26.0	24.0	28.0	22.0	24.0	27.0	30.0	-	27.0	32.0
CD "	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	17.0	<10.0	<10.0
CR "	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
CU "	<10.0	<10.0	<10.0	25.0	14.0	<10.0	<10.0	<10.0	11.0	12.0
FE "	281.0	179.0	172.0	144.0	76.0	938.0	978.0	677.0	313.0	1640.0
PB "	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
MN "	20.0	15.0	23.0	19.0	19.0	53.0	67.0	98.0	30.0	72.0
NI "	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
ZN "	<10.0	<10.0	<10.0	22.0	<10.0	<10.0	12.0	<10.0	17.0	28.0
AL "	264.0	210.0	146.0	212.0	166.0	590.0	726.0	424.0	<135.0	1220.0
HG "	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0
(Sed Chem)										
AS MG/KG	17.8	30.0	15.3	17.3	17.4	17.3	12.7	18.7	16.7	15.7
BA "	138.0	158.0	163.0	146.0	134.0	141.0	158.0	139.0	155.0	128.0
CD MG/K	10.0	7.5	9.3	8.6	8.5	8.9	9.8	8.5	8.9	9.9
CR "	81.5	69.4	60.0	71.6	64.0	62.1	73.3	59.2	64.4	75.0
CU "	115.0	97.4	92.7	105.0	102.0	95.1	105.0	87.5	97.8	102.0
FE "	42200.	41800.	33700.	42000.	41600.	38100.	42500.	33700.	38900.	36200.
PB "	182.0	151.0	130.0	161.0	156.0	141.0	167.0	110.0	123.0	183.0
MN "	589.0	8750.	570.0	611.0	796.0	4330.0	665.0	551.0	585.0	551.0
NI "	74.9	74.1	43.6	46.9	44.0	51.0	55.6	50.4	56.0	50.6
ZN MG/KG	415.0	398.0	344.0	405.0	356.0	350.0	387.0	353.0	365.0	420.0
AL "	17700.	18100.	13500.	19100.	17400.	16500.	21800.	13500.	16700.	15400.
HG "	0.676	0.489	0.351	0.546	0.561	0.616	0.658	0.566	0.767	0.964
(Nitrosamines)										
NDMA ug/kg				5540.	6.0	960.0	0.0	0.0	17626.	
NDPA "				0.0	24.0	0.0	86.8	278.2	736.0	

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107-4431
Jun 21, 1993

RECEIVED

JUN 23 1993

ENVIRONMENTAL RESOURCES
MEADVILLE REGIONAL OFFICE

Mr. James D. Rozakis
Assistant Regional Director
Pennsylvania Department of Environmental Resources
1012 Water Street
Meadville, PA 16835

Dear Mr. Rozakis:

The Environmental Protection Agency Region III (EPA) has reviewed the Presque Isle Bay Remedial Action Plan (RAP) which you submitted on January 15, 1993. The RAP was prepared as a result of the United States Department of State designation on January 30, 1991, of Presque Isle Bay as the 43rd Area of Concern (AOC) under the Great Lakes Water Quality Agreement. The Great Lakes Critical Programs Act of 1990 (GLCPA) required the RAP to be submitted to EPA within two years of designation. This statutory requirement has been satisfied, and we believe the RAP is generally ready to be submitted to the International Joint Commission (IJC) for its review.

We believe the RAP is a very well written, comprehensive plan to identify and in certain cases alleviate the pollution and resulting environmental impacts in Presque Isle Bay. We recognize there is a lack of data to adequately define several of the uses which could be or are impaired and several studies are ongoing which will fill in some of the data gaps. As you indicated in your letter of submittal, we expect the RAP to be a living document with periodic additions and revisions as resources allow studies to be completed and remedial actions undertaken.

Various members of our staff and the Great Lakes National Program Center (GLNRC) have reviewed the RAP and have several comments and suggestions which are enclosed. Some questions regarding use impairments are raised due in part to a lack of information to fully define the cause, or degree of possible impairment. In a few cases, additional or different types of studies are suggested. If you are interested, we can attempt to get the reviewer to more specifically define his suggestion. Most of the questions raised concerning the use impairments should be addressed in future editions of the RAP.

Under the GLCPA the RAP must be submitted to the International Joint Commission (IJC) no later than six months after submittal to EPA. You should proceed to submit the RAP to the IJC at your convenience, but no later than July 15, 1993.

The GLCPA also requires that the Commonwealth include the RAP in the State water quality plan no later than one year after submitting it to the IJC.

If you have any questions concerning our comments on the RAP, please contact me. I can be reached at (215) 597-9096.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chuck Sapp".

Charles W. Sapp
Great Lakes Coordinator

Enclosure

CC: Evelyn MacKnight (3WM12)
Victoria P. Binetti (3WM10)
Chris Grundler (GLNPO)

**PRESQUE ISLE BAY
REMEDIAL ACTION PLAN
US ENVIRONMENTAL PROTECTION AGENCY
REGION III REVIEWERS' COMMENTS
JUNE 21, 1993**

USE IMPAIRMENTS

1. Guideline #1 - Fish and Wildlife Consumption should be considered impaired. The RAP, through its evaluation of impaired beneficial uses, appears to contradict the Pennsylvania Fish Commission which in its latest fish consumption advisory listed chlordane and PCBs as reasons for limiting Lake Erie fish consumption. Although no differences are noted between Lake Erie and PIB fish, and the two pollutants are not listed as pollutants of concern in PIB, the sweeping conclusion that no impairment is noted in PIB may not be valid. Source evaluations in the food chain may be a better method of pinpointing bio-accumulation and magnification pathways. As long as Pennsylvania has an advisory in place in Erie County including the PIB, the Fish and Wildlife Consumption use should be listed as impaired.

Most of the fish tissue data indicated higher levels of PCBs outside of PIB, but there was very little data on bottom feeders inside the PIB. Even the 1992 data showed no detectable levels in yellow perch from the PIB, however, channel catfish from the mouth of Sixmile Creek had levels over 4 ppm. Additional data on bottom feeders from PIB may be needed.

2. The RAP underestimates the effects of the millions of cubic yards of organic, metal laden muck that has been deposited on the bay bottom as a result of anthropogenic activity in the watershed. The muck limits the benthic fish and macroinvertebrate species that can inhabit the majority of the bay. Undoubtedly, the bottom dwelling community would be quite different if the substrate in the bay was sand and/or other glacially deposited materials. As a result of the apparent destruction of the natural substrate, guidelines #3 - Fish and Wildlife Populations, #6 - Degradation of Benthos, and #14 - Loss of Fish and Wildlife Habitat should be designated as impaired.

The alteration to the substrate may have also been affected by upstream erosion of shales, coupled with the energy dynamics of the system, i.e., tributaries entering the Bay lose energy and deposit their loads of eroded shale. To accurately identify the sources contributing to the altered substrata cores would need to be taken and dated in order to determine if the artificial substrata is pre- or post-anthropogenic in origin or a combination of the two. This point may be moot, however, due to the scale of the

impairment and the unlikelihood of any remedial activities occurring besides natural recovery.

3. Guideline #6 - Degradation of Benthos - Impairment is unknown due to lack of data, but would be suspected due to sediment contamination problems. Part of the goal of a Stage I RAP is to identify data gaps and areas that require further study. By identifying these needs, resources can be brought to bear, and this new information can be fed back into the RAP process to address data gaps and to drive remedial options to be recommended in the Stage II document. Sediment contamination in other Areas of Concern (AOCs) often contributes to and/or causes degradation of benthos. A lack of data is not a sufficient reason to determine an impairment does not exist. This is the antithesis of the RAP process. The Stage II document should be flexible enough to incorporate changes in remedial activities and resource allocation based upon new findings. This has been one of the reasons for the lag time in the issuance of Stage II RAPs in some other AOCs.
4. In addressing guideline #8 - Eutrophication, the RAP summary stated "No significant, current cultural eutrophication problems are identified; no impairment is indicated." We believe that the trophic status of the bay is primarily a result of past, not "current cultural" activities. As a result of a 1990 study of the trophic status of Presque Isle Bay, Eric Obert, PADER, Meadville Regional Office, in a 1991 report classified the bay as "mesotrophic/eutrophic." Other measures that indicate excessive enrichment are the more than ample fish population (as compared to oligotrophic communities) and the wide expanse of aquatic macrophytes in the littoral zone of the bay. In a shallow system, such as Presque Isle Bay, with deep light penetration, it is likely that the presence of macrophytes and large fish populations is a natural, expected and desirable outcome. We agree with Mr. Rozakis's statement that Presque Isle Bay probably always has been mesotrophic at best. There does not appear to be a eutrophication problem in the classic sense, i.e., blue-green algal blooms. In the western basin of Lake Erie, zebra mussels are filtering the water, leading to the return of macrophytes and associated fish population growth. EPA concurs that there is little evidence of eutrophication caused by human activities and beneficial uses should not be considered impaired due to eutrophication.
5. Use #14 - Loss of Fish and Wildlife Habitat - The PADER concern specifically deals with the sport fishery (mostly stocked) of the PIB. Concern has been raised regarding the protecting of fish propagation areas inside the PIB. What about habitat loss from the City of Erie development? This section could use more background information in Stage II.

GENERAL COMMENTS

6. Throughout the entire document, data was presented and cited for explaining the current state of the ecosystem. Some of the sweeping conclusions put forth in the "Impaired Beneficial Uses Evaluation" process were based on historic data gathered for studies which were not designed for those evaluation purposes. It is at best difficult to draw definitive conclusions on use impairments based on partial or missing data. Rather, it is preferable that the RAP authors err on the side of caution when drawing such conclusions.
7. Certain major issues were not addressed which would be of use in the evaluation of impacted beneficial use. The Zebra Mussel invasion was barely mentioned even though the potential effect on the PIB ecosystem in terms of fish populations, phyto/zooplankton dynamics, eutrophication, and benthic structure changes may be quite profound. Their effects should be documented although there are very few remedial options currently available and we realize this is part of a lake-wide problem rather than limited to PIB.

In regard to benthos degradation, no mention was made of the Theoretical Bioaccumulation Potential (TBP) evaluation process which targets pollutants of concern. In addition, new organisms have been added to the list of effects-based biological testing of sediments. These tests increase the variety of end points which allow for a better evaluation of sediment effects on the aquatic community. When I obtain more information about these procedures I will forward it to you for consideration.

8. The RAP seems to struggle with the PAH in sediments issue. Some EPA programs have used a NOAA screening level of 4 ppm for low ecological effects and 35 ppm for moderate effects. The use of NOAA screening levels for PAHs is adequate for a gross level of assumptions such as the presence/absence of a potential PAH contamination problem. Its limited utility is due to the inclusion of only three of 16 PAH compounds in this protocol. As such, it should not be considered to have the level of detail needed to make a definitive conclusion on PAH contamination. Bioavailability of the PAHs should also be factored into the findings. In the absence of Great Lakes sediment quality values, these screening levels have been used in other AOCs, but only at these gross levels. A new set of PAH screening levels which will incorporate more compounds should be issued soon. The NOAA reference is "Technical Memorandum NOS OMA 52."

SPECIFIC COMMENTS

9. Tables 4.15, 4.16, and 4.17 - It is difficult to differentiate between regular type "non polluted" and bold type "moderately polluted".
10. Section 4.1.1.9, p. 41 - The last line indicates that normal lake currents are toward the east, away from the City of Erie water intakes. Are there any drinking water intakes on Lake Erie east of PIB which might be affected by contaminants discharged from PIB? *No*
11. Chapter 4 - A couple pages seem to be out of order. Figure 4.5 is between pages 42 and 43, and figure 4.4 is after page 44.
12. Section 4.1.2, p. 51, second paragraph - The EPA regulations list six reasons why it may not be possible to attain certain beneficial uses. We suggest all six be listed or only the one of concern here - physical limitations.

P. 52, third paragraph, line 4 - Change "Act" to "Federal regulations", line 7 - end sentence after "waterway". Again there are six reasons for non-attainment of use, physical condition of the waterway is one.
13. Figure 5.2 is difficult to read. On maps where a USGS, or other map, is used as a base for other information, it might be useful to reproduce the basic map using a light setting, then add the information in bolder type so there will be more contrast.

14. Section 5.2.2, and Figure 5.3 - Site summaries refer to numbers on Figure 5.3, these do not appear. See also comment 11 regarding contrast.
15. Section 8.5, p. 3, second paragraph - There is mention that a number of Erie industries have joined the voluntary 33/50 program. Our 33/50 coordinator had indicated there was a lack of interest from that area and he had no plans for any more follow-up activities. If you have a list of Erie industries that are involved in the 33/50 program, I would appreciate receiving it.
16. Section 9.1.3 - This section titled "New Programs" discusses existing programs. Mention could be made that the Clean Air Act Amendments (CAAA) will require more stringent controls on emissions, also under the Great Waterbodies program CAAA will require even more controls if air deposition is shown to preclude attainment of water quality standards.
17. ACRONYMS AND ABBREVIATIONS - PCB should be "Polychlorinated Biphenyls"



great lakes
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Joseph V. DePinto

Director

Monica Moshenko

Administrative Assistant

September 8, 1993

SEP 13 1993

Mr. Mark A. Breederland, RAP Review Coordinator
LJC Great Lakes Regional Office
P.O. Box 32869
Detroit, MI 48232

Dear Mark:

Please find enclosed a copy of my remarks on the Presque Isle Bay RAP stage I report. I hope the comments are pertinent and at the right level of detail. Let me know if you have questions or require additional input prior to the October 14 meeting in Erie. I am currently planning on attending that meeting. See you then.

Best Regards,

Joseph V. DePinto, Director
Great Lakes Program

enc.



Review Comments for
Presque Isle Bay Remedial Action Plan - Stage I

Prepared by
Joseph V. DePinto, Director
Great Lakes Program
University at Buffalo
Buffalo, NY 14260-4400
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Have Environmental Problems Been Adequately Described

The site description and specification of extent of AOC is a concern to me. First, the map presented in Figure 1 is virtually impossible to read and to assess whether the watershed boundaries have been correctly assigned. *Are there really no creeks that originate upstream of the area indicated?* Also, the PIB is called an "estuary" but then it is indicated that virtually no exchange of water with Lake Erie occurs; where is the "estuary" exchange? *How was the mean hydraulic retention time of 2.5 years arrived at? Was a hydrologic budget developed for the system?* If so, it should be presented in this report. A related question is the exchange of Lake Erie water with PIB. The report claims it is very small, but is there data to confirm that it is negligible in terms of pollutant mass exchange? Have there been any studies which measure flow magnitude and direction versus time?

Have any changes in the biological community been detected following the cessation of cooling water use by Penelec in 1990 (ref. page II-4)?

In the report (ref. page III-15), zebra mussels have been mentioned as having inhabited PIB in large numbers and as having a potentially large impact on the bay aquatic ecosystem. A major question in my mind would be its impact on the fishery by shifting the energy flow away from the planktivorous forage base and into a benthic food chain. *Has this potential impact on the PIB fishery been evaluated?* This could change the conclusion that fish populations are not suffering from a "use impairment" if the level of sport/predator fish biomass in the bay now exceeds its carrying capacity. Also, the considerable increase in water clarity could have an impact on fish bioaccumulation of toxic chemicals by increasing the amount of dissolved chemical in the water column. **Because of these recent influences of the zebra mussel invasion, up-to-date surveys of plankton biomass and production (Sect. 4.1.1.80, the capacity of the system to support a healthy sport fishery (Sect. 4.1.1.3), and of fish body burdens of chemicals (Sect. 4.1.1.1) are essential.**

It is difficult to compare sediment contaminant data without knowing something about the relative location of the samples and, perhaps more importantly, about the sample collection, storage, and pre-treatment protocols (e.g.,

surface grabs versus cores, methods for drying, etc.). This information is lacking for the sediment chemistry data presented in Sect. 4.1.1.7. Also, it would be helpful, if the selected data sets included physical characterization of the sediments (e.g., porosity, particle size information), to include these data in the summary. With regard to this section, if sediments appear to be in such a degraded condition, why don't sediment toxicity bioassays corroborate the chemistry data? Also, with the shallow water column depth and long hydraulic retention time of the bay, I would expect that the sediments would have a more significant impact on water quality (because of the relative importance of sediment-water interactions in systems like this) than appears from the data presented in the report.

Referring to section 4.1.1.8 on eutrophication, what was the trophic state index model used for this assessment. It should at least be referenced if not described in more detail in the report. I have an inherent mistrust of TSIs, because they have to make *a priori* judgments as to the inclusion and relative importance of various measures of trophic state or degree of eutrophication. For example, in a shallow system like PIB D.O. levels might never be a problem even if algal productivity is very high. Also, how were phytoplankton assessments conducted? Were algal counts made and genus or class identified or was chlorophyll *a* the only measurement made? I guess I am not convinced about the "no impairment" conclusion for this category.

Have Causes of Use Impairments and Sources of Impairment Causes Been Identified

The physical description of the system (shallow, high wind wave action, fine-grained sediments) suggests a very high potential for sediment resuspension. *To what extent has this factor been investigated as a cause of use impairments?* While the authors have clearly estimated the reservoir of in-place pollutants, they have made no attempt to estimate or to gather data on the potential for sediment resuspension to impact the system.

If the detection limits on PAHs (10 µg/l) is indicative of the rest of the organics in the wastewater treatment plant influent, then these data are of relatively little value because these are very high DL. I do think that the report can state, on the basis of these data that CSOs are not a major source of organics to the PIB.

Human Health Issues

I have a slight problem with the analysis presented in Section 4.1.1.1 on fish consumption advisories. While the conclusion that PIB fish have similar body burdens to lake Erie fish will probably not change, I disagree with lumping all species of fish and all age classes of fish together in making comparisons. These factors should be taken into consideration in reaching a conclusion regarding the degree of impairment, if any, of fish consumption.

Systematic and Comprehensive Ecosystem Approach

Some consideration of atmospheric influences is present in the report; this reflects a recognition of this part of the ecosystem. *But has the relative contribution of atmospheric deposition to the loading of contaminants to the system been estimated or measured?* Given the small watershed to bay surface area ratio and the relatively long hydraulic retention time, this may be a significant loading factor.

I do not care for the statement on page 4-2 that "restrictions on consumption of fish and wildlife only qualify as an AOC use impairment if the elevated levels of the offending contaminants result from the input from the AOC's watershed." This seems to be contrary to the ecosystem approach concept. What is the reason for the inclusion of this statement in the AOC listing guidelines?

Stakeholder Involvement

Missing Data/Information and Mechanisms to Fill Gaps

Updating the city's mapping of its sewer system and a development of a more certain quantitative understanding of the relative contribution of storm and combined sewers (flow and concentration) to PIB could be very important to understanding the causes of use impairments, especially the beach closings. This should be a high priority study prior to making remediation decisions. While the review of urban nonpoint runoff in the report was very good, it seems to be important enough in this site to warrant a site-specific study. Without better data in these areas, the current loading estimates will not be accurate enough to serve as a baseline for future load reductions that might result from RAP implementation.

A good hydrologic budget for the system does not seem to be available. This would make a useful contribution to the stage 1 report.

In addition to the estimation of sediment resuspension potential, it would be very instructive from an historical perspective (not to mention in the assessment of potential impacts of dredging) to obtain some fairly high resolution sediment core profiles in radionuclide-dated cores. Perhaps this has already been done but not presented in the report; if so, it would be very instructive.

It seems fairly obvious that there is a considerable lack of information on plankton in the bay. I would recommend initiation of a water column plankton study that included determination of the community biomass and structure as well as plankton toxicity tests for sediment samples.

General Comments

- Please convert all units presented in the "English" system to the "metric" system, or at least put the metric equivalent in parentheses after the English units value.
- The map overlay of protected areas of PIB is described in the report but the map itself is not included. This would make a nice addition to the report.

- Please generate a new site location map (Fig. 3.1) that is readable and contains reference points that are mentioned in the text.
- Map locating sediment sites for Tables 4.15 and 4.16 would be helpful. Maybe these sites could be located on the map in figure 4.3 for comparison.
- Page 43 of report is out of place; it does not follow page 42.
- I do not necessarily agree with the statement at the beginning of section 5.1. For example, resuspension of bottom sediments accounts for over 95% of the Fox River loading of PCBs to Green Bay.
- On page 5-3, referencing to preliminary data on CSOs in Appendix C is incorrect; nothing like that is in this appendix.

227 Indian Road
Toronto, Ontario
M6R 2W9

September 16, 1993

Mr. Mark Brederland
International Joint Commission
Great Lakes Regional Office
100 Ouellette Avenue, 8th Floor
Windsor, Ontario
N9A 6T3

Dear Mark:

I have just today completed my review of the Presque Isle Bay RAP.

I can't help remarking on what a luxury it is to be handed "on a silver platter" a well-organized synthesis of the existing data on a body of water, along with relevant contextual information and a summary of activities and regulatory tools which relate to it. So much hard work is rolled into the Stage 1 product! How wonderful to be the recipient of the information, not the generator of it!

As you will see from the attached comments, my reading of this information has generated some questions, and some reactions. As a generalist with experience in the public involvement field, I have felt quite free to raise questions about any part of the document that might raise questions in the minds of interested citizens. I hope this will be of value to PADER and its partners as the RAP proceeds.

Sincerely,



Louise Knox

PRESQUE ILE BAY RAP: REVIEW

from Louise Knox

Review Questions 1 and 2 re: Adequacy of Probl

Available data appear to have been considered, to draw conclusions wherever possible. The unanswered. Those which seem relevant are:

1. It appears that ambient water quality data was 17 pollutants of concern (copper and zinc). have ambient water quality data for the remaining
2. Amounts of in-place pollutants seem quite 1 in quantities that amount to about 41 lb. per sq. outsider, common sense would lead to the conclusion is impacted in a negative way. If PADER impairment of the health of the benthic community stronger argument than the one presented in the R: unimpacted benthic community is a weak argument. Lake Erie of levels found in PIB sediments demonstrate and not the reverse.

Review Question 3 re: Causes & Sources

3. Point sources are identified but one is less the information is not complete. Quantification assumptions, so that it is hard to know how close to The report refers to industrial dischargers who then discharge into the sewer system, but it neglects is (and how much of it) that is finally discharged

It appears that work to be done by the City of Erie fill some of the data gaps, so it may be that if done, there will be at least enough to provide:

4. For non-point sources, especially surface run-off, "no reliable data exist from which to estimate the annual loadings of pollutants.....". It is hypothesized that "surface runoff may contribute very high annual loadings of a wide variety of pollutants". It would therefore seem important to identify the sources of these "very high annual loadings". The word "sources" is important. Surface run-off is more of a channel through which pollutants move than an actual source of pollutants.

There is no doubt that the prospect of trying to characterize and quantify the pollution carried into the Bay through surface run-off and other non-point sources is unpalatable. Where this has been done in other locations, it is likely to have been at great expense to the taxpayer. Should there be further investigation? If so, of what kind? The RAP does not say what approach it intends to take in order to gain an understanding of the sources of pollution carried by surface run-off, so that they can eventually be controlled or eliminated. This is the point in RAP development at which the "societal causes" need to be considered. There is not much in this RAP that describes what it is about human behaviour in the AOC that is linked to the generation of pollutants. In other words, the investigation hasn't moved "up the pipe", to use the language of some of our Canadian public advisory committee members.

The attempt to address this gap in information about surface run-off by using data from other locations seems a great stretch of the imagination, especially since land-use has such a strong influence on the generation of pollutants. More work on identifying sources now might pay off in the long run in terms of the ability to take effective action.

5. One troubling issue for the non-technical reader is that, despite the information that does exist on the pollutants of concern, one is still unsure, even after reading the whole RAP, as to which of these pollutants, if any, poses a really a serious problem. Is it the mix that's the problem? The sheer quantities? The PAH's? What do we really need to go after here?

Review Question 4 re: Ecosystem Approach

6. I'm not sure who would pretend to know exactly what an ecosystem approach would look like! However, my understanding is that it implies recognition that all things are linked and inter-dependent, and that a holistic view is needed. This RAP does recognize the interconnections between land, air, and water and the creatures that live in them, and does combine disciplines in its evaluation of the local problems. However, there is still a gulf between what happens among humans (their individual and organizational behaviour) and how this affects air, land, water and other organisms. This is really the same point made in item 4, above.

Review Question Re: Human Health

7. Human health issues are not addressed, other than in passing, or through discussion of fish consumption advisories. If there is a reason for this, the RAP might be well advised to state the reason.

Review Question Re: Stakeholders

8. Stakeholders are listed in the appendix and the Listing appears to be quite comprehensive. However, there is nothing to indicate:

- a) whether they have ever met;
- b) whether they are involved or merely informed;
- c) whether they agree with the problem definition as it appears in the Stage 1 report;
- d) whether they accept what is reported to be their "responsibility to negotiate a compromise solution that meets the the environmental restoration & maintenance needs of the AOC while being sensitive to the economic realities...." (Section 9.3)
- e) what support is available to facilitate their reaching a compromise solution;
- f) what commitment there is from PADER to participate in and/or facilitate the committee work;
- g) whether there will be resources for the RAP to fulfill its reported "hope" to be able to provide support for community events which promote awareness of the environmental issues faced by the community (Section 8.5).

Normally, one would expect at the very minimum either terms of reference for a committee of this kind, or some kind of letter or memorandum outlining what are the terms of members' participation, the objectives of the exercise, and the roles and responsibilities of the sponsoring organization. Some indication of activities/achievements to date would be helpful as well.

Community involvement is part of the human-oriented aspect of the ecosystem approach. The purpose of including the above information is to allow the reader to assess whether this component is being adequately addressed. In this Stage 1 document, the reader does not have enough information to make such an assessment.

9. It is significant that the reference to "virtual elimination" comes in the section of the report called "Other goals of the Remedial Action Process" (Section 8.5). These are goals that "may be achieved" using the RAP process and they include public education, pollution prevention and "virtual elimination". One is left with the distinct impression that these are secondary goals, not only because of the "may be achieved" phrase, but also because of phrases like "the RAP seeks to support" and especially the last sentence in this section which says that the goal of "virtually eliminating toxic inputs" is "the Basin's goal".

The basin does not have a stated goal. The people in the basin say. The Great Lakes Water Quality Agreement commits the governments to a goal of virtually eliminating discharges of persistent toxic substances (not "toxic inputs"). The RAP would be enhanced by some clarity about which goals it is adopting. Perhaps this will come in stage 2.

A final, more general comment, is that one can sense a tension in this and probably every RAP document, that has to do with making a shift from a known and comfortable way of doing business (which has produced demonstrable results and shouldn't be discounted), toward an unknown and not-so-comfortable and less frequently tested approach loosely described as "pollution prevention". Nearly everyone agrees that this is the way to go, but this is based on common sense and a belief that it can be done, and a bit of evidence. So resistance is understandable. But we will never know more about this approach if we don't try it, and seriously. So I will exercise my privilege as a reviewer of this RAP to say that it doesn't look, yet, as though the shift is being made with very serious intent, and the RAP group needs to ask itself whether that's what it wants.

Louise Knox
September 16, 1993

SEP 16 1993

610 Green Street
Grand Ledge, MI 48837
September 13, 1993

Ms. Marge Dochoda, Fishery Biologist
Great Lakes Fishery Commission
2100 Commonwealth Blvd., Suite 209
Ann Arbor, Michigan 48105-1563

Dear Ms. Dochoda:

Re: Review of Presque Isle Bay, Pennsylvania, Remedial Action Plan (RAP), Stage I

According to your request of August 10, 1993, and in response to Mark Brederland's of August 5, 1993, I have reviewed the Stage I RAP for Presque Isle Bay, Pennsylvania, and submit the following comments for consideration by the I.J.C.

With few exceptions (noted later), this Stage I R.A.P.:

- Adequately describes environmental problems in the A.O.C., including identifying beneficial uses impaired, degree of impairment and the geographical extent of such impairment.
- Has identified specific objectives of the GLWQA that are not met to the extent that such failure has caused, or is likely to cause, impairment of beneficial uses, including the area's ability to support aquatic life.
- Has identified the causes of the use impairments, including a description of all known sources of pollutants involved and an evaluation of other possible sources. Societal causes such as demographics, economic forces, private and public sector activities, and technological changes have been described and their contribution to use impairments investigated.
- The plan embodies a systematic and comprehensive ecosystem approach, and problems, sources and causes have been examined within an interdisciplinary framework.
- Human health problems have been thoroughly addressed and evaluated.
- Stakeholders have been identified and involved in defining

problems and causes, and it is clear that the RAP intends to involve stakeholders at every turn. But a detailed involvement plan and schedule for public participation is not evident.

•There are information gaps and there are mechanisms identified for filling them where feasible.

The most serious weakness in this Stage I R.A.P. is the lack of an historical description of the Presque Isle Bay environment. The fish, wildlife, benthos, zooplankton and physical environment are well described in the here and now, but there is no description of historical conditions. Although scientific data and studies may be lacking, an attempt should, none the less, be made to describe Presque Isle Bay as it was in pre-settlement or early settlement days. Descriptions of conditions found by explorers and early settlers will be helpful in setting long range ecosystem goals for the A.O.C. and in measuring progress toward those goals. Observations need not be sophisticated or detailed to be of value. I include a copy of 3.1.3 "The Historical Cuyahoga River Environment" from the Stage I R.A.P. for that river to illustrate. It may be worthwhile to use habitat conditions that currently exist on the north side of the bay as an insight into those that once existed (and perhaps could, to a degree, exist in the future) on the south side.

The R.A.P. is well written. It is clear yet thorough. It uses good logic. I especially liked its objective and thorough coverage of the contribution that naturally occurring heavy metals could be making to Presque Isle Bay (and Lake Erie) bottom sediments. The facts and analysis in this part of the R.A.P. clearly call into question current E.P.A. and Corp of Engineers' dredging criteria, but they do so in a very subtle and fair way.

This R.A.P. process provides a one time opportunity to review the past and present environment of Presque Isle Bay and to unite the public in a long range vision for its future. It is important in this process that everyone concerned understand and agree that the ecosystem being planned for and protected is the human ecosystem. Fish, wildlife, pure water and natural settings are all important parts of that ecosystem. The P.A.C. will largely be responsible for putting together a blueprint for the Bay that will enhance the living conditions for present and future Erie residents. They will, I think, not err far if they set their sights high and describe the Bay as they truly would like to see it. The Stage I R.A.P. often, and correctly, points out that the mix of representation on the P.A.C. will assure that all interests are weighed in this process of goal setting. That "Remediation of A.O.C.'s is typically expensive and requires a relatively long time frame to complete" is an important acknowledgement. Long time frames allow for considerable economic and political adjustment and

make possible change not normally considered possible or practical.
This is an exciting opportunity for the P.A.C. and all those
involved in the R.A.P. process. I know I appreciate the
opportunity to be involved as a reviewer.

Sincerely,


David P. Borgeson

DPB:cb

cc:Mark A. Breederland, IJC

Investigation of the source of contaminants has encompassed the entire Cuyahoga River drainage basin and the basin to the east which drains to the nearshore area of the Area of Concern. Figure 3-2 shows the relationship of these two basins to Lake Erie and highlights the Area of Concern.

The following sections 3.2 through 3.4 are intended to provide the reader with a very detailed picture of the Cuyahoga River basin's natural and cultural characteristics.

1.3 THE HISTORICAL CUYAHOGA RIVER ENVIRONMENT

The lower Cuyahoga River and its valley, between the present day sites of Akron and Cleveland, has a long history of use for navigation and travel. For over 2,500 years many Native American tribes shared this important resource for living space, hunting, and transportation on their long journeys between Lake Erie and the Gulf of Mexico. Up through the 1700s, the river was described as "gentle" with "few riffles or swift running places," and "muddy."

William Coates said of the Cuyahoga in 1924:

"The rich bottom lands along the course of the Cuyahoga are very productive and in the early days, before the presence of a great city at its mouth dyed its waters, the stream abounded in fish, which were a great factor in the food supply. We need not go back to the days when the dusky Chippewa (Indians) occupied its banks for this fact. In quite recent years, the mullet, redhorse, bass, catfish, bullhead, sturgeon, shad and other varieties were caught in great numbers. Sturgeon, five, six and seven feet in length, were often the prey of fishermen.

Wild game was attracted to the river banks, sometimes in great numbers, and then the river valley became valuable hunting grounds. Because of the forests and with it the leaves in the summer and the slow melting of snow, the lack of ditches and tile drainage, accompaniment of civilization, the flow of water in the river was more regular throughout the year than it is now. Floods did not rise to such proportions and navigation was not impeded by the low water of the dry season, as in later years."¹

One naturalist commented (as recently as 1851) that the waters of Lake Erie near the mouth of the Cuyahoga River would literally be "black with fishing boats"; "one could capture near the present Cleveland Harbor as many as 100 bass and walleye in a morning by hook and line."²

William Coates, "A History of Cuyahoga County and the City of Cleveland." 1924.

Jared Potter Kirtland, in "The Fisheries of the Cleveland Metropolitan Area Including the Lake Erie Shoreline," by Dr. Andrew M. White, for the Water Quality Baseline Assessment for the Cleveland Area - Lake Erie. USEPA, 1975.

Prior to European settlement, the entire area where the Cuyahoga River entered the lake was a large, near level plain covered by marsh and swamp. It was only through dredging and breakwall construction in 1823 that the Cuyahoga River marshes became the Cleveland Harbor with a discernable mouth.³

After the settling of Cleveland, at the very beginning of the nineteenth century, not quite 200 years ago, the river began to experience an increasing intensity of use. With the completion of the Ohio-Erie Canal linking Cleveland and Akron in 1827, and the Valley Railroad in 1850, Cleveland and Akron communities grew by leaps and bounds. By 1850, Cleveland's population was over 17,000 and ten years later 43,000 people lived in the city.

Although large industrial development and subsequent urbanization meant prosperity for the region, it also brought with it major sources of pollution between Akron and Cleveland. Over the period of roughly 150 years, the Cuyahoga River would be used to support commercial shipping, major steel, rubber and chemical manufacturing processes, and the disposal of human wastes. Drastic deterioration of water quality in the Cleveland area began in earnest in the 1850s.

3.2 Natural Features

3.2.1 Drainage Basin

The Cuyahoga River and its tributaries drain approximately 813.3 square miles of land in the basin.^{*} The Cuyahoga River basin lies mostly within Geauga, Portage, Summit and Cuyahoga Counties.

Several major tributaries flow into the Cuyahoga below the confluence of the East and West Branches in Geauga County. Figure 3-3 shows the major tributaries in the Cuyahoga River basin.

These include:

GEAUGA COUNTY

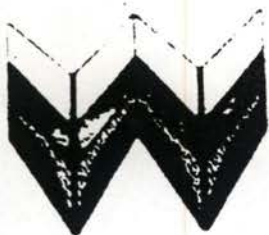
Bridge Creek
Black Brook

PORTAGE COUNTY

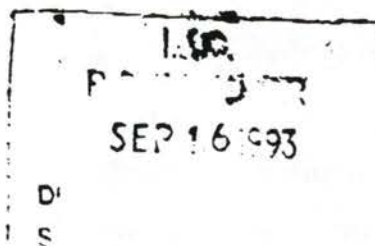
Breakneck Creek
Congress Lake Outlet
Plum Creek

3 James Bissell, Staff Botanist. "Natural History of Arcola Creek Estuary." Cleveland Museum of Natural History. July 30, 1987.

* Gazetteer of Ohio Streams. ODNR, 1960.



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September 15, 1993

Mr. Mark Breederland,
RAP Review Coordinator
International Joint Commission
Great Lakes Regional Office
100 Avenue Quellerie Avenue
Windsor, Ontario
N9A 6T3

Dear Mr. Breederland:

Please find attached a brief report prepared by Lynda McCarthy and myself on the Stage 1, RAP for Presque Isle Bay. I hope this is satisfactory to you and we look forward to seeing you in Erie next month.

Yours sincerely,

Richard L. Thomas,
Director,
Waterloo Centre for Groundwater Research.

Encl.

RLT/sm



Ontario Centres of Excellence

Comments Re: Presque Isle Bay Remedial Action Plan

Summary: The Presque Isle Bay RAP represents a sound documentation of the conditions of the system as they currently exist. It further identifies omissions in knowledge required to complete the assessment and indicates the requirements needed to overcome these omissions.

Major Review Conclusions: For virtually all measures of impairment, the PIB is in excellent condition, and can be best described as a marginal Area of Concern. Problems may exist with respect to:

- 1) liver tumours and external lesions on bullheads
- 2) levels of metals in PIB sediment
- 3) levels of PAHs, which may be of concern as a causative agent in the tumours of bullheads

Resolution or an improved understanding of these problems could well result in the delisting of PIB without recourse to major remediation. Disposal of dredged spoil may well continue to be a problem, though elimination of anthropogenic sources could alleviate even this problem.

Major Recommendations:

- a) Continue to examine fish for increased incidence of liver tumours to determine the extent of impairment relative to background levels. Since PAH bioaccumulation does not appear to occur, viral infections appear to be a likely cause.
- b) Bioavailability of metals must be established by chemical speciation and the mode of incorporation into the sediment must be determined. Results could then be rapidly assessed by comparison to bioassay data.
- c) PAHs should be further evaluated in fish and sediments and uptake experiments conducted. A more detailed assessment is given as per attached.

Summary of Bioassays Conducted on PIB Water and Sediment

First of all, no water column bioassay testing was carried out, presumably since it was concluded that the fisheries were a thriving concern and that the area is an effective fisheries nursery. However, the incidence of skin lesions and liver tumours in brown bullheads was worrisome to members of the RAP group. Thus, it is highly recommended that water column bioassays be conducted, to ascertain whether anthropogenic sources of contaminants are causing these lesions, or whether they are naturally-occurring, through viral intervention.

Secondly, assessing the validity of sediment bioassays conducted in this study was extremely difficult, since there was a paucity of detail outlining the actual experiments. Although the Prater & Anderson (1977) methodology that was utilized by the Corps of Engineers for the 1982 and 1986 bioassays was perused by ourselves, there was still a little confusion as to the exact protocol carried out. The following outline some of our concerns:

- 1) Prater & Anderson (1977) only used *Daphnia* and *Hexagenia* in their 96-hour bioassays; what methodology was followed by the COE for the fathead minnow tests?
- 2) Were the sediments sieved to reduce predation and competition potential from indigenous benthic populations when *Hexagenia* were added to the sediment?
- 3) Were all three animal species exposed to the sediment in the same containers, or were the animals segregated in different test beakers?
- 4) Were the control sediments of similar physicochemical conditions (same grain size, etc.) as those sediments found in PIB? (if not, *Hexagenia* sometimes has a difficult time populating sediment due to physical reasons, such as not being able to build a proper burrow; thus, observed mortality in PIB sediment may be strictly due to differences in the physical sediment compared to the control site rather than to chemical differences)
- 5) Why was there a lack of consistency between experiments conducted in 1982 and 1986. For example, the 1982 study utilized five replicates for all tests and the 1986

study just used three replicates; in the 1986 study, the *Daphnia* experiment was terminated at 48 hours, and not the 96 hours used in the 1982 study?

6) When low dissolved oxygen levels in the 1986 study were implicated in the observed toxicity of the *Hexagenia* and *Daphnia*, why were retests done only on the former organism, and not on the latter? (Because of this lack of retesting, it is difficult to conclude that "according to the *Daphnia* results of the 1986 study, PIB sampling sites were moderately polluted". Mortality may have been due to lack of dissolved oxygen).

7) Were sediment controls (along with water controls) implemented in the *Daphnia* and fathead minnow bioassays?

Lastly, when the control organisms have high mortality, as in the case of *Hexagenia* in the 1986 retest, very few conclusions can be drawn as to the quality or lack thereof, of the sediment in question. Thus, Conclusion #1 on Page 18 of Chapter 4 is tentative at best, and correlations between mortality and pollution are weak.

Recommendations:

First of all, it is highly recommended that water column bioassays be carried out, particularly to assess accurately the cause of the lesions observed in bullheads. Some experimentation could include caging fish and examining mixed-function oxidase (MFOs) levels in the liver after a certain exposure period, and/or caging *Daphnia* or other water column invertebrates and suspending them at the sites of interest, measuring lethality or reproductive potential as toxicity endpoints. Also, after a predetermined exposure time, these caged animals should have body burden assessments and tissue analyses performed. Toxicity could then be correlated with concentrations of organic compounds sequestered within the bodies of the animals. Secondly, it is recommended that further sediment bioassay toxicity studies be conducted, using *in situ* methodologies in conjunction with laboratory experimentation. The bioassays that were conducted in the study used methodologies

from Prater & Anderson of 1977, who suggested a 96-hour bioassay test. The inherent problem with acute bioassays that are carried out on long-lifecycle organisms such as *Hexagenia* is that many sublethal results are never observed. Thus, it is recommended that a relatively short life-cycle test using benthic invertebrates such as *Hyalella* be implemented, where acute lethal endpoints are used, along with sublethal endpoints such as growth and reproductive potential. Again, the use of fathead minnows is recommended in bioassay testing, but 96 hours can be much too short to properly assess potential toxicity. Since the life cycle of the fathead minnow is often too long for most laboratories to feasibly examine, growth is an excellent sublethal endpoint, as is mixed-function oxidase testing, particularly if it is suspected that organics are the major contaminants of concern.

Body burden residues should also be examined, to determine a correlation between toxicity and organic contaminants within the sediment, particularly with benthic invertebrates. Also, symptoms of stress such as the induction of metallothioneins should be monitored in fish tissues, as indicators of metal exposure.

Physicochemical parameters that are naturally-occurring in the system have recently been implicated as culprits in toxicity bioassays. These include high levels of ammonia, water hardness, pH of the sediment, alkalinity, etc., which could have a radical effect on the survivorship of the test organisms. Thus, it is recommended that not only should these pertinent parameters be measured, but that statistical correlations be conducted to assess a relationship between the observed toxicity and concentrations of these chemicals in the system.

Conclusions

More details concerning the bioassays should be included in the RAP document, if only as an appendix. Also, many more types and numbers of bioassays must be conducted before one can conclusively say whether PIB waters and sediment are toxic or not. The relationship between fish tumours and concentrations of PAHs is tentative at best and further testing must be done to conclusively prove the relationship. Also,

since *Daphnia* appeared to show the most consistent toxic results, would this not argue for a water-soluble contaminant, rather than hydrophobic compounds such as PAHs?

Questions Regarding Stage 1: Adequacy of Problem Definition

1. Yes, the environmental problems have been adequately described, although the degree of impairment (particularly compared with other Areas of Concern) may be substantially over-estimated. There is some question whether the metals in the PIB sediments are truly cause for concern, since many may be naturally-occurring. Also, dredging the sediment and disposing of it in Lake Erie may not create the deleterious effects assumed by the RAP committee. Although there is speculation that lesions in the bullheads can be correlated with concentrations of PAHs in the sediment, it appears to be a rather tentative relationship and certainly further studies must be conducted.

2. Although specific objectives of the GLWQA have been identified, it is debatable whether the two use impairments (fish tumours and meeting dredging guidelines) have been conclusively shown to impair aquatic life. Certainly, the PIB seems very able to support aquatic life.

3. Although many sources were examined to determine whether they were contributing to the contaminants found in PIB sediment and water (mainly CSOs), there appeared to be some problem in actually identifying a specific source and its concomitant contaminant. Page 2 in Chapter 5 indicates problems in obtaining monitoring data, in sorting out inconsistencies in data reporting, in overestimating annual loadings, etc. Also, it was not possible to calculate the annual pollutant loadings from the individual CSOs, and data on total discharges from all of these sources is not currently available.

The source of PAHs in sediment was unclear, while data from disposal of toxicants from residential areas (ie. "down the kitchen sink and toilet") were not presented (often thought to contribute up to 50% of secondary sources of pollutants in some areas). Public sector (industry) activities were certainly described and their contribution to use impairment investigated, although economic forces and private

sector activities were not as clearly presented.

4. Yes, the plan does embody a comprehensive approach, within ~~1732~~ interdisciplinary framework.

5. The RAP indirectly addressed human health issues by examining body burdens for fish and wildlife consumption. Also, whole-body water contact was investigated, and since the PIB is not used for drinking water, no use impairment was indicated.

6. Yes, stakeholders have been adequately identified, although it is not clear who was involved in defining the problems and causes in PIB. The Department of State designated the Bay as an Area of Concern in 1991, although "no reasons were cited ... as the impetus for the designation". There certainly appears to be a system in place to inform the broader community about the RAP (public notices and comment period requirements).

7. It is hoped that Stage 2 will indicate whether, in fact, there is a mechanism to fill in missing information (increased bioassay testing, for example). The philosophies and processes of RAPs seem to lend itself to flexibility as far as assessing and utilizing information as it becomes available



United States Department of the Interior

Fish and Wildlife Service

National Fisheries Contaminant Research Center

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In Reply Refer to:

Paul C. Baumann, Leader
The Ohio State University
473 Kottman Hall
2021 Coffey Road
Columbus, Ohio 43210

September 23, 1993

Mark A. Breederland
RAP Review Coordinator
International Joint Commission
Great Lakes Regional Office
100, Avenue Ouelette
Windsor, Ontario
N9A 6T3 Canada

Dear Mark:

Here is my review of the Presque Isle Bay Remedial Action Plan. I was more detailed in reviewing the PAH and fish tumor sections than I was in reviewing the rest. Hope this is of help.

I will be out of the office from September 24th until October 4th. However, call if you have questions, and I am planning to attend the conference in Erie on October 14th.

Sincerely,

Paul C. Baumann, Ph.D.

PCB/cmw

I.L.C.	
R.O. WINDSOR	
SEP 28 1993	
Dir.	_____
Secty WQB	_____
Secty LAB	_____
Asst. PS	_____

REVIEW

PRESQUE ISLE BAY
REMEDIAL ACTION PLAN

- O Have the environmental problems in the Areas of Concern been adequately described, including identifying beneficial uses impaired, the degree of impairment and the geographic extent of such impairment?

Only two use impairments have been designated; one for tumors in fish and another for dredging activities. The sediment concentrations of metals which caused the dredging impairment seem well documented. Tumor investigations are ongoing and I will comment on those in more detail later.

However, I have some concern about the data available for use-impairment decision making in a couple of the other categories. For instance, under "Biotoxicity of Water Column or Sediment Contaminants" (ch. 4, p. 15, and "Sediment Toxicity to Benthos" (ch. 4, p. 32) both use the same data sets: two Corps of Engineers studies from eleven and seven years ago. Both of these were 96 hour acute bioassays. No mortality was observed for fathead minnows, but *Daphnia* mortality was elevated (10%-50%) in the harbor basin and disposal area for both assays and in the inner harbor for the 1986 assay. Furthermore, *Hexogenia* mortalities were also elevated for the outer and inner harbor sites in 1986. These data are discounted because a single lake reference site also caused mortality in these tests. The high mortality of the reference site could have three possible explanations.

- 1) All (or most) sediments in Lake Erie are at least "moderately polluted".
- 2) The lake reference site chosen is "moderately polluted" but not representative of most Lake Erie sediments (and thus is an inappropriate reference selection).
- 3) The mortality was caused by inappropriate test conditions (such as the low DO mentioned on p. 17) which means that all the test results may be compromised.

The authors of this section selected #1 as the appropriate explanation without backing that choice with data from other open lake stations which must be available. Without such confirming data, either #2 or #3 seems more feasible to me. I am also at a loss as to why, after seeing such a high mortality from the single lake reference site in 1982, those performing these assays in 1986 used the same single location instead of adding more reference locations or at least changing the one they had.

In a related section, "Benthic Macroinvertebrate Community Structure", conclusions are drawn from a similarly thin data base. Early studies showing the community structure to be impaired are put aside as too old. The new study commissioned has not quite been completed, but shows a pattern "similar to that of the earlier studies" (ch. 4, p. 29). However, results from specific sites are then used with a complex weighting system for pollutants to attempt to correlate benthic community structure with specific contaminant loads. When the correlations attempted are not strong, the impairment issue is dismissed. Additional reasons for the dismissal include the statement that finding a comparable reference site was "not possible" (p. 29) and that "harbor areas very seldom support a well balanced benthos population" (p. 31).

Taking a closer look at the sediment correlation analysis, only 7 sites had both invertebrate and chemical data (#s 1, 2, 3, 4, 11, 13, and 16). Of these, four had characteristics of an impaired community and three (#s 1, 11, and 16) did not. Site 16 is ranked dead last for almost all pollutants (2nd last for As) and is in a sheltered pond well off the main harbor; one would expect that site to have the best community. Site one appears to be moderately polluted and site 11 highly polluted; it is a surprise that they (particularly 11) have "associations of pollution sensitive taxa". However, no detail was provided on what was actually present.

In any case, I don't believe one or two locations with better than expected fauna would cancel out a judgement that overall the benthic community is impaired. One would need much more compelling testimony to the contrary than that provided, especially in light of the undeniably high toxicant concentrations detailed under "Restrictions on Dredging Activities". It would be strange if sediments that are too "heavily polluted" for open lake disposal would have no damaging effect on resident benthic fauna.

- Has there been identification of specific objectives of the GLWOA that are not met to the extent that such failure has caused or is likely to cause impairment of beneficial uses, including the area's ability to support aquatic life?

I will focus my comments on the specific science involved in evaluating toxicant problems, rather than commenting directly on this question.

The site comparison on Table 6.3 is limited. Also, the use of the early Black River outfall value tends to give a distorted view of just how concentrated PAH need to be for tumor epizootics. The following table may provide a better perspective. It includes average PAH values for 9 locations with tumor epizootics and five reference locations. Values are given as the average of averages for each set, plus the range of averages. Black River sediment data is from 1982 (when tumor frequency was quite high) and represents a wider range of samples than the single 1980 scoop.

Table 1. Average Concentrations (ppm dry weight) of selected PAHs from locations with tumor epizootics, reference locations, and Presque Isle Bay.

Site averages	Phenan.	Fluoran.	B(a)A	B(a)P
Tumor sites (9) (range)	17 (1.0-100)	23 (1.8-76)	5.9 0.83-23)	5.2 (0.36-21)
Reference sites (5)	0.08	0.15	0.05	0.07
Presque Isle Bay 14 sites	1.6	2.8	0.9	0.9
Presque Isle Bay Sites 1, 5, 10, & 11	2.4	4.0	1.4	1.5

Table 1 includes both the 14 site average for Presque Isle Bay given in Table 6.3 and an average based on 4 "hot" sites. The latter may a better comparison to the tumor epizootic locations, where a point source is often known and sediment sampling is concentrated nearby. Also, the tumor site averages are still heavily influenced by the Black River (from which all the high end range numbers are derived).

In looking over Table 1, all values from both PIB indexes fall within the range of PAH values from locations with tumor epizootics. Even though these values are in the lower portion of the range, they are clearly elevated above reference locations. More to the point, values for the two carcinogens (B(a)A and B(a)P) are clearly up into the range of tumor locations; if the Black River were eliminated from these values, the averages for the other eight tumor sites would be 3.8 for B(a)A and 3.2 for B(a)P.

○ Have the causes of the use impairments been identified, including a description of all known sources of pollutants involved and an evaluation of other possible sources? Have societal causes such as demographics, economic forces, private and public sector activities, and technological changes been described and their contribution to use impairments investigated?

I will use this question to discuss the tumors found in brown bullhead, their likely cause, and the possible sources of polynuclear aromatic hydrocarbons (PAH) in the system. To be brief, the preliminary results (N=17) of the most recent survey, as related by Dr. Jan Spitsberger in March, 1993, show an over all liver tumor frequency of 35% and a liver carcinoma frequency of about 12%. In addition, 40% of the fish had external tumors, and over 60% of these were cancers, not papillomas. To quote Dr. Spitsberger: "This suggests that the fish in Presque Isle Bay are exposed to a rather potent carcinogen or carcinogens..." I agree completely with this statement and with Dr. Spitsberger's conclusions:

"Taken together, the tumor transmission studies, the molecular biology studies, electron microscopy studies, and the studies of seasonal influences on the neoplasms, all suggest that the orocutaneous papillomas of brown bullheads are not likely to be caused by a viral agent and are more likely to be caused by an environmental carcinogen. The liver neoplasms which are also often seen in fish affected by orocutaneous papillomas are an additional indication of the presence of one or more environmental carcinogens in brown bullhead habitats."

As an aside, the age data appear wrong to me; at least either they are incorrect or all my published age data are incorrect.

Given a high tumor rate, caused by carcinogens, which carcinogens are the likely cause? While volatile nitrosamines are carcinogens, they have never been associated with tumor epizootics in wild populations of fish. What has been repeatedly identified as the cause of such epizootics (and demonstrated to cause liver and external tumors in the laboratory) are PAHs. The list of species and locations on which a PAH-fish tumor cause and effect relationship has been proposed is quite extensive.

So the next question is: Are PAH elevated in Presque Isle Bay? While metals values for each individual site in the Bay are presented in Chapter 4, such values are not presented for PAH. We do get rankings of sites (Table 4.12) and an average value for all locations (Table 6.3) except sites 6 and 16 (ranked second to last and last) and site 17 (which in reality was an analysis of asphalt pieces). However, the FWS 1991 Table does show reasonably consistent values among locations; thus the average calculated is useful.

The fact that the PIB carcinogen values are 20% or 30% of the tumor site's average is not nearly as important as the fact that they are 2 to 3 1/2 times greater than the tumor site's lower range value.

In my opinion, the PAH concentrations in Presque Isle Bay are sufficient to explain the observed tumor frequencies. This opinion is further bolstered by the elevated levels of PAH metabolites found in PIB bullhead bile, as reported by GERG of Texas A&M on June 21, 1993. A viral etiology is not needed nor, in my opinion, should a lot of time, energy, and money be expended looking for nitrosamines. Time, energy, and money would be better spent to determine the source of the PAH and verify whether the input was historic or is ongoing.

So one to part three of this question; what is the source of the PAH? I believe Table 2 (ch. 1, p. 10.5) is misleading since it implies that all PAH enter from storm sewers. However, as explained in chapter 5, p. 3 and as elaborated in Table 5.3, PAH were, in actuality, not detected in analysis of CSOs. I am unclear as to why a loading value was developed for a non-detect in the case of CSOs, but not in the case of Erie Forge and Steel, also a non-detect (Table 5.2) or in the case of the other industries whose wastes weren't tested for PAH. In any event the truth seems to be that we have, at this time, no data whatsoever on where the PAHs are coming from.

If we look at the other locations with epizootics of fish tumors across the country, what have been the PAH sources in those cases? The vast majority of such sites have received PAH from either coking facilities or creosote plants, with a few relating to syn-fuel plants, petroleum cracking, or aluminum production. Coke production is not mentioned in conjunction with either Erie Forge & Steel or Urich Foundry. However, toward the back of Chapter 5 under the heading of Groundwater Contamination (p. 25) two coking facilities are mentioned in passing; Erie Coke and Kopper's Coke Plant. In a RAP which lists PAH as "(probably)" (ch. 5, p. 1) a pollutant of concern, one would hope that coking facilities would receive a more prominent and detailed discussion, including their period of manufacture, discharge locations, and dump sites. It would be interesting to know if any other coking facilities have been active in the recent past or are currently active. PAHs are also noted in high concentrations at other dump sites (Lord Corp. and Kimmel).

In summary, I do not believe sufficient data has been taken to ascertain the source of the PAH. Identifying that source (and whether it is ongoing) will be crucial to developing a successful remediation strategy.

- Does the plan embody a systematic and comprehensive ecosystems approach? Have the problems, sources and causes been examined within an interdisciplinary framework?

The authors have presented an overview of the ecosystem and a variety of studies on different organisms. However, recent ecosystem changes need a more comprehensive discussion. In particular the issue of zebra mussels, their effect on algae, the secondary effect on the planktonic food chain, effects of increased water clarity on macrophytes, and concentration of toxicants by the mussels and the passage of those into sediment through feces and pseudofeces. Effects of shells and intake obstruction could also be considered on impairment.

- To what extent are relevant human health issues addressed in the RAP? Have human health data been included and evaluated?

I did not notice any discussion of potential human health effects, other than fish fillet data.

- Have stakeholders been identified? Have they been involved in defining problems and causes? Has the broader community been informed about the RAP? Are there regular opportunities for public input? Is there a detailed plan for public participation and information?

I found this difficult to evaluate, but stakeholders appear to be involved.

- If there is data or information missing, is there a mechanism to fill these gaps?

Studies on tumor frequency and bile metabolites are ongoing or have yet to be included. Similarly, benthic invertebrate studies are still being completed. However, additional studies are certainly needed on the source and loadings of PAHs. I also believe additional studies are warranted on sediment toxicity and zebra mussel induced alterations.

**MEETING OF THE INTERNATIONAL JOINT COMMISSION'S
REMEDIAL ACTION PLAN STEERING COMMITTEE
TO REVIEW THE STAGE 1 ST. LOUIS RIVER SYSTEM RAP**

**DULUTH ENTERTAINMENT AND CONVENTION CENTER
FRENCH RIVER ROOM
530 HARBOR
DULUTH MINNESOTA 55802**

**Thursday, March 18, 1993
6:00 p.m.**

- | | | |
|-----|--------------------------------------|---------------|
| 1.0 | Welcome and Introductions | |
| 2.0 | Overview of IJC RAP Process | IJC |
| 3.0 | Overview of St. Louis River RAP | RAP Team |
| 4.0 | Overview of Public Participation | PAC Chair |
| 5.0 | Overview of RAP Comments | IJC |
| 6.0 | Reviewer Comments | RAP Reviewers |
| 7.0 | Discussion, Clarification, Questions | ALL |
| 8.0 | Summary | IJC |
| 9.0 | Adjourn | 9:00 p.m. |

DRAFT standard Format
for meeting...
Jim Chandler, IJC
Washington
will chair
mtg.
Mde

ILL.
R.O. WINDSOR
SEP 27 1993

TO: Mark Brederland
RAP Review Coordinator
International Joint Commission

FROM: Mary Beth Binns
Environmental Planning Coordinator
Cuyahoga River Community Planning Organization

DATE: September 27, 1993

RE: REVIEW OF PRESQUE ISLE BAY REMEDIAL ACTION PLAN

Dir. _____
Secty WQB _____
Secty SAB _____
H. d. SS _____

Thank you for the opportunity to provide review and comment on the Presque Isle Bay Remedial Action Plan. My belated comments should not reflect negatively on the RAP document or my willingness to review the report. Having read the document, I am left feeling very optimistic and enthusiastic about the Presque Isle Bay RAP process. Nonetheless, the report is written in such a way that a cover-to-cover reading is necessary to adequately understand this RAP process, the complexities of the ecosystem, the vast amount of work done by PADER et al., and the complete results of each analysis. The report deserves a thorough review.

Overall, the report documents an impressive process. Stage One development spawned additional agency research and, in some cases, independent community based work - very positive signs for the RAP process. The demonstrated level of cooperation among agencies in developing the analyses is most encouraging. The participation and contributions of additional institutions, Mercyhurst College for example, are a priceless asset.

The report in general, as well as certain impaired beneficial use analyses, could be enhanced with more visuals. Tables do alright for technical people, but visuals work even better. Enhanced maps and graphics present the issues more effectively to the general public as well. In that vein, the executive summary could be better oriented toward public interest and understanding.

The review did not leave me with important information on socio-demographics of the Erie region. Some statistics to that effect could be presented. It would be useful to discuss in general the categories of industries present and their relative significance to the economy. What is the trend in regional population growth, or decline?

It could also improve the report to demonstrate the involvement of the public in its development. How much attention was paid to this process by the public at large? How many of the non-agency people participated in problem definition on a regular or irregular, maybe even one-time, basis. Which stakeholder organizations are well represented? Sections 8.5 and 9.3 are fine policy statements, but I have no feel for how well they were employed in the development of the Stage One Report or the level of commitment to developing public awareness or expanding public involvement in Stage Two.

With respect to the RAP process as a whole, I am not sure in which stage this process is engaged. Several contradicting statements are made in the report. While understanding that there is overlap between stages, and that remedial strategies can be developed for clearly identified problems while other problems are still being identified, I believe this process would benefit from a clearer idea of its status. A clearly articulated problem statement in a Stage One Report, defined as such, greatly facilitates the development of remedial strategies in a formal Stage Two process.

In my review of the technical details, I have come to understand how unique Presque Isle Bay is. The review inspired me to travel to Erie one Saturday to experience it first hand. Not only is it a one-of-a-kind outdoor experience on the south shore of Lake Erie, but it presents some unique challenges to scientists as well. It seems as though this process leaves all of us with some large questions. Where do all the pollutants go? Where, if anywhere, does accumulation take place? How long, if ever, will it take before accumulation does cause biological harm?

The fact that a RAP process is in place here poses a unique opportunity. Is it possible to demonstrate any phenomena here that may be more difficult to demonstrate elsewhere in the Great Lakes System (because Presque Isle Bay is largely a closed system within the closed Great Lakes system)? Specifically, I have in mind to demonstrate the effects of atmospheric deposition, as in the elevated arsenic levels of the sediments in Big Pond; and accumulation and bioaccumulation rates. Perhaps the AOC could leverage Great Lakes Protection Fund resources to develop studies to address these issues.

Furthermore, because of the concentration of fishers and water sport recreationists, studies of their health may be most feasible here. Does PIB have a population of subsistence fishers? What is the rate of accumulation of contaminants in their systems? Similarly, do people who come into contact with the water in PIB contract gastrointestinal illnesses? Do medical care facilities or druggists think to ask if observed illnesses are connected to water contact? Are the fecal coliform standards adequate, or are they overly restrictive?

Finally, I find it difficult to imagine that the tributaries to Presque Isle Bay are not impacted by the sites listed in 5.2.2 and CSOs (81% of which begin in Mill Creek). How could those streams be healthy? Should an ecosystem approach to remediation take into consideration the health of those tributaries, or are the tributaries there to dilute the problems before reaching the bay? "Mill Creek Tube" seems somewhat science-fictional to me. Will it always be that way? It is such a large tributary that it should be possible to find people who could benefit from the restoration of that area. However, restoration in Stage Two will not be as easy if the problems are not clearly articulated in Stage One.

SPECIFIC COMMENTS

DESCRIPTION OF IMPAIRED BENEFICIAL USES

Fish Consumption

Are any stakeholders concerned about the level of human health protection afforded by the FDA action levels?

It will be important to stay in touch with the issue of fish consumption and emerging information about contaminant levels, and to continue fish tissue sampling programs using basin-wide standardized protocol.

Benches

I applaud the innovation that went into the FWS development of a ranking process, but was this strategy peer reviewed? Is it appropriate to draw conclusions about the correlation between the presence of pollution sensitive taxa and sediment contamination based on the FWS ranking process without such a peer review. I believe that the findings of this process are unwisely weighted in the Stage One Report. On the other hand, with broader exposure and an opportunity to incorporate the comments of other experts, such a ranking may offer a rigorous and reliable test.

Furthermore, beyond the limited scope of the sediment bioassay tests, there is no discussion of the general health of the benthic organisms found in situ. Perhaps the Mercyhurst study or another could be expanded to include a qualitative review of organism health. Guidelines for such a study do exist. In some AOCs, macroinvertebrate organism health is used as a finer-tuned indicator of localized pollution problems. Could this type of study provide useful information in conjunction with the FWS ranking process?

Restrictions to Dredging Activities

The description of the analysis for this beneficial use seems incomplete or somewhat confused. Table 1 indicates an impairment, suggesting that there are restrictions on dredging or disposal activities due to elevations of specified parameters, and table 4.14 references a PADER sample location named "Confined disposal area". However, the text does not state what becomes of the heavily contaminated dredgings. Is their disposal confined, or are they disposed in the open lake? If all sediments are disposed in the open lake, is it at site 15 (which is only identified in figure 4.1 in a discussion of fish and wildlife populations)? Are impacts to the aquatic communities from open lake disposal being measured? If dredged sediments are not confined, is this not the mandate to do so? How much of what is dredged must be confined? At what cost? If this beneficial use impairment is the mandate to reduce sediment toxicity, some economic analysis could be helpful.

Perhaps it is not the dredged sites which contain the heavily contaminated sediments (a point which could be elucidated in the text), but then should this beneficial use be considered impaired? As it is suggested in the text, USEPA guidelines are 15 years old and do not reflect current scientific knowledge regarding the extrapolation of human health risks from sediment contamination levels. Therefore, there really is no guidance here for indicating problems to the aquatic community. There is only the suggestion that those heavily contaminated dredgings should be confined.

Beach Closings

The analysis of available data on fecal coliform levels could be made stronger by separating wet weather and dry weather sampling events. Presque Isle Bay is probably used as extensively the day after a rain as the day before, and the bacteria numbers presented do not assure me that the acute standard is being met. In fact, experience dictates that anywhere there is a combined sewer system, there are elevated levels of bacteria for up to 72 hours after a rain event. Would this analysis or subsequent remedial action benefit from a sampling of bacteria on a wet weather basis, or possibly even daily?

Have any stakeholders questioned the use of the present standard or the geometric mean as adequate for the protection of health?

Why is it illegal for swimming in those areas referenced in the third paragraph on page 44? Could swimming become a protected use in those areas; would it take a level of public will currently undemonstrated? Were those who do swim in those areas contacted, as "stakeholders" of the RAP process? Are they getting sick from water contact? Is there any notice to the people who use the water, "albeit illegally" in some instances, that exceedances of the bacteria standard could be occurring for up to 72 hours after a rain event?

Fecal coliform should be listed in the last paragraph before section 1.3 on page 10.

Would it be appropriate to revisit the question of recreational impairment due to bacteria levels? Would it also be appropriate to apply the standards to areas where water contact as a beneficial and protected use could be expanded?

Degradation of Aesthetics

Where do the floatables and street litter commonly found in combined sewer overflow go? Is anyone annoyed by this stuff? Is it worth noting this in the assessment of aesthetics?

Loss of Fish and Wildlife Habitat

Is it possible that a loss of open space in the watershed has resulted in any impacts to fish and wildlife populations in the PIB? If the Stage One Report were to highlight the fact that only 16% of the watershed remains in open space, would this facilitate the development of a mandate for Stage Two to protect that remaining habitat or open space? Is a study needed to evaluate the significance of the remaining habitat to the wildlife populations in the watershed. Would it be useful to investigate and present the likely future of any piece of that remaining habitat or open space?

SPECIFIC OBJECTIVES OF GLWQA

Were the Pennsylvania Code Title 16 numerical water quality criteria compared to UC general and specific criteria? Is the PADER list inclusive of all UC contaminants of concern? Will future water quality sampling programs need to be expanded to include the UC criteria?

There is a brief mention of UC water quality criteria in the first paragraph under section 3.5.1, but I don't find any comparison of PADER criteria or measured levels to the actual UC values. Is there a will to reduce pollution levels, of for example, the UC critical 11, toward a goal of virtual elimination of toxic chemicals? I was only able to find a brief policy statement in Section 8.5 of the document.

There is also the statement made at the bottom of page 60 that contaminants of concern are only those which exceed the established criteria for dredging. While this prioritization of contaminants of concern is honorable, if the process is perceived as incremental, it does not reassure me that all others included in the UC specific objectives have been or will be considered. The fact that no "water column impairments" were indicated (also on page 60) is to be interpreted as no Pennsylvania Code Title 25 water quality criteria for toxic contaminants, is however not an assurance that all contaminants of concern are tested for.

Finally, it appears that some exotic contaminants were sampled for in investigations of sources of contamination to ground water. The list of sites is impressive, and it appears that a great deal is known about each site. However, I don't find comparisons of measured levels to UC criteria. If a strategy is needed to eliminate those sources of persistent toxic discharges, would the case be strengthened by UC specific objectives? Have impacts to the tributaries from these sites been measured?

ECOSYSTEM APPROACH

There is some room in the Presque Isles Bay RAP process to develop the ecosystem approach further, and toward this end, I offer some ideas:

- o a look up the tributaries for current impacts of pollution and previous land use decisions, as well as for potential future land use decisions which could further impact the PIB itself (can each tributary exist as a healthy, independent micro-ecosystem, and wouldn't an unhealthy tributary, in terms of biological communities and habitat, contribute poorly to overall health of the bay?);

- o a little more attention to fish community structure, while still emphasizing the highly respected sports fishery and those species on which the game fish feed (this could be especially useful in analysis of the tributaries);
- o in addition to bay-wide averages, attention to hot spots in areas of the Bay (like the Sommerhelm WTP, the ore dock, and Misery Bay) where pollution is likely to be concentrated and resulting problems would perhaps be more obvious;
- o a holistic look at a possible causal relationship between elevated levels of contaminants in the sediments and the health of the benthic macroinvertebrate communities and fish tumors - are there perhaps contaminants which should be investigated other than those established by the USEPA guidance for pollutional characteristics in sediments, a body of criteria not well supported for its demonstrated protection of aquatic wildlife; similarly, it would be worth noting somewhere that the loss of habitat in the "non-PIB" areas of the watershed (resulting in 16% remaining open space) is likely to have had some impact on the fish and wildlife populations in the watershed; and
- o a note about the people in the region - how they were and can still be involved, through surveys, census, town meetings, classrooms, fairs and festivals, in order to celebrate the uniqueness of this resource, capture their visions, and enlist their help as individual stewards of the Bay.

RELEVANT HUMAN HEALTH QUESTIONS

Are there subsistence fishers in the PIB region? Are they adequately protected by FDA action levels?

Is there appropriate notice to hunters in the PIB area that contaminant levels in waterfowl have been known to exceed the PCB FDA action level, regardless of the source of contamination?

Has a process been established to identify whether people are getting sick from water contact? Do medical care facilities know to ask if gastrointestinal illnesses or eye/ear/nose/throat infections could be related to water contact?

STAKEHOLDERS AND PUBLIC PARTICIPATION

In the problem definition phase, was there an attempt to engage:

Millcreek sewer authority

Summit Township

Greene Township

Harborcreek Township

user groups,

i.e., swimmers, 1,500 boaters based in erie harbor, including the sixteen marinas, water skiers, sail boarders, picnickers, hunters, fishers, and hikers

significant dischargers

How could their participation be expanded from this point forward?



International Joint Commission
Commission mixte internationale

GREAT LAKES REGIONAL OFFICE

RECEIVED

OCT 4 1993

**ENVIRONMENTAL RESOURCES
MEADVILLE REGIONAL OFFICE**

September 28, 1993

To: Addressees *MB*
From: Mark Breederland, Presque Isle Bay RAP Review Coordinator
Subject: **PRESQUE ISLE BAY STAGE 1 RAP REVIEW MEETING / REVIEWS**

Thank you for your subject reviews of the Presque Isle Bay RAP. Enclosed, for your information, please find copies of all the reviewer comments I've received to date. As mentioned, the subject meeting will be held on Thursday, October 14th from 6:30 p.m. till 9:30 p.m. at the Villa Maria College Campus Admissions Center in Erie, Pennsylvania. A block of \$40.00 rooms has been set aside under the IJC at:

Bel Aire North Hotel
2800 West 8th Street
Erie, Pennsylvania
814-833-1116

You will need to make your own reservations. **I would like to meet all reviewers in the hotel lobby at 4:45 p.m. and we would like to do an early dinner at the Bel Aire with the IJC delegation to brief you on the review meeting.** We will then be transported to the meeting room, which is located nearby, by Mr. Jim Rozakis and Mr. Kelly Burch, Pennsylvania Department of Environmental Resources or their staff. I've enclosed a map of Erie for your information and you can contact me or Jim Rozakis (814-332-6945) if you need assistance (a shuttle does run from the Erie Airport to the Bel Aire Hotel).

Thanks again for the time and energies you have committed towards the RAP process. I'm confident you have added significant value to the ongoing Presque Isle Bay RAP process as well as to the Commission.

Addressees:

Mary Beth Binns
Murray German
Richard Thomas

Paul Bauman
Dave Borgeson
Tim Bartish

Joe DePinto
Louise Knox
Trefor Reynoldson

cc: G. Durnil
J. Houston
K. Burch

J. Chandler
B. Kirschner
J. Rozakis

A. Hamilton
D. Dolan
C. Sapp

Windsor • Ottawa • Washington

100, avenue Ouellette Avenue, Windsor, Ontario N9A 6T3 (519) 256-7821
or/ou P.O. Box 32869, Detroit, Michigan 48232 (313) 226-2170

DRAFT

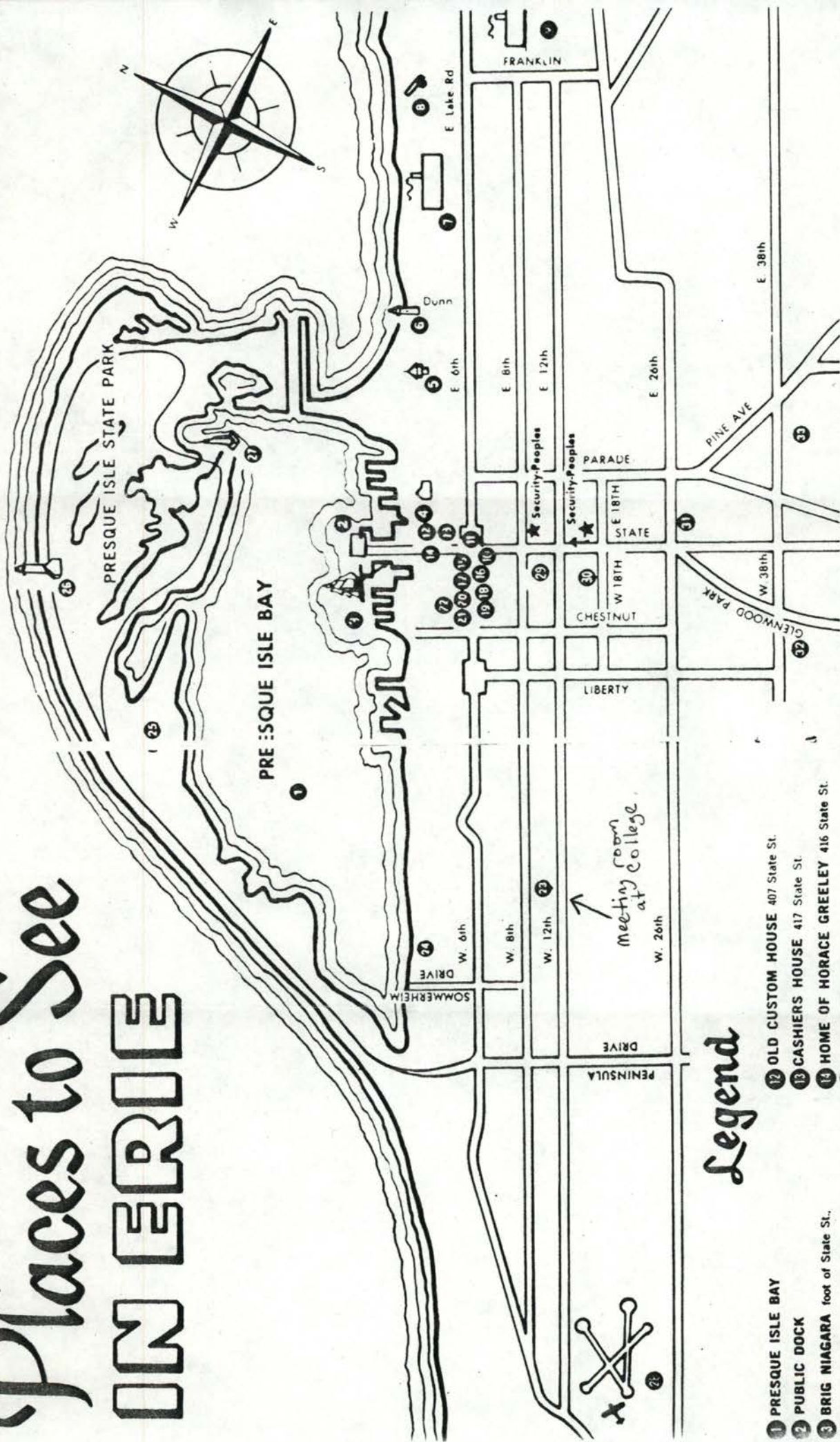
**MEETING OF THE INTERNATIONAL JOINT COMMISSION'S
REMEDIAL ACTION PLAN STEERING COMMITTEE
TO REVIEW THE STAGE 1 PRESQUE ISLE BAY RAP**

**VILLA MARIA COLLEGE CAMPUS
ADMISSIONS CENTER
ERIE PENNSYLVANIA**

**Thursday, October 14, 1993
6:30 p.m.**

1.0	Welcome and Introductions	
2.0	Overview of IJC RAP Process	IJC
3.0	Overview of St. Louis River RAP / Public Participation	RAP Team/PAC
4.0	Overview of RAP Comments	IJC
5.0	Reviewer Comments	RAP Reviewers
6.0	Discussion, Clarification, Questions	ALL
7.0	Summary	IJC
8.0	Adjourn	

Places to See IN ERIE



Legend

- | | | |
|---|---|--|
| 1 PRESQUE ISLE BAY | 23 VILLA MARIA COLLEGE 2551 W. Lake Rd. | 29 ST. PETER'S R. C. CATHEDRAL
10th and Sassafras St. |
| 2 PUBLIC DOCK | 24 SOMMERHEIM DRIVE PUMPING STATION. | 30 THE MALL uptown Erie, |
| 3 BRIG NIAGARA foot of State St. | 25 PRESQUE ISLE STATE PARK | 31 ERIE STADIUM |
| 4 PERRY MEMORIAL HOUSE 2nd and French Sts. | 26 PRESQUE ISLE LIGHTHOUSE | 32 ERIE ZOO, GLENWOOD PARK |
| 5 GEN. ANTHONY WAYNE BLOCKHOUSE 560 E. 3rd | 27 PERRY MONUMENT | 33 MERCYHURST COLLEGE 501 E. 38th St. |
| 6 OLD LAND LIGHTHOUSE foot of Dunn Blvd. | 28 PORT ERIE AIRPORT W. 12th St. | |
| 7 HAMMERMILL PAPER CO. East Lake Road | | |
| 8 GRIDLEY CIRCLE Lakeside Cemetery. | | |
| 9 GENERAL ELECTRIC East Lake Road, | | |
| 10 CITY HALL Erie's new administration building. | | |
| 11 PERRY SQUARE downtown Erie | | |
| 12 OLD CUSTOM HOUSE 407 State St. | | |
| 13 CASHIERS HOUSE 417 State St. | | |
| 14 HOME OF HORACE GREELEY 416 State St. | | |
| 15 ERIE CLUB 6th and Peach Sts. | | |
| 16 GANNON COLLEGE 109 W. 6th Street, | | |
| 17 ERIE COUNTY COURT HOUSE 130 W. 6th Street, | | |
| 18 ST. PAUL EPISCOPAL CATHEDRAL 133 W. 6th St. | | |
| 19 CHURCH OF THE COVENANT (Presbyterian)
247 W. 6th St., | | |
| 20 ERIE ART CENTER 338 W. 6th St. | | |
| 21 ERIE PUBLIC MUSEUM 356 W. 6th St. | | |
| 22 ERIE PLANETARIUM 356 W. 6th St. (rear) | | |

September 22, 1993

Subject: 1993/1994 DER Work Plan for studying the effects of hazardous substances/toxics on Presque Isle Bay fish.

The following is a outline of the proposed work to be performed on Presque Isle Bay for 1993/1994 provided the necessary funding becomes available. The research for 1993/1994 will focus on the causative agents involved in the tumor promotion affecting various fish species, within the bay, especially brown bullheads.

The results of the 1992 study have tended to rule out the theory of disease or viruses as the causative agents of fish tumor formation. Therefore, this study will focus on hazardous waste substances/toxics as the likely causes of tumors and fish tissue contamination.

The following fish sampling schedule is proposed for 1994:

1. A minimum of 4 fish species will be collected from 4 locations within Presque Isle Bay and at one location (control) outside the bay. A total of 100 individuals will be taken from all of the combined sampling locations. Laboratory tests to be performed on these fish include complete histological work up, bile analyses, and fish flesh contaminant analyses.

Cost estimate = 100 indiv. x \$200/fish = \$20,000 (contaminants)
100 indiv. x \$150/fish = \$15,000 (histological)
Total = \$35,000

(DER's 25% portion of matching funds will include field, laboratory, data analyses, and report preparation time.)

2. Fish collections will be started in early spring due to the migratory patterns and spawning behavior of various fish species.
3. The study is contingent upon the procurement of the following sampling equipment and related items: (Approximate costs are provided)
 - a. Variable voltage pulsator for electrofishing = (\$4350)
 - b. Wisconsin ring and boom (anode) with wiring harness for electrofishing = (\$1030)
 - c. Portable AC/DC generator for electrofishing = (\$1800)
 - d. Miscellaneous wiring, plugs, lights, 12 volt marine battery and charger for electrofishing boat = (\$500)

- e. Portable notebook 486 computer for data storage,
analysis, and report work = (\$2000)
- f. Van Dorne water sampler for depth integrated
sampling = (\$300)

(Total = \$ 9,980)

(Equipment items need to be purchased as soon as possible (preferably fall of 1993) in order to outfit the electrofishing boat for the spring 1994 sampling period)

- 4. Total Cost of project including fish contaminant analyses and equipment purchases is estimated at \$44,980.

INTERNATIONAL JOINT COMMISSION

Great Lakes Regional Office

100 Ouellette Avenue, Eighth Floor
Windsor, Ontario N9A 6T3
Phone: (519) 257-6700/FAX: (519) 257-6740

P.O. Box 32889
Detroit, Michigan 48232
Phone: (313) 226-2170

TELECOPY

NOTE: Please call if there is an error in transmission,
otherwise, we will assume you have received it in good order

TO: ☐ Jim Rozakis / Kelly Burch, PADER FAX: 814-332-6831

FROM: Mark Brederland

Date: September 27, 1993

MESSAGE

8 pages follow

Hi Jim / Kelly --

from Paul Bauman

This arrived in my office 10 minutes ago via Express mail.....sorry I didn't get it to you before your PAC meeting today. I do have some tentative travel plans and would like to draft an agenda soon for the 14th meeting....I've enclosed a DRAFT one we used in Duluth.....

I'll look forward to talking to you in the near future. MARK.



United States Department of the Interior

Fish and Wildlife Service

National Fisheries Contaminant Research Center

Route 2

4200 New Haven Road

Columbia, Missouri 65201

TAKE
PRIDE IN
AMERICA

In Reply Refer to:

Paul C. Baumann, Leader
The Ohio State University
473 Kottman Hall
2021 Coffey Road
Columbus, Ohio 43210

September 23, 1993

Mark A. Breederland
RAP Review Coordinator
International Joint Commission
Great Lakes Regional Office
100, Avenue Ouelette
Windsor, Ontario
N9A 6T3 Canada

Dear Mark:

Here is my review of the Presque Isle Bay Remedial Action Plan. I was more detailed in reviewing the PAH and fish tumor sections than I was in reviewing the rest. Hope this is of help.

I will be out of the office from September 24th until October 4th. However, call if you have questions, and I am planning to attend the conference in Erie on October 14th.

Sincerely,

Paul C. Baumann

Paul C. Baumann, Ph.D.

PCB/cmw

I.L.C.	
R.O. WINDSOR	
SEP 28 1993	
Dir.	_____
Secty WQB	_____
Secty LAB	_____
Head PS	_____

REVIEW

PRESQUE ISLE BAY
REMEDIAL ACTION PLAN

- O Have the environmental problems in the Areas of Concern been adequately described, including identifying beneficial uses impaired, the degree of impairment and the geographic extent of such impairment?

Only two use impairments have been designated; one for tumors in fish and another for dredging activities. The sediment concentrations of metals which caused the dredging impairment seem well documented. Tumor investigations are ongoing and I will comment on those in more detail later.

However, I have some concern about the data available for use-impairment decision making in a couple of the other categories. For instance, under "Biotoxicity of Water Column or Sediment Contaminants" (ch. 4, p. 15, and "Sediment Toxicity to Benthos" (ch. 4, p. 32) both use the same data sets: two Corps of Engineers studies from eleven and seven years ago. Both of these were 96 hour acute bioassays. No mortality was observed for fathead minnows, but *Daphnia* mortality was elevated (10%-50%) in the harbor basin and disposal area for both assays and in the inner harbor for the 1986 assay. Furthermore, *Hexogenia* mortalities were also elevated for the outer and inner harbor sites in 1986. These data are discounted because a single lake reference site also caused mortality in these tests. The high mortality of the reference site could have three possible explanations.

- 1) All (or most) sediments in Lake Erie are at least "moderately polluted".
- 2) The lake reference site chosen is "moderately polluted" but not representative of most Lake Erie sediments (and thus is an inappropriate reference selection).
- 3) The mortality was caused by inappropriate test conditions (such as the low DO mentioned on p. 17) which means that all the test results may be compromised.

The authors of this section selected #1 as the appropriate explanation without backing that choice with data from other open lake stations which must be available. Without such confirming data, either #2 or #3 seems more feasible to me. I am also at a loss as to why, after seeing such a high mortality from the single lake reference site in 1982, those performing these assays in 1986 used the same single location instead of adding more reference locations or at least changing the one they had.

In a related section, "Benthic Macroinvertebrate Community Structure", conclusions are drawn from a similarly thin data base. Early studies showing the community structure to be impaired are put aside as too old. The new study commissioned has not quite been completed, but shows a pattern "similar to that of the earlier studies" (ch. 4, p. 29). However, results from specific sites are then used with a complex weighting system for pollutants to attempt to correlate benthic community structure with specific contaminant loads. When the correlations attempted are not strong, the impairment issue is dismissed. Additional reasons for the dismissal include the statement that finding a comparable reference site was "not possible" (p. 29) and that "harbor areas very seldom support a well balanced benthos population" (p. 31).

Taking a closer look at the sediment correlation analysis, only 7 sites had both invertebrate and chemical data (#s 1, 2, 3, 4, 11, 13, and 16). Of these, four had characteristics of an impaired community and three (#s 1, 11, and 16) did not. Site 16 is ranked dead last for almost all pollutants (2nd last for As) and is in a sheltered pond well off the main harbor; one would expect that site to have the best community. Site one appears to be moderately polluted and site 11 highly polluted; it is a surprise that they (particularly 11) have "associations of pollution sensitive taxa". However, no detail was provided on what was actually present.

In any case, I don't believe one or two locations with better than expected fauna would cancel out a judgement that overall the benthic community is impaired. One would need much more compelling testimony to the contrary than that provided, especially in light of the undeniably high toxicant concentrations detailed under "Restrictions on Dredging Activities". It would be strange if sediments that are too "heavily polluted" for open lake disposal would have no damaging effect on resident benthic fauna.

- Has there been identification of specific objectives of the GLWOA that are not met to the extent that such failure has caused or is likely to cause impairment of beneficial uses, including the area's ability to support aquatic life?

I will focus my comments on the specific science involved in evaluating toxicant problems, rather than commenting directly on this question.

The site comparison on Table 6.3 is limited. Also, the use of the early Black River outfall value tends to give a distorted view of just how concentrated PAH need to be for tumor epizootics. The following table may provide a better perspective. It includes average PAH values for 9 locations with tumor epizootics and five reference locations. Values are given as the average of averages for each set, plus the range of averages. Black River sediment data is from 1982 (when tumor frequency was quite high) and represents a wider range of samples than the single 1980 scoop.

Table 1. Average Concentrations (ppm dry weight) of selected PAHs from locations with tumor epizootics, reference locations, and Presque Isle Bay.

Site averages	Phenan.	Fluoran.	B(a)A	B(a)P
Tumor sites (9) (range)	17 (1.0-100)	23 (1.8-76)	5.9 0.83-23)	5.2 (0.36-21)
Reference sites (5)	0.08	0.15	0.05	0.07
Presque Isle Bay 14 sites	1.6	2.8	0.9	0.9
Presque Isle Bay Sites 1, 5, 10, & 11	2.4	4.0	1.4	1.5

Table 1 includes both the 14 site average for Presque Isle Bay given in Table 6.3 and an average based on 4 "hot" sites. The latter may a better comparison to the tumor epizootic locations, where a point source is often known and sediment sampling is concentrated nearby. Also, the tumor site averages are still heavily influenced by the Black River (from which all the high end range numbers are derived).

In looking over Table 1, all values from both PIB indexes fall within the range of PAH values from locations with tumor epizootics. Even though these values are in the lower portion of the range, they are clearly elevated above reference locations. More to the point, values for the two carcinogens (B(a)A and B(a)P) are clearly up into the range of tumor locations; if the Black River were eliminated from these values, the averages for the other eight tumor sites would be 3.8 for B(a)A and 3.2 for B(a)P.

- Have the causes of the use impairments been identified, including a description of all known sources of pollutants involved and an evaluation of other possible sources? Have societal causes such as demographics, economic forces, private and public sector activities, and technological changes been described and their contribution to use impairments investigated?

I will use this question to discuss the tumors found in brown bullhead, their likely cause, and the possible sources of polynuclear aromatic hydrocarbons (PAH) in the system. To be brief, the preliminary results (N=17) of the most recent survey, as related by Dr. Jan Spitsberger in March, 1993, show an over all liver tumor frequency of 35% and a liver carcinoma frequency of about 12%. In addition, 40% of the fish had external tumors, and over 60% of these were cancers, not papillomas. To quote Dr. Spitsberger: "This suggests that the fish in Presque Isle Bay are exposed to a rather potent carcinogen or carcinogens..." I agree completely with this statement and with Dr. Spitsberger's conclusions:

"Taken together, the tumor transmission studies, the molecular biology studies, electron microscopy studies, and the studies of seasonal influences on the neoplasms, all suggest that the orocutaneous papillomas of brown bullheads are not likely to be caused by a viral agent and are more likely to be caused by an environmental carcinogen. The liver neoplasms which are also often seen in fish affected by orocutaneous papillomas are an additional indication of the presence of one or more environmental carcinogens in brown bullhead habitats."

As an aside, the age data appear wrong to me; at least either they are incorrect or all my published age data are incorrect.

Given a high tumor rate, caused by carcinogens, which carcinogens are the likely cause? While volatile nitrosamines are carcinogens, they have never been associated with tumor epizootics in wild populations of fish. What has been repeatedly identified as the cause of such epizootics (and demonstrated to cause liver and external tumors in the laboratory) are PAHs. The list of species and locations on which a PAH-fish tumor cause and effect relationship has been proposed is quite extensive.

So the next question is: Are PAH elevated in Presque Isle Bay? While metals values for each individual site in the Bay are presented in Chapter 4, such values are not presented for PAH. We do get rankings of sites (Table 4.12) and an average value for all locations (Table 6.3) except sites 6 and 16 (ranked second to last and last) and site 17 (which in reality was an analysis of asphalt pieces). However, the FWS 1991 Table does show reasonably consistent values among locations; thus the average calculated is useful.

The fact that the PIB carcinogen values are 20% or 30% of the tumor site's average is not nearly as important as the fact that they are 2 to 3 1/2 times greater than the tumor site's lower range value.

In my opinion, the PAH concentrations in Presque Isle Bay are sufficient to explain the observed tumor frequencies. This opinion is further bolstered by the elevated levels of PAH metabolites found in PIB bullhead bile, as reported by GERG of Texas A&M on June 21, 1993. A viral etiology is not needed nor, in my opinion, should a lot of time, energy, and money be expended looking for nitrosamines. Time, energy, and money would be better spent to determine the source of the PAH and verify whether the input was historic or is ongoing.

So one to part three of this question; what is the source of the PAH? I believe Table 2 (ch. 1, p. 10.5) is misleading since it implies that all PAH enter from storm sewers. However, as explained in chapter 5, p. 3 and as elaborated in Table 5.3, PAH were, in actuality, not detected in analysis of CSOs. I am unclear as to why a loading value was developed for a non-detect in the case of CSOs, but not in the case of Erie Forge and Steel, also a non-detect (Table 5.2) or in the case of the other industries whose wastes weren't tested for PAH. In any event the truth seems to be that we have, at this time, no data whatsoever on where the PAHs are coming from.

If we look at the other locations with epizootics of fish tumors across the country, what have been the PAH sources in those cases? The vast majority of such sites have received PAH from either coking facilities or creosote plants, with a few relating to syn-fuel plants, petroleum cracking, or aluminum production. Coke production is not mentioned in conjunction with either Erie Forge & Steel or Urlich Foundry. However, toward the back of Chapter 5 under the heading of Groundwater Contamination (p. 25) two coking facilities are mentioned in passing; Erie Coke and Kopper's Coke Plant. In a RAP which lists PAH as "(probably)" (ch. 5, p. 1) a pollutant of concern, one would hope that coking facilities would receive a more prominent and detailed discussion, including their period of manufacture, discharge locations, and dump sites. It would be interesting to know if any other coking facilities have been active in the recent past or are currently active. PAHs are also noted in high concentrations at other dump sites (Lord Corp. and Kimmel).

In summary, I do not believe sufficient data has been taken to ascertain the source of the PAH. Identifying that source (and whether it is ongoing) will be crucial to developing a successful remediation strategy.

- Does the plan embody a systematic and comprehensive ecosystems approach? Have the problems, sources and causes been examined within an interdisciplinary framework?

The authors have presented an overview of the ecosystem and a variety of studies on different organisms. However, recent ecosystem changes need a more comprehensive discussion. In particular the issue of zebra mussels, their effect on algae, the secondary effect on the planktonic food chain, effects of increased water clarity on macrophytes, and concentration of toxicants by the mussels and the passage of those into sediment through feces and pseudofeces. Effects of shells and intake obstruction could also be considered on impairment.

- To what extent are relevant human health issues addressed in the RAP? Have human health data been included and evaluated?

I did not notice any discussion of potential human health effects, other than fish fillet data.

- Have stakeholders been identified? Have they been involved in defining problems and causes? Has the broader community been informed about the RAP? Are there regular opportunities for public input? Is there a detailed plan for public participation and information?

I found this difficult to evaluate, but stakeholders appear to be involved.

- If there is data or information missing, is there a mechanism to fill these gaps?

Studies on tumor frequency and bile metabolites are ongoing or have yet to be included. Similarly, benthic invertebrate studies are still being completed. However, additional studies are certainly needed on the source and loadings of PAHs. I also believe additional studies are warranted on sediment toxicity and zebra mussel induced alterations.

**MEETING OF THE INTERNATIONAL JOINT COMMISSION'S
REMEDIAL ACTION PLAN STEERING COMMITTEE
TO REVIEW THE STAGE 1 ST. LOUIS RIVER SYSTEM RAP**

**DULUTH ENTERTAINMENT AND CONVENTION CENTER
FRENCH RIVER ROOM
530 HARBOR
DULUTH MINNESOTA 55802**

**Thursday, March 18, 1993
6:00 p.m.**

1.0	Welcome and Introductions	
2.0	Overview of IJC RAP Process	IJC
3.0	Overview of St. Louis River RAP	RAP Team
4.0	Overview of Public Participation	PAC Chair
5.0	Overview of RAP Comments	IJC
6.0	Reviewer Comments	RAP Reviewers
7.0	Discussion, Clarification, Questions	ALL
8.0	Summary	IJC
9.0	Adjourn	9:00 p.m.

DRAFT Standard Format
for meeting...
Jim Chandler, IJC
Washington
will chair
mtg.

Mike

To: JR
From: Kelly

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TELECOPY

*NOTE: Please call if there is an error in transmission,
otherwise, we will assume you have received it in good order*

TO: ☐ Kelly Burch, PADER FAX: 814-332-6831

FROM: Mark Breederland

Date: September 13, 1993

MESSAGE

13 pages follow

Kelly --

As mentioned, here's 2 reviewer comments which have just come in -- as other's come it I'll get them to you as soon as possible. I'll look forward to hearing from you later after you have room logistics in place for October 14th...

Thanks. MARK.

MAB

Remedial Action Plan Plan d'Assainissement

Bay of Quinte Remedial Action Plan

C/O Environment Ontario
133 Dalton Ave., P.O. Box 820
Kingston, Ontario K7L 4X6
(613) 549-4000 FAX. (613) 548-6908

August 30, 1993

Mr. Mark A. Breederland
RAP Review Coordinator
International Joint Commission
100 Ouelette Avenue
Windsor, Ontario
N9A 6T3

Dear Mr. Breederland:

Thank you for allowing me the opportunity to participate as a reviewer for the Presque Isle Bay RAP Stage 1 report. I have reviewed the document and wish to offer my comments from the perspective of a RAP coordinator. I serve as Coordinator of the Bay of Quinte and the St. Lawrence River (Cornwall) RAPs.

I found the Presque Isle Bay RAP Stage 1 report to be a well written, easy to read and highly informative document which on balance provided sufficient information for someone totally unfamiliar with the bay to recognize the problems in the Area of Concern and their causes. As a RAP coordinator, I recognize the major effort that has been devoted to the preparation of the Presque Isle Bay Stage 1 report. The effort is all the more impressive since it has been produced in only two years. Many RAPs have struggled for five or six years to prepare their Stage 1 reports. For all these reasons, I would like to offer congratulations to the Presque Isle Bay RAP.

In my detailed review comments (attached), I have identified a number of deficiencies in terms of satisfying the formal requirements of a Stage 1 RAP document. In my opinion, the most serious deficiency of the Presque Isle Bay Stage 1 document is its failure to provide the actual data that is available. It provide lots of discussion of data sets but offers very little documentation. This is unfortunate since it will require future investigators of Presque Isle Bay to

2-

duplicate the effort by going back to original sources for data. Also, as a RAP Coordinator, I had hoped to find water quality data in the Presque Isle Bay report that could be compared with conditions in the Bay of Quinte. I was somewhat disappointed on that count. The RAP process presents a unique opportunity to share information and increase our understanding of Great Lakes Ecosystem by allowing scientists ready access to a common set of comparative data for the 43 Areas of Concern. For these reasons, the Presque Isle Bay RAP should be encouraged to undertake the studies necessary to fill its data gaps and to then produce a Stage 1 Update that presents as much actual data as possible.

Thanks again for the opportunity to review the Presque Isle Bay Stage 1 report. I now know a lot about the bay. It obviously is an extremely valuable resource and an important component of the Great Lakes ecosystem. While the reasons for having Presque Isle Bay listed as an Area of Concern are not known, I am sure that the Commonwealth of Pennsylvania will benefit from having become involved in the RAP program.

Yours truly,



Murray German
Coordinator
Bay of Quinte and St. Lawrence River RAPs

PRESQUE ISLE BAY - STAGE 1 RAP DOCUMENT

REVIEW COMMENTS

by

MURRAY GERMAN

- Q1. Have the environmental problems in the Area of Concern been adequately described including beneficial uses impaired, the degree of impairment and the geographic extent of such impairment?
- A1. With two exception that I will comment on separately below, I found the PIB RAP Stage 1 report to either provide adequate information to describe the environmental problems or that it acknowledged its deficiencies and indicated that further studies would be undertaken. In particular, I was impressed with the amount of information available on fish tumors and the discussion of this information. I have not seen a RAP document that is as informative on the topic of fish tumors as the PIB RAP. It is also evident PIB has a good sport fishery and that Department of Environmental Resources has a good understanding of the bay's fish populations. The Stage 1 report also presents a good assessment of the bay's sediment contamination problem.

Restrictions on Fish and Wildlife Consumption.

Considering the magnitude of the sport fish harvest from PIB, the suitability of its fish for human consumption warrants greater attention than it appears to have received.

The fish contaminant information provided in the PIB RAP Stage 1 report is of questionable scientific value and certainly appears inadequate to support a conclusion that the fish of PIB are safe for consumption.

The report provides analyses for 51 fish fillets however these data represent a variety of fish species taken from inside and outside PIB over a period of 4 years and no information is provided concerning the size of the fish analyzed. The data set simply appear inadequate to support a comparison of levels between PIB and Outer Harbor fish or a conclusion that the PIB sport fish are safe for consumption.

Contaminants accumulate in different fish species at different rates and for those species (normally the top predators) that tend to accumulate contaminants, there normally is a strong relationship between fish length and contaminant level. Considering these factors, one would have greater confidence in regulatory agencies consumer advice if were based a larger sample size of a few key species.

In Section 4.1.1.4 dealing with fish tumors, reference is made to tissue analyses of fish samples for a wide range of contaminants having been undertaken in 1984, 1985 and 1991. It is possible that these data sets might have provide a better understanding of the contaminant levels in PIB than that possible from the data sets provided in Section 4.1.1.1.

There appears to be a conflict between the PIB RAP's conclusion concerning contaminants in fish and the Commonwealth of Pennsylvania's official position. It is stated in Section 4.1.1.1 that the Commonwealth has issued fish consumption advisories (and not rescinded them?) for PIB fish while the PIB RAP's conclusion is that fish and wildlife consumption is not an impaired use.

Eutrophication

The PIB RAP's assessment of eutrophication in PIB is the most puzzling aspect of the Stage 1 report. Based on the description of PIB and its drainage area, it just appears to be a bay that should have a eutrophication problem. This apparently was the case during the 1960 and 1970s when the bay is described as having had all of the readily recognizable symptoms of cultural eutrophication including algal blooms, dissolved oxygen depletion, malodorous conditions, reduced clarity and excessive growths of aquatic macrophytes.

These conditions are reported to no longer exist. Some recent but very sketchy information (a 1990 study) is provide to substantiate the improved water quality and the report offers two possible explanations for what has happened. The improvement in trophic status must be real. If not, the symptoms of eutrophication would still be readily apparent. However, I have difficulty accepting the 1990 study as the proof and the two possible explanations offered, while plausible, are not sufficiently advanced to be convincing.

The 1990 study is described as consisting of one sampling occasion in mid-April, a second in mid-August and a third in late-October. With two of the three sampling occasions being at the fringes of the plant growth season, the study is left with only one sampling date during the portion of the year in which the previously described classical symptoms of cultural eutrophication would have been evident. No actual data is provided. Algal densities can vary substantially within a single plant growth season in response rainfall events (nutrient loadings) and natural reasons (pulses of different species). Algal densities also vary widely from year to year based on climatic factors (e.g. wet year vrs. dry year, sunny year vrs. cloudy year, high water level vrs. low water level). For all these reasons, it is difficult to draw any conclusions from sparse information. The 1990 study appears to be deficient and does not warrant confidence in its conclusions.

With regard to the possible explanation for a major reversal of eutrophication in PIB, the Stage 1 report (page 4-39) suggests "recent advances in pollution control in PIB". Unfortunately, the report does not explain what these recent advancements have been. If, for example, the City of Erie's sewage treatment plant discharge had been relocated from within PIB to the Outer Harbor, the explanation provide would be very plausible.

The zebra mussel invasion is suggest as a second possible factor. This seems like a plausible explanation. The improvement in Lake Erie water clarity attributable to the zebra mussel invasion is a well known phenomenon. The Stage 1 report (page 3-15) makes reference to large numbers of zebra mussels being found in PIB. The difficulty in simply accepting this statement rests with the description of PIB substrate provided on page 3-3. Much of the bay is described as having organic rich sediments, some areas of sand and few large rocks or other solid substrate. These substrate types don't suggest conditions that would support a large zebra mussel population. While there might very well be a large enough zebra mussel population in PIB to have a significant impact on water clarity conditions, the information presented in the report is simply vague and requires further clarification.

Based on the physical features of PIB, it seems logical that the bay would remain well oxygenated throughout the summer. However, one has to wonder if such a shallow bay with such organically enriched sediments might not experience oxygen depletion under late winter ice conditions.

Geographic Extent of Impairment

The Presque Isle Bay Area of Concern presents a unique set of circumstances in terms of defining its geographic boundary. The confines of the bay and its drainage area are a natural geographic entity. However its drainage area covers only the central portion of the City of Erie and all of the sewage and industrial wastewater generated within the PIB drainage area is exported out of the PIB drainage area to the Outer Harbor.

The discharge in question is City of Erie's sewage treatment plant and the Commonwealth of Pennsylvania's major discharge to Lake Erie. It is a 45 mgd discharge that contains wastewater inputs from 39 industries. These seem like compelling reasons to expand the RAP's geographic boundary to include the Outer Harbor. Without addressing the environmental impact of this major discharge, the PIB RAP seems incomplete and deficient in its ecosystem perspective.

All of the factors mentioned above are acknowledged in the Stage 1 document and the report leaves the door open for possible expansion of the AOC to include the Outer Harbor. The PIB RAP should be encouraged to do this.

- Q2. Has there been identification of specific objectives of the GLWQA that are not met to the extent that such failure has caused or is likely to cause impairment of beneficial uses, including the area's ability to support aquatic life.
- A2. No. The greatest deficiency of the PIB RAP Stage 1 report is its lack of actual water quality data. Section 3.5.1 references the IJC and PADER water quality criteria and Section 4.2.1 starts by listing the use indicators that require direct or indirect water quality comparisons (i.e. numbers 2, 3, 8, 9, 10, 12 and 13).

Notwithstanding this statement, there is virtually no water chemistry data presented in the document. Table 4.8 presents some data for copper and zinc. Table 4-20 presents some data for nitrate & nitrites, chlorides sulphates iron and manganese. Tables 4-18 & 4-19 provide bacteriological data. With these few exceptions, the reader will not be able to find actual water quality data in the report. Parameters such as phosphorus and water clarity are mentioned but no data offered.

The paucity of ambient water quality data is unfortunate since a Stage 1 document should become the reference point for a future Stage 3 delisting document.

- Q3. Have the causes of use impairments been identified, including a description of all known sources of pollution involved and an evaluation of other possible sources?
- A3. Yes. The Stage 1 document provides a good description of the pollution sources within the PIB drainage area including estimates of contaminant loadings. It is clear from the document that major source of contamination is overflows from the City of Erie's combined sewers system.
- Q4. Does the plan embody a systematic and comprehensive ecosystem approach?
- A4. It would be difficult to conclude that the PIB RAP has embraced an ecosystem approach. While the report has compiled a substantial amount of information, it is presented in a compartmentalized manner with little attempt at integration. As an example, the bay's trophic status should be a function of nutrient loadings, abiotic factors and the biological interactions that are taking place. The net result should be a community structure of phytoplankton, macrophytes, macroinvertebrates, zooplankton and fish that in total reveal the bay's trophic status. While the lack of data for some components of the ecosystem hinder this type of assessment, the conclusion concerning bay's trophic status do not reflect these data deficiencies (e.g. lack of information on zooplankton and phytoplankton) or other information that seems to conflict (e.g. trophic status suggested by the benthic community).
- Q5. To what extent are relevant human health issues addressed in the RAP.
- A5. The bacteriological contamination problem and its associated risk to human engaged in water contact recreational activities appears to be adequately recognized and described. I don't believe the report provides sufficient information to support a case that there is no risk to human health associated with consumption of fish from PIB.
- Q6. Have stakeholders been identified? Have they been involved in defining the problems and causes?

- A6. The PIB RAP has established an Advisory Committee and the members are listed in Appendix D. There is Reference to the Advisory Committee in Section 9.3 of the Stage 1 report and the reference to the Advisory Committee appears on the cover of the document. Beyond these references, there is no information provided concerning the Advisory Committee's role or involvement in the RAP.
- Q7. If there are data or information missing, is there a mechanism to fill these gaps?
- A7. Yes. For the most part, the Stage 1 report acknowledges data gaps and indicates plans to obtain the missing information.



great lakes
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Joseph V. DePinto

Director

Monica Moshenko

Administrative Assistant

September 8, 1993

Mr. Mark A. Breederland, RAP Review Coordinator
IJC Great Lakes Regional Office
P.O. Box 32869
Detroit, MI 48232

Dear Mark:

Please find enclosed a copy of my remarks on the Presque Isle Bay RAP stage I report. I hope the comments are pertinent and at the right level of detail. Let me know if you have questions or require additional input prior to the October 14 meeting in Erie. I am currently planning on attending that meeting. See you then.

Best Regards,

Joseph V. DePinto, Director
Great Lakes Program

enc.

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SECRET

Review Comments for
Presque Isle Bay Remedial Action Plan - Stage I

Prepared by
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Have Environmental Problems Been Adequately Described

The site description and specification of extent of AOC is a concern to me. First, the map presented in Figure 1 is virtually impossible to read and to assess whether the watershed boundaries have been correctly assigned. *Are there really no creeks that originate upstream of the area indicated?* Also, the PIB is called an "estuary" but then it is indicated that virtually no exchange of water with Lake Erie occurs; where is the "estuary" exchange? *How was the mean hydraulic retention time of 2.5 years arrived at? Was a hydrologic budget developed for the system?* If so, it should be presented in this report. A related question is the exchange of Lake Erie water with PIB. The report claims it is very small, but is there data to confirm that it is negligible in terms of pollutant mass exchange? Have there been any studies which measure flow magnitude and direction versus time?

Have any changes in the biological community been detected following the cessation of cooling water use by Penelec in 1990 (ref. page II-4)?

In the report (ref. page III-15), zebra mussels have been mentioned as having inhabited PIB in large numbers and as having a potentially large impact on the bay aquatic ecosystem. A major question in my mind would be its impact on the fishery by shifting the energy flow away from the planktivorous forage base and into a benthic food chain. *Has this potential impact on the PIB fishery been evaluated?* This could change the conclusion that fish populations are not suffering from a "use impairment" if the level of sport/predator fish biomass in the bay now exceeds its carrying capacity. Also, the considerable increase in water clarity could have an impact on fish bioaccumulation of toxic chemicals by increasing the amount of dissolved chemical in the water column. **Because of these recent influences of the zebra mussel invasion, up-to-date surveys of plankton biomass and production (Sect. 4.1.1.80, the capacity of the system to support a healthy sport fishery (Sect. 4.1.1.3), and of fish body burdens of chemicals (Sect. 4.1.1.1) are essential.**

It is difficult to compare sediment contaminant data without knowing something about the relative location of the samples and, perhaps more importantly, about the sample collection, storage, and pre-treatment protocols (e.g.,

surface grabs versus cores, methods for drying, etc.). This information is lacking for the sediment chemistry data presented in Sect. 4.1.1.7. Also, it would be helpful, if the selected data sets included physical characterization of the sediments (e.g., porosity, particle size information), to include these data in the summary. With regard to this section, if sediments appear to be in such a degraded condition, why don't sediment toxicity bioassays corroborate the chemistry data? Also, with the shallow water column depth and long hydraulic retention time of the bay, I would expect that the sediments would have a more significant impact on water quality (because of the relative importance of sediment-water interactions in systems like this) than appears from the data presented in the report.

Referring to section 4.1.1.8 on eutrophication, what was the trophic state index model used for this assessment. It should at least be referenced if not described in more detail in the report. I have an inherent mistrust of TSIs, because they have to make *a priori* judgments as to the inclusion and relative importance of various measures of trophic state or degree of eutrophication. For example, in a shallow system like PIB D.O. levels might never be a problem even if algal productivity is very high. Also, how were phytoplankton assessments conducted? Were algal counts made and genus or class identified or was chlorophyll *a* the only measurement made? I guess I am not convinced about the "no impairment" conclusion for this category.

Have Causes of Use Impairments and Sources of Impairment Causes Been Identified

The physical description of the system (shallow, high wind wave action, fine-grained sediments) suggests a very high potential for sediment resuspension. *To what extent has this factor been investigated as a cause of use impairments?* While the authors have clearly estimated the reservoir of in-place pollutants, they have made no attempt to estimate or to gather data on the potential for sediment resuspension to impact the system.

If the detection limits on PAHs (10 µg/l) is indicative of the rest of the organics in the wastewater treatment plant influent, then these data are of relatively little value because these are very high DL. I do think that the report can state, on the basis of these data that CSOs are not a major source of organics to the PIB.

Human Health Issues

I have a slight problem with the analysis presented in Section 4.1.1.1 on fish consumption advisories. While the conclusion that PIB fish have similar body burdens to lake Erie fish will probably not change, I disagree with lumping all species of fish and all age classes of fish together in making comparisons. These factors should be taken into consideration in reaching a conclusion regarding the degree of impairment, if any, of fish consumption.

Systematic and Comprehensive Ecosystem Approach

Some consideration of atmospheric influences is present in the report; this reflects a recognition of this part of the ecosystem. *But has the relative contribution of atmospheric deposition to the loading of contaminants to the system been estimated or measured?* Given the small watershed to bay surface area ratio and the relatively long hydraulic retention time, this may be a significant loading factor.

I do not care for the statement on page 4-2 that "restrictions on consumption of fish and wildlife only qualify as an AOC use impairment if the elevated levels of the offending contaminants result from the input from the AOC's watershed." This seems to be contrary to the ecosystem approach concept. What is the reason for the inclusion of this statement in the AOC listing guidelines?

Stakeholder Involvement

Missing Data/Information and Mechanisms to Fill Gaps

Updating the city's mapping of its sewer system and a development of a more certain quantitative understanding of the relative contribution of storm and combined sewers (flow and concentration) to PIB could be very important to understanding the causes of use impairments, especially the beach closings. This should be a high priority study prior to making remediation decisions. While the review of urban nonpoint runoff in the report was very good, it seems to be important enough in this site to warrant a site-specific study. Without better data in these areas, the current loading estimates will not be accurate enough to serve as a baseline for future load reductions that might result from RAP implementation.

A good hydrologic budget for the system does not seem to be available. This would make a useful contribution to the stage 1 report.

In addition to the estimation of sediment resuspension potential, it would be very instructive from an historical perspective (not to mention in the assessment of potential impacts of dredging) to obtain some fairly high resolution sediment core profiles in radionuclide-dated cores. Perhaps this has already been done but not presented in the report; if so, it would be very instructive.

It seems fairly obvious that there is a considerable lack of information on plankton in the bay. I would recommend initiation of a water column plankton study that included determination of the community biomass and structure as well as plankton toxicity tests for sediment samples.

General Comments

- Please convert all units presented in the "English" system to the "metric" system, or at least put the metric equivalent in parentheses after the English units value.
- The map overlay of protected areas of PIB is described in the report but the map itself is not included. This would make a nice addition to the report.

- Please generate a new site location map (Fig. 3.1) that is readable and contains reference points that are mentioned in the text.
- Map locating sediment sites for Tables 4.15 and 4.16 would be helpful. Maybe these sites could be located on the map in figure 4.3 for comparison.
- Page 43 of report is out of place; it does not follow page 42.
- I do not necessarily agree with the statement at the beginning of section 5.1. For example, resuspension of bottom sediments accounts for over 95% of the Fox River loading of PCBs to Green Bay.
- On page 5-3, referencing to preliminary data on CSOs in Appendix C is incorrect; nothing like that is in this appendix.

INTERNATIONAL JOINT COMMISSION

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*NOTE: Please call if there is an error in transmission,
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TO: ☐ Jim Rozakis / Kelly Burch, PADER FAX: 814-332-6831

FROM: Mark Brederland

Date: September 27, 1993

MESSAGE

5 pages follow

Jim / Kelly --

Arrival #2 today for RAP Reviews (I only know of one more that is still due us -- Tim Bartish). This came via FAX 20 minutes ago from Mary Beth Binns. Again, I'll put "hard copies" in the mail to you which may be easier to reproduce than this FAX copy.

Talk w/you soon. MARK.

ILL.
R.O. WINDSOR
SEP 27 1993

TO: Mark Breederland
RAP Review Coordinator
International Joint Commission

FROM: Mary Beth Binns
Environmental Planning Coordinator
Cuyahoga River Community Planning Organization

DATE: September 27, 1993

RE: REVIEW OF PRESQUE ISLE BAY REMEDIAL ACTION PLAN

Dir. _____
Secty WQB _____
Secty SAB _____
H. d. SS. _____

Thank you for the opportunity to provide review and comment on the Presque Isle Bay Remedial Action Plan. My belated comments should not reflect negatively on the RAP document or my willingness to review the report. Having read the document, I am left feeling very optimistic and enthusiastic about the Presque Isle Bay RAP process. Nonetheless, the report is written in such a way that a cover-to-cover reading is necessary to adequately understand this RAP process, the complexities of the ecosystem, the vast amount of work done by PADER et al., and the complete results of each analysis. The report deserves a thorough review.

Overall, the report documents an impressive process. Stage One development spawned additional agency research and, in some cases, independent community based work - very positive signs for the RAP process. The demonstrated level of cooperation among agencies in developing the analyses is most encouraging. The participation and contributions of additional institutions, Mercyhurst College for example, are a priceless asset.

The report in general, as well as certain impaired beneficial use analyses, could be enhanced with more visuals. Tables do alright for technical people, but visuals work even better. Enhanced maps and graphics present the issues more effectively to the general public as well. In that vein, the executive summary could be better oriented toward public interest and understanding.

The review did not leave me with important information on socio-demographics of the Erie region. Some statistics to that effect could be presented. It would be useful to discuss in general the categories of industries present and their relative significance to the economy. What is the trend in regional population growth, or decline?

It could also improve the report to demonstrate the involvement of the public in its development. How much attention was paid to this process by the public at large? How many of the non-agency people participated in problem definition on a regular or irregular, maybe even one-time, basis. Which stakeholder organizations are well represented? Sections 8.5 and 9.3 are fine policy statements, but I have no feel for how well they were employed in the development of the Stage One Report or the level of commitment to developing public awareness or expanding public involvement in Stage Two.

With respect to the RAP process as a whole, I am not sure in which stage this process is engaged. Several contradicting statements are made in the report. While understanding that there is overlap between stages, and that remedial strategies can be developed for clearly identified problems while other problems are still being identified, I believe this process would benefit from a clearer idea of its status. A clearly articulated problem statement in a Stage One Report, defined as such, greatly facilitates the development of remedial strategies in a formal Stage Two process.

In my review of the technical details, I have come to understand how unique Presque Isle Bay is. The review inspired me to travel to Erie one Saturday to experience it first hand. Not only is it a one-of-a-kind outdoor experience on the south shore of Lake Erie, but it presents some unique challenges to scientists as well. It seems as though this process leaves all of us with some large questions. Where do all the pollutants go? Where, if anywhere, does accumulation take place? How long, if ever, will it take before accumulation does cause biological harm?

The fact that a RAP process is in place here poses a unique opportunity. Is it possible to demonstrate any phenomena here that may be more difficult to demonstrate elsewhere in the Great Lakes System (because Presque Isle Bay is largely a closed system within the closed Great Lakes system)? Specifically, I have in mind to demonstrate the effects of atmospheric deposition, as in the elevated arsenic levels of the sediments in Big Pond; and accumulation and bioaccumulation rates. Perhaps the AOC could leverage Great Lakes Protection Fund resources to develop studies to address these issues.

Furthermore, because of the concentration of fishers and water sport recreationists, studies of their health may be most feasible here. Does PIB have a population of subsistence fishers? What is the rate of accumulation of contaminants in their systems? Similarly, do people who come into contact with the water in PIB contract gastrointestinal illnesses? Do medical care facilities or druggists think to ask if observed illnesses are connected to water contact? Are the fecal coliform standards adequate, or are they overly restrictive?

Finally, I find it difficult to imagine that the tributaries to Presque Isle Bay are not impacted by the sites listed in 5.2.2 and CSOs (81% of which begin in Mill Creek). How could those streams be healthy? Should an ecosystem approach to remediation take into consideration the health of those tributaries, or are the tributaries there to dilute the problems before reaching the bay? "Mill Creek Tube" seems somewhat science-fictional to me. Will it always be that way? It is such a large tributary that it should be possible to find people who could benefit from the restoration of that area. However, restoration in Stage Two will not be as easy if the problems are not clearly articulated in Stage One.

SPECIFIC COMMENTS

DESCRIPTION OF IMPAIRED BENEFICIAL USES

Fish Consumption

Are any stakeholders concerned about the level of human health protection afforded by the FDA action levels?

It will be important to stay in touch with the issue of fish consumption and emerging information about contaminant levels, and to continue fish tissue sampling programs using basin-wide standardized protocol.

Benthos

I applaud the innovation that went into the FWS development of a ranking process, but was this strategy peer reviewed? Is it appropriate to draw conclusions about the correlation between the presence of pollution sensitive taxa and sediment contamination based on the FWS ranking process without such a peer review. I believe that the findings of this process are unwisely weighted in the Stage One Report. On the other hand, with broader exposure and an opportunity to incorporate the comments of other experts, such a ranking may offer a rigorous and reliable test.

Furthermore, beyond the limited scope of the sediment bioassay tests, there is no discussion of the general health of the benthic organisms found in situ. Perhaps the Mercyhurst study or another could be expanded to include a qualitative review of organism health. Guidelines for such a study do exist. In some AOCs, macroinvertebrate organism health is used as a finer-tuned indicator of localized pollution problems. Could this type of study provide useful information in conjunction with the FWS ranking process?

Restrictions to Dredging Activities

The description of the analysis for this beneficial use seems incomplete or somewhat confused. Table 1 indicates an impairment, suggesting that there are restrictions on dredging or disposal activities due to elevations of specified parameters, and table 4.14 references a PADER sample location named "Confined disposal area". However, the text does not state what becomes of the heavily contaminated dredgings. Is their disposal confined, or are they disposed in the open lake? If all sediments are disposed in the open lake, is it at site 15 (which is only identified in figure 4.1 in a discussion of fish and wildlife populations)? Are impacts to the aquatic communities from open lake disposal being measured? If dredged sediments are not confined, is this not the mandate to do so? How much of what is dredged must be confined? At what cost? If this beneficial use impairment is the mandate to reduce sediment toxicity, some economic analysis could be helpful.

Perhaps it is not the dredged sites which contain the heavily contaminated sediments (a point which could be elucidated in the text), but then should this beneficial use be considered impaired? As it is suggested in the text, USEPA guidelines are 15 years old and do not reflect current scientific knowledge regarding the extrapolation of human health risks from sediment contamination levels. Therefore, there really is no guidance here for indicating problems to the aquatic community. There is only the suggestion that those heavily contaminated dredgings should be confined.

Beach Closings

The analysis of available data on fecal coliform levels could be made stronger by separating wet weather and dry weather sampling events. Presque Isle Bay is probably used as extensively the day after a rain as the day before, and the bacteria numbers presented do not assure me that the acute standard is being met. In fact, experience dictates that anywhere there is a combined sewer system, there are elevated levels of bacteria for up to 72 hours after a rain event. Would this analysis or subsequent remedial action benefit from a sampling of bacteria on a wet weather basis, or possibly even daily?

Have any stakeholders questioned the use of the present standard or the geometric mean as adequate for the protection of health?

Why is it illegal for swimming in those areas referenced in the third paragraph on page 44? Could swimming become a protected use in those areas; would it take a level of public will currently undemonstrated? Were those who do swim in those areas contacted, as "stakeholders" of the RAP process? Are they getting sick from water contact? Is there any notice to the people who use the water, "albeit illegally" in some instances, that exceedances of the bacteria standard could be occurring for up to 72 hours after a rain event?

Fecal coliform should be listed in the last paragraph before section 1.3 on page 10.

Would it be appropriate to revisit the question of recreational impairment due to bacteria levels? Would it also be appropriate to apply the standards to areas where water contact as a beneficial and protected use could be expanded?

Degradation of Aesthetics

Where do the floatables and street litter commonly found in combined sewer overflow go? Is anyone annoyed by this stuff? Is it worth noting this in the assessment of aesthetics?

Loss of Fish and Wildlife Habitat

Is it possible that a loss of open space in the watershed has resulted in any impacts to fish and wildlife populations in the PIB? If the Stage One Report were to highlight the fact that only 16% of the watershed remains in open space, would this facilitate the development of a mandate for Stage Two to protect that remaining habitat or open space? Is a study needed to evaluate the significance of the remaining habitat to the wildlife populations in the watershed. Would it be useful to investigate and present the likely future of any piece of that remaining habitat or open space?

SPECIFIC OBJECTIVES OF GLWQA

Were the Pennsylvania Code Title 16 numerical water quality criteria compared to IJC general and specific criteria? Is the PADER list inclusive of all IJC contaminants of concern? Will future water quality sampling programs need to be expanded to include the IJC criteria?

There is a brief mention of IJC water quality criteria in the first paragraph under section 3.5.1, but I don't find any comparison of PADER criteria or measured levels to the actual IJC values. Is there a will to reduce pollution levels, of for example, the IJC critical 11, toward a goal of virtual elimination of toxic chemicals? I was only able to find a brief policy statement in Section 8.5 of the document.

There is also the statement made at the bottom of page 60 that contaminants of concern are only those which exceed the established criteria for dredging. While this prioritization of contaminants of concern is honorable, if the process is perceived as incremental, it does not reassure me that all others included in the IJC specific objectives have been or will be considered. The fact that no "water column impairments" were indicated (also on page 60) is to be interpreted as no Pennsylvania Code Title 25 water quality criteria for toxic contaminants, is however not an assurance that all contaminants of concern are tested for.

Finally, it appears that some exotic contaminants were sampled for in investigations of sources of contamination to ground water. The list of sites is impressive, and it appears that a great deal is known about each site. However, I don't find comparisons of measured levels to IJC criteria. If a strategy is needed to eliminate those sources of persistent toxic discharges, would the case be strengthened by IJC specific objectives? Have impacts to the tributaries from these sites been measured?

ECOSYSTEM APPROACH

There is some room in the Presque Isles Bay RAP process to develop the ecosystem approach further, and toward this end, I offer some ideas:

- o a look up the tributaries for current impacts of pollution and previous land use decisions, as well as for potential future land use decisions which could further impact the PIB itself (can each tributary exist as a healthy, independent micro-ecosystem, and wouldn't an unhealthy tributary, in terms of biological communities and habitat, contribute poorly to overall health of the bay?);

- o a little more attention to fish community structure, while still emphasizing the highly respected sports fishery and those species on which the game fish feed (this could be especially useful in analysis of the tributaries);
- o in addition to bay-wide averages, attention to hot spots in areas of the Bay (like the Sommerheim WTP, the ore dock, and Misery Bay) where pollution is likely to be concentrated and resulting problems would perhaps be more obvious;
- o a holistic look at a possible causal relationship between elevated levels of contaminants in the sediments and the health of the benthic macroinvertebrate communities and fish tumors - are there perhaps contaminants which should be investigated other than those established by the USEPA guidance for pollutional characteristics in sediments, a body of criteria not well supported for its demonstrated protection of aquatic wildlife; similarly, it would be worth noting somewhere that the loss of habitat in the "non-PIB" areas of the watershed (resulting in 16% remaining open space) is likely to have had some impact on the fish and wildlife populations in the watershed; and
- o a note about the people in the region - how they were and can still be involved, through surveys, census, town meetings, classrooms, fairs and festivals, in order to celebrate the uniqueness of this resource, capture their visions, and enlist their help as individual stewards of the Bay.

RELEVANT HUMAN HEALTH QUESTIONS

Are there subsistence fishers in the PIB region? Are they adequately protected by FDA action levels?

Is there appropriate notice to hunters in the PIB area that contaminant levels in waterfowl have been known to exceed the PCB FDA action level, regardless of the source of contamination?

Has a process been established to identify whether people are getting sick from water contact? Do medical care facilities know to ask if gastrointestinal illnesses or eye/ear/nose/throat infections could be related to water contact?

STAKEHOLDERS AND PUBLIC PARTICIPATION

In the problem definition phase, was there an attempt to engage:

Millcreek sewer authority

Summit Township

Greene Township

Harborcreek Township

user groups,

i.e., swimmers, 1,500 boaters based in erie harbor, including the sixteen marinas, water skiers, sail boarders, picnickers, hunters, fishers, and hikers

significant dischargers

How could their participation be expanded from this point forward?

INTERNATIONAL JOINT COMMISSION

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*NOTE: Please call if there is an error in transmission,
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TO: ☐ Kelly Burch, PADER FAX: 814-332-6831

FROM: Mark Breederland

Date: September 20, 1993

MESSAGE

18 pages follow

Kelly --

Here are reviews from 3 people (Knox, Borgeson, & Thomas) for the Presque Isle Bay RAP. I still am anticipating reviews from Binns, Bartish & Bauman (all confirmed with me last Friday or today).

I am having a packet sent out to you via U.S. mail with copies of all reviews to date so you don't have to deal with these FAXed copies.

MARK.

227 Indian Road
Toronto, Ontario
M6R 2W9

September 16, 1993

Mr. Mark Brederland
International Joint Commission
Great Lakes Regional Office
100 Quellerie Avenue, 8th Floor
Windsor, Ontario
N9A 6T3

Dear Mark:

I have just today completed my review of the Presque Isle Bay RAP.

I can't help remarking on what a luxury it is to be handed "on a silver platter" a well-organized synthesis of the existing data on a body of water, along with relevant contextual information and a summary of activities and regulatory tools which relate to it. So much hard work is rolled into the Stage 1 product! How wonderful to be the recipient of the information, not the generator of it!

As you will see from the attached comments, my reading of this information has generated some questions, and some reactions. As a generalist with experience in the public involvement field, I have felt quite free to raise questions about any part of the document that might raise questions in the minds of interested citizens. I hope this will be of value to PADER and its partners as the RAP proceeds.

Sincerely,



Louise Knox

PRESQUE ILE BAY RAP: REVIEW COMMENTS

from Louise Knox

Review Questions 1 and 2 re: Adequacy of Problem Description

Available data appear to have been considered, thoughtfully analysed, and used to draw conclusions wherever possible. The RAP does leave some questions unanswered. Those which seem relevant are:

1. It appears that ambient water quality data were obtained for only 2 of the 17 pollutants of concern (copper and zinc). Would it be of some value to have ambient water quality data for the remaining pollutants?
2. Amounts of in-place pollutants seem quite large. Iron alone is present in quantities that amount to about 41 lb. per square yard! To the average outsider, common sense would lead to the conclusion that the benthic community is impacted in a negative way. If PADER really believes there is no impairment of the health of the benthic community, it is likely to need a stronger argument than the one presented in the RAP. Absence of a comparable unimpacted benthic community is a weak argument. Similarly, exceedences in Lake Erie of levels found in PIB sediments demonstrate that both are polluted, and not the reverse.

Review Question 3 re: Causes & Sources

3. Point sources are identified but one is left with an uneasy feeling that the information is not complete. Quantification of loadings is based on many assumptions, so that it is hard to know how close the estimates may be to reality. The report refers to industrial dischargers who pre-treat their effluent and then discharge into the sewer system, but it neglects to tell the reader what it is (and how much of it) that is finally discharged into the sewer system.

It appears that work to be done by the City of Erie under the consent order will fill some of the data gaps, so it may be that for point sources, once this is done, there will be at least enough to provide a basis for planning.

4. For non-point sources, especially surface run-off, "no reliable data exist from which to estimate the annual loadings of pollutants.....". It is hypothesized that "surface runoff may contribute very high annual loadings of a wide variety of pollutants". It would therefore seem important to identify the sources of these "very high annual loadings". The word "sources" is important. Surface run-off is more of a channel through which pollutants move than an actual source of pollutants.

There is no doubt that the prospect of trying to characterize and quantify the pollution carried into the Bay through surface run-off and other non-point sources is unpalatable. Where this has been done in other locations, it is likely to have been at great expense to the taxpayer. Should there be further investigation? If so, of what kind? The RAP does not say what approach it intends to take in order to gain an understanding of the sources of pollution carried by surface run-off, so that they can eventually be controlled or eliminated. This is the point in RAP development at which the "societal causes" need to be considered. There is not much in this RAP that describes what it is about human behaviour in the AOC that is linked to the generation of pollutants. In other words, the investigation hasn't moved "up the pipe", to use the language of some of our Canadian public advisory committee members.

The attempt to address this gap in information about surface run-off by using data from other locations seems a great stretch of the imagination, especially since land-use has such a strong influence on the generation of pollutants. More work on identifying sources now might pay off in the long run in terms of the ability to take effective action.

5. One troubling issue for the non-technical reader is that, despite the information that does exist on the pollutants of concern, one is still unsure, even after reading the whole RAP, as to which of these pollutants, if any, poses a really a serious problem. Is it the mix that's the problem? The sheer quantities? The PAH's? What do we really need to go after here?

Review Question 4 re: Ecosystem Approach

6. I'm not sure who would pretend to know exactly what an ecosystem approach would look like! However, my understanding is that it implies recognition that all things are linked and inter-dependent, and that a holistic view is needed. This RAP does recognize the interconnections between land, air, and water and the creatures that live in them, and does combine disciplines in its evaluation of the local problems. However, there is still a gulf between what happens among humans (their individual and organizational behaviour) and how this affects air, land, water and other organisms. This is really the same point made in item 4, above.

Review Question Re: Human Health

7. Human health issues are not addressed, other than in passing, or through discussion of fish consumption advisories. If there is a reason for this, the RAP might be well advised to state the reason.

Review Question Re: Stakeholders

8. Stakeholders are listed in the appendix and the listing appears to be quite comprehensive. However, there is nothing to indicate:

- a) whether they have ever met;
- b) whether they are involved or merely informed;
- c) whether they agree with the problem definition as it appears in the Stage 1 report;
- d) whether they accept what is reported to be their "responsibility to negotiate a compromise solution that meets the the environmental restoration & maintenance needs of the AOC while being sensitive to the economic realities...." (Section 9.3)
- e) what support is available to facilitate their reaching a compromise solution;
- f) what commitment there is from PADER to participate in and/or facilitate the committee work;
- g) whether there will be resources for the RAP to fulfill its reported "hope" to be able to provide support for community events which promote awareness of the environmental issues faced by the community (Section 8.5).

Normally, one would expect at the very minimum either terms of reference for a committee of this kind, or some kind of letter or memorandum outlining what are the terms of members' participation, the objectives of the exercise, and the roles and responsibilities of the sponsoring organization. Some indication of activities/achievements to date would be helpful as well.

Community involvement is part of the human-oriented aspect of the ecosystem approach. The purpose of including the above information is to allow the reader to assess whether this component is being adequately addressed. In this Stage 1 document, the reader does not have enough information to make such an assessment.

9. It is significant that the reference to "virtual elimination" comes in the section of the report called "Other goals of the Remedial Action Process" (Section 8.5). These are goals that "may be achieved" using the RAP process and they include public education, pollution prevention and "virtual elimination". One is left with the distinct impression that these are secondary goals, not only because of the "may be achieved" phrase, but also because of phrases like "the RAP seeks to support" and especially the last sentence in this section which says that the goal of "virtually eliminating toxic inputs" is "the Basin's goal".

The basin does not have a stated goal. The people in the basin may. The Great Lakes Water Quality Agreement commits the governments to a goal of virtually eliminating discharges of persistent toxic substances (not "toxic inputs"). The RAP would be enhanced by some clarity about which goals it is adopting. Perhaps this will come in stage 2.

A final, more general comment, is that one can sense a tension in this and probably every RAP document, that has to do with making a shift from a known and comfortable way of doing business (which has produced demonstrable results and shouldn't be discounted), toward an unknown and not-so-comfortable and less frequently tested approach loosely described as "pollution prevention". Nearly everyone agrees that this is the way to go, but this is based on common sense and a belief that it can be done, and a bit of evidence. So resistance is understandable. But we will never know more about this approach if we don't try it, and seriously. So I will exercise my privilege as a reviewer of this RAP to say that it doesn't look, yet, as though the shift is being made with very serious intent, and the RAP group needs to ask itself whether that's what it wants.

Louise Knox
September 16, 1993

SEP 16 1993

610 Green Street
Grand Ledge, MI 48837
September 13, 1993

Ms. Marge Dochoda, Fishery Biologist
Great Lakes Fishery Commission
2100 Commonwealth Blvd., Suite 209
Ann Arbor, Michigan 48105-1563

Dear Ms. Dochoda:

Re: Review of Presque Isle Bay, Pennsylvania, Remedial Action Plan (RAP), Stage I

According to your request of August 10, 1993, and in response to Mark Brederland's of August 5, 1993, I have reviewed the Stage I RAP for Presque Isle Bay, Pennsylvania, and submit the following comments for consideration by the I.J.C.

With few exceptions (noted later), this Stage I R.A.P.:

- Adequately describes environmental problems in the A.O.C., including identifying beneficial uses impaired, degree of impairment and the geographical extent of such impairment.

- Has identified specific objectives of the GLWQA that are not met to the extent that such failure has caused, or is likely to cause, impairment of beneficial uses, including the area's ability to support aquatic life.

- Has identified the causes of the use impairments, including a description of all known sources of pollutants involved and an evaluation of other possible sources. Societal causes such as demographics, economic forces, private and public sector activities, and technological changes have been described and their contribution to use impairments investigated.

- The plan embodies a systematic and comprehensive ecosystem approach, and problems, sources and causes have been examined within an interdisciplinary framework.

- Human health problems have been thoroughly addressed and evaluated.

- Stakeholders have been identified and involved in defining

problems and causes, and it is clear that the RAP intends to involve stakeholders at every turn. But a detailed involvement plan and schedule for public participation is not evident.

•There are information gaps and there are mechanisms identified for filling them where feasible.

The most serious weakness in this Stage I R.A.P. is the lack of an historical description of the Presque Isle Bay environment. The fish, wildlife, benthos, zooplankton and physical environment are well described in the here and now, but there is no description of historical conditions. Although scientific data and studies may be lacking, an attempt should, none the less, be made to describe Presque Isle Bay as it was in pre-settlement or early settlement days. Descriptions of conditions found by explorers and early settlers will be helpful in setting long range ecosystem goals for the A.O.C. and in measuring progress toward those goals. Observations need not be sophisticated or detailed to be of value. I include a copy of 3.1.3 "The Historical Cuyahoga River Environment" from the Stage I R.A.P. for that river to illustrate. It may be worthwhile to use habitat conditions that currently exist on the north side of the bay as an insight into those that once existed (and perhaps could, to a degree, exist in the future) on the south side.

The R.A.P. is well written. It is clear yet thorough. It uses good logic. I especially liked its objective and thorough coverage of the contribution that naturally occurring heavy metals could be making to Presque Isle Bay (and Lake Erie) bottom sediments. The facts and analysis in this part of the R.A.P. clearly call into question current E.P.A. and Corp of Engineers' dredging criteria, but they do so in a very subtle and fair way.

This R.A.P. process provides a one time opportunity to review the past and present environment of Presque Isle Bay and to unite the public in a long range vision for its future. It is important in this process that everyone concerned understand and agree that the ecosystem being planned for and protected is the human ecosystem. Fish, wildlife, pure water and natural settings are all important parts of that ecosystem. The P.A.C. will largely be responsible for putting together a blueprint for the Bay that will enhance the living conditions for present and future Erie residents. They will, I think, not err far if they set their sights high and describe the Bay as they truly would like to see it. The Stage I R.A.P. often, and correctly, points out that the mix of representation on the P.A.C. will assure that all interests are weighed in this process of goal setting. That "Remediation of A.O.C.'s is typically expensive and requires a relatively long time frame to complete" is an important acknowledgement. Long time frames allow for considerable economic and political adjustment and

make possible change not normally considered possible or practical.
This is an exciting opportunity for the P.A.C. and all those
involved in the R.A.P. process. I know I appreciate the
opportunity to be involved as a reviewer.

Sincerely,


David P. Borgeson

DPB:cb
cc:Mark A. Breederland, IJC

Investigation of the source of contaminants has encompassed the entire Cuyahoga River drainage basin and the basin to the east which drains to the nearshore area of the Area of Concern. Figure 3-2 shows the relationship of these two basins to Lake Erie and highlights the Area of Concern.

The following sections 3.2 through 3.4 are intended to provide the reader with a very detailed picture of the Cuyahoga River basin's natural and cultural characteristics.

1.3 THE HISTORICAL CUYAHOGA RIVER ENVIRONMENT

The lower Cuyahoga River and its valley, between the present day sites of Akron and Cleveland, has a long history of use for navigation and travel. For over 2,500 years many Native American tribes shared this important resource for living space, hunting, and transportation on their long journeys between Lake Erie and the Gulf of Mexico. Up through the 1700s, the river was described as "gentle" with "few riffles or swift running places," and "muddy."

William Coates said of the Cuyahoga in 1924:

"The rich bottom lands along the course of the Cuyahoga are very productive and in the early days, before the presence of a great city at its mouth dyed its waters, the stream abounded in fish, which were a great factor in the food supply. We need not go back to the days when the dusky Chippewa (Indians) occupied its banks for this fact. In quite recent years, the mullet, redhorse, bass, catfish, bullhead, sturgeon, shad and other varieties were caught in great numbers. Sturgeon, five, six and seven feet in length, were often the prey of fishermen.

Wild game was attracted to the river banks, sometimes in great numbers, and then the river valley became valuable hunting grounds. Because of the forests and with it the leaves in the summer and the slow melting of snow, the lack of ditches and tile drainage, accompaniment of civilization, the flow of water in the river was more regular throughout the year than it is now. Floods did not rise to such proportions and navigation was not impeded by the low water of the dry season, as in later years."¹

One naturalist commented (as recently as 1851) that the waters of Lake Erie near the mouth of the Cuyahoga River would literally be "black with fishing boats"; "one could capture near the present Cleveland Harbor as many as 100 bass and walleye in a morning by hook and line."²

William Coates, "A History of Cuyahoga County and the City of Cleveland." 1924.

Jared Potter Kirtland, in "The Fisheries of the Cleveland Metropolitan Area Including the Lake Erie Shoreline," by Dr. Andrew M. White, for the Water Quality Baseline Assessment for the Cleveland Area - Lake Erie. USEPA, 1975.

Prior to European settlement, the entire area where the Cuyahoga River entered the lake was a large, nearly level plain covered by marsh and swamp. It was only through dredging and breakwall construction in 1825 that the Cuyahoga River marshes became the Cleveland Harbor with a discernable mouth.³

After the settling of Cleveland, at the very beginning of the nineteenth century, not quite 200 years ago, the river began to experience an increasing intensity of use. With the completion of the Ohio-Erie Canal linking Cleveland and Akron in 1827, and the Valley Railroad in 1850, Cleveland and Akron communities grew by leaps and bounds. By 1850, Cleveland's population was over 17,000 and ten years later 43,000 people lived in the city.

Although large industrial development and subsequent urbanization meant prosperity for the region, it also brought with it major sources of pollution between Akron and Cleveland. Over the period of roughly 150 years, the Cuyahoga River would be used to support commercial shipping, major steel, rubber and chemical manufacturing processes, and the disposal of human wastes. Drastic deterioration of water quality in the Cleveland area began in earnest in the 1850s.

3.2 Natural Features

3.2.1 Drainage Basin

The Cuyahoga River and its tributaries drain approximately 813.3 square miles of land in the basin.^{*} The Cuyahoga River basin lies mostly within Geauga, Portage, Summit and Cuyahoga Counties.

Several major tributaries flow into the Cuyahoga below the confluence of the East and West Branches in Geauga County. Figure 3-3 shows the major tributaries in the Cuyahoga River basin.

These include:

GEAUGA COUNTY

Bridge Creek
Black Brook

PORTAGE COUNTY

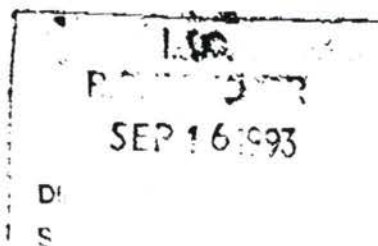
Breakneck Creek
Congress Lake Outlet
Plum Creek

3 James Bissell, Staff Botanist. "Natural History of Arcola Creek Estuary." Cleveland Museum of Natural History, July 30, 1987.

* Gazetteer of Ohio Streams, ODNR, 1960.



Waterloo Centre for Groundwater Research
University of Waterloo
Waterloo, Ontario, Canada
N2L 3G1
(519) 885-1211, Ext. 2892
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September 15, 1993

Mr. Mark Breederland,
RAP Review Coordinator
International Joint Commission
Great Lakes Regional Office
100 Avenue Quellerie Avenue
Windsor, Ontario
N9A 6T3

Dear Mr. Breederland:

Please find attached a brief report prepared by Lynda McCarthy and myself on the Stage 1, RAP for Presque Isle Bay. I hope this is satisfactory to you and we look forward to seeing you in Erie next month.

Yours sincerely,

Richard L. Thomas,
Director,
Waterloo Centre for Groundwater Research.

Encl.

RLT/sm



Ontario Centres of Excellence

Comments Re: Presque Isle Bay Remedial Action Plan

Summary: The Presque Isle Bay RAP represents a sound documentation of the conditions of the system as they currently exist. It further identifies omissions in knowledge required to complete the assessment and indicates the requirements needed to overcome these omissions.

Major Review Conclusions: For virtually all measures of impairment, the PIB is in excellent condition, and can be best described as a marginal Area of Concern. Problems may exist with respect to:

- 1) liver tumours and external lesions on bullheads
- 2) levels of metals in PIB sediment
- 3) levels of PAHs, which may be of concern as a causative agent in the tumours of bullheads

Resolution or an improved understanding of these problems could well result in the delisting of PIB without recourse to major remediation. Disposal of dredged spoil may well continue to be a problem, though elimination of anthropogenic sources could alleviate even this problem.

Major Recommendations:

- a) Continue to examine fish for increased incidence of liver tumours to determine the extent of impairment relative to background levels. Since PAH bioaccumulation does not appear to occur, viral infections appear to be a likely cause.
- b) Bioavailability of metals must be established by chemical speciation and the mode of incorporation into the sediment must be determined. Results could then be rapidly assessed by comparison to bioassay data.
- c) PAHs should be further evaluated in fish and sediments and uptake experiments conducted. A more detailed assessment is given as per attached.

Summary of Bioassays Conducted on PIB Water and Sediment

First of all, no water column bioassay testing was carried out, presumably since it was concluded that the fisheries were a thriving concern and that the area is an effective fisheries nursery. However, the incidence of skin lesions and liver tumours in brown bullheads was worrisome to members of the RAP group. Thus, it is highly recommended that water column bioassays be conducted, to ascertain whether anthropogenic sources of contaminants are causing these lesions, or whether they are naturally-occurring, through viral intervention.

Secondly, assessing the validity of sediment bioassays conducted in this study was extremely difficult, since there was a paucity of detail outlining the actual experiments. Although the Prater & Anderson (1977) methodology that was utilized by the Corps of Engineers for the 1982 and 1986 bioassays was perused by ourselves, there was still a little confusion as to the exact protocol carried out. The following outline some of our concerns:

- 1) Prater & Anderson (1977) only used *Daphnia* and *Hexagenia* in their 96-hour bioassays; what methodology was followed by the COE for the fathead minnow tests?
- 2) Were the sediments sieved to reduce predation and competition potential from indigenous benthic populations when *Hexagenia* were added to the sediment?
- 3) Were all three animal species exposed to the sediment in the same containers, or were the animals segregated in different test beakers?
- 4) Were the control sediments of similar physicochemical conditions (same grain size, etc.) as those sediments found in PIB? (if not, *Hexagenia* sometimes has a difficult time populating sediment due to physical reasons, such as not being able to build a proper burrow; thus, observed mortality in PIB sediment may be strictly due to differences in the physical sediment compared to the control site rather than to chemical differences)
- 5) Why was there a lack of consistency between experiments conducted in 1982 and 1986. For example, the 1982 study utilized five replicates for all tests and the 1986

study just used three replicates; in the 1986 study, the *Daphnia* experiment was terminated at 48 hours, and not the 96 hours used in the 1982 study?

6) When low dissolved oxygen levels in the 1986 study were implicated in the observed toxicity of the *Hexagenia* and *Daphnia*, why were retests done only on the former organism, and not on the latter? (Because of this lack of retesting, it is difficult to conclude that "according to the *Daphnia* results of the 1986 study, PIB sampling sites were moderately polluted". Mortality may have been due to lack of dissolved oxygen).

7) Were sediment controls (along with water controls) implemented in the *Daphnia* and fathead minnow bioassays?

Lastly, when the control organisms have high mortality, as in the case of *Hexagenia* in the 1986 retest, very few conclusions can be drawn as to the quality or lack thereof, of the sediment in question. Thus, Conclusion #1 on Page 18 of Chapter 4 is tentative at best, and correlations between mortality and pollution are weak.

Recommendations:

First of all, it is highly recommended that water column bioassays be carried out, particularly to assess accurately the cause of the lesions observed in bullheads. Some experimentation could include caging fish and examining mixed-function oxidase (MFOs) levels in the liver after a certain exposure period, and/or caging *Daphnia* or other water column invertebrates and suspending them at the sites of interest, measuring lethality or reproductive potential as toxicity endpoints. Also, after a predetermined exposure time, these caged animals should have body burden assessments and tissue analyses performed. Toxicity could then be correlated with concentrations of organic compounds sequestered within the bodies of the animals. Secondly, it is recommended that further sediment bioassay toxicity studies be conducted, using *in situ* methodologies in conjunction with laboratory experimentation. The bioassays that were conducted in the study used methodologies

from Prater & Anderson of 1977, who suggested a 96-hour bioassay test. The inherent problem with acute bioassays that are carried out on long-lifecycle organisms such as *Hexagenia* is that many sublethal results are never observed. Thus, it is recommended that a relatively short life-cycle test using benthic invertebrates such as *Hyalella* be implemented, where acute lethal endpoints are used, along with sublethal endpoints such as growth and reproductive potential. Again, the use of fathead minnows is recommended in bioassay testing, but 96 hours can be much too short to properly assess potential toxicity. Since the life cycle of the fathead minnow is often too long for most laboratories to feasibly examine, growth is an excellent sublethal endpoint, as is mixed-function oxidase testing, particularly if it is suspected that organics are the major contaminants of concern.

Body burden residues should also be examined, to determine a correlation between toxicity and organic contaminants within the sediment, particularly with benthic invertebrates. Also, symptoms of stress such as the induction of metallothioneins should be monitored in fish tissues, as indicators of metal exposure.

Physicochemical parameters that are naturally-occurring in the system have recently been implicated as culprits in toxicity bioassays. These include high levels of ammonia, water hardness, pH of the sediment, alkalinity, etc., which could have a radical effect on the survivorship of the test organisms. Thus, it is recommended that not only should these pertinent parameters be measured, but that statistical correlations be conducted to assess a relationship between the observed toxicity and concentrations of these chemicals in the system.

Conclusions

More details concerning the bioassays should be included in the RAP document, if only as an appendix. Also, many more types and numbers of bioassays must be conducted before one can conclusively say whether PIB waters and sediment are toxic or not. The relationship between fish tumours and concentrations of PAHs is tentative at best and further testing must be done to conclusively prove the relationship. Also,

since *Daphnia* appeared to show the most consistent toxic results, would this not argue for a water-soluble contaminant, rather than hydrophobic compounds such as PAHs?

Questions Regarding Stage 1: Adequacy of Problem Definition

1. Yes, the environmental problems have been adequately described, although the degree of impairment (particularly compared with other Areas of Concern) may be substantially over-estimated. There is some question whether the metals in the PIB sediments are truly cause for concern, since many may be naturally-occurring. Also, dredging the sediment and disposing of it in Lake Erie may not create the deleterious effects assumed by the RAP committee. Although there is speculation that lesions in the bullheads can be correlated with concentrations of PAHs in the sediment, it appears to be a rather tentative relationship and certainly further studies must be conducted.

2. Although specific objectives of the GLWQA have been identified, it is debatable whether the two use impairments (fish tumours and meeting dredging guidelines) have been conclusively shown to impair aquatic life. Certainly, the PIB seems very able to support aquatic life.

3. Although many sources were examined to determine whether they were contributing to the contaminants found in PIB sediment and water (mainly CSOs), there appeared to be some problem in actually identifying a specific source and its concomitant contaminant. Page 2 in Chapter 5 indicates problems in obtaining monitoring data, in sorting out inconsistencies in data reporting, in overestimating annual loadings, etc. Also, it was not possible to calculate the annual pollutant loadings from the individual CSOs, and data on total discharges from all of these sources is not currently available.

The source of PAHs in sediment was unclear, while data from disposal of toxicants from residential areas (ie. "down the kitchen sink and toilet") were not presented (often thought to contribute up to 50% of secondary sources of pollutants in some areas). Public sector (industry) activities were certainly described and their contribution to use impairment investigated, although economic forces and private

sector activities were not as clearly presented.

4. Yes, the plan does embody a comprehensive approach, within ~~1732~~ disciplinary framework.

5. The RAP indirectly addressed human health issues by examining body burdens for fish and wildlife consumption. Also, whole-body water contact was investigated, and since the PIB is not used for drinking water, no use impairment was indicated.

6. Yes, stakeholders have been adequately identified, although it is not clear who was involved in defining the problems and causes in PIB. The Department of State designated the Bay as an Area of Concern in 1991, although "no reasons were cited ... as the impetus for the designation". There certainly appears to be a system in place to inform the broader community about the RAP (public notices and comment period requirements).

7. It is hoped that Stage 2 will indicate whether, in fact, there is a mechanism to fill in missing information (increased bioassay testing, for example). The philosophies and processes of RAPs seem to lend itself to flexibility as far as assessing and utilizing information as it becomes available



IN REPLY REFER TO:

FWS/AES-EC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, MN 55111-4056



OCT 06 1993

Mark Breaderland
International Joint Commission
Great Lakes Regional Office
P.O. Box 38269
Detroit, Michigan 48238

Dear Mark:

Enclosed is my review of the Presque Isle Bay Remedial Action Plan. I apologize for my very late submittal of this review. I hope these comments are beneficial to the Presque Isle Bay Public Advisory Committee in developing their remediation strategies and further improving this important resource area.

Sincerely,

A handwritten signature in cursive script, appearing to read "Tim Bartish".

Tim Bartish
Biomonitoring Coordinator

Enclosure

Review Comments
Presque Isle Bay Remedial Action Plan Document

One of the most valuable aspects to a Stage I RAP document is that it is an opportunity to compile the current environmental conditions in the area. Such a document then becomes a much used reference as remediation measures proceed, providing the benchmark against which progress is measured. Therefore, it is critical that all credible and applicable information is included. A critical discussion and consideration of the use impairments should serve to segment that information and to provide a direction and focus for future remediation efforts.

However, while it appears the authors have done a good job in obtaining and considering the available data and information, much of the critical information is not presented. This makes it difficult for the reviewer to assess the adequacy of the statements made in the text. In addition, the discussion focusses much emphasis on persuading the reader that a problem does not exist. The logic in the arguments and the rationale for accepting or rejecting certain types of data are not consistent from one use-category to another, especially when attempting to compare to a "control site."

I do not understand the reasoning behind excluding the outer harbor from the AOC. Originally included as part of the AOC, PADER redrew the boundaries to exclude the outer harbor based on the reason that Presque Isle Bay is sufficiently isolated and should be considered independently. However, the outer harbor receives effluent from the bay, from the City of Erie Sewage Treatment Plant (50 million gallons/day load), and probably from other sources. Efforts to clean up the bay may force more contamination to the STP ("a major effort has been made to transmit all collected wastes from the City, Peninsula, and Bay watershed to the City's Sewage Treatment Plant;" section 5.2.1.2), thus transporting the problem rather than eliminating it. Such an approach is clearly not in keeping with a comprehensive, ecosystem approach.

The assessment of use-impairments focusses solely on the bay itself; there is no discussion of conditions away from the shoreline, in the upstream parts of the AOC. For example, the very channelized nature of Mill Creek suggests a marked impairment of fish and wildlife habitat. It is also stated that very little wildlife habitat exists along the southern shore of the bay, as a result of alterations by human activities. Yet, in the discussion of fish and wildlife habitat degradation, this use is found not to be impaired because no wildlife management objectives exist (or where stated) for the area.

The introduction of this document describes some highly degraded conditions in the bay occurring during and since the 1960's, including algal blooms, DO depletion, fish kills, malodorous conditions. Also indicated were the historical point source (128 MGD) that was discontinued in 1991, that CSOs release raw sanitary sewage directly to the Bay (during overflow) and that untreated industrial effluent is released through these CSOs. The net result is, a considerable amount of material is being delivered to a system that is essentially closed. These points makes it hard to comprehend that more severe

contaminant problems are not being documented.

The document identifies two uses that are impaired, and one for which insufficient data exists. However, I feel that several other uses should either be identified as impaired or that insufficient (or sufficiently contradictory) data exists to make a determination at this time. Individual uses are described below.

Regarding the geographic extent of the use-impairments, it is difficult to come to a conclusion regarding the location and distribution of the data discussed in the document. Is the bay a well mixed system that is relatively homogenous, or does a gradient exist away from potential sources that can be used to focus remediation efforts? With the exception of the sediment data, it is difficult to assess this distribution.

I found little comparison of Presque Isle Bay data with specific objectives of the Great Lakes Water Quality Agreement.

Fish consumption:

I question the conclusion that the fish in the bay are no different than Lake Erie fish. The collection sites of the Lake Erie fish are either not identified or are from nearshore or tributary areas, and some of the fish were collected from the vicinity of the POTW outfall in the outer harbor. It is difficult to determine if these are impacted by the AOC, by other localized conditions, or if they truly are indicative of overall Lake Erie fish. In addition, most of the Presque Isle Bay fish were collected from the same site: Cascade Creek. While there is mention of earlier data that was not used (due to conflicting results), perhaps this data should be incorporated into the assessment if the data was collected from other areas of the bay.

The bay is often described as a virtually closed system with little interaction with the lake. Assuming this to be the case, then conditions within the bay result largely from localized input (with the exception of atmospheric deposition). Therefore, it is inappropriate to conclude that concentrations in resident Presque Isle Bay fish is due to Lake Erie conditions, even if they are similar, with the exception of those fish sampled (eg. walleye) which spend substantial time outside of the bay.

Tainting of Fish and Wildlife Flavor

As stated in the document, STORET data (and data from any central data base) should be used with caution and consideration of QA/QC measures. However, the authors have dismissed some data and used others with no real rationale, other than age of the data. The document states that older data for water quality (from STORET) was not used because it is not representative of current conditions in Presque Isle Bay; yet there is no substantiation that current conditions are different from past.

It appears, that the criteria for zinc and copper exceeded the standards (even if the "relative magnitude of the exceedences are small"). Therefore, by the definitions described, this use is impaired.

Degradation of Fish and Wildlife Populations

I question whether one site in Lake Erie is appropriate as a control. There is no comparison of this site to others in Lake Erie or to other controls. How is it known that this site is not affected by localized sources, such as the open water disposal site located nearby, as indicated in the figure. In addition, the discussion of other use impairments often cites that no "agreed upon unimpacted control site exists," and therefore no consideration of any outside data is conducted.

Fish tumors

Substantial evidence of impairment is presented upon which to come to a more definitive conclusion than "this use is tentatively concluded to be impaired."

Bird and animal deformities

It is surprising, given the description of the quality of the peninsula and the shoreline inside the northern portion of the bay, that there exists "no colonies of nesting birds in the AOC." If such is the case it likely indicates a deficiency in physical habitat or a great deal of disturbance.

A statement is made that the fish tissue concentrations are not sufficiently high to cause deformities. However, no indication is given that the authors have considered what concentrations are necessary in prey to bring about the impairments.

Restrictions on Dredging

The choice of data used and excluded is odd. First of all, it is stated that some data were not used due to a lack of QA/QC information. However, that did not seem to restrict the data used in other use impairment discussions. It is also stated that some data did not reflect overall conditions in the bay. This should not restrict that data from inclusion in this assessment. Finally, the author's (PADER) data is not used in the assessment, nor is data that has been published in the peer-reviewed literature (Plowchalk and Zagorski 1986).

In the Chapter 5, the Presque Isle Bay sediment concentrations are compared with data from IJC's Dredging Register (1990). These data are used to show that Presque Isle Bay is similar or lower than general Lake Erie conditions. However, the data for Lake Erie is from other harbor environments, many of which are also Areas of Concern (eg. Cleveland, Maumee Bay/Toledo, Detroit River, Raisin River/Monroe). Therefore, the conclusion from this should be that the concentrations in sediments from Presque Isle Bay are in some cases (mercury, arsenic) lower than other Lake Erie AOCs, and in other cases (copper, zinc, chromium, lead, cadmium) higher than other L. Erie AOCs.

Eutrophication or undesirable algae

It does not seem appropriate to develop a trophic state analysis of Presque Isle Bay using sampling dictated by events that do not occur in the bay. Specifically, two of the three sampling times are scheduled to correspond to "spring overturn" and "fall overturn." These overturn periods in large lakes correspond to a time of tremendous nutrient availability. However, Presque Isle Bay does not stratify and therefore does not overturn. Therefore, the use of this trophic state index is suspect.

With such fine grain organic sediments that are found in the bay, I suspect that occasional, short-term anoxia may occur in the sediment-water interface. This anoxic water would be difficult to detect with water or in-situ samplers. Mayflies (Hexagenia) have occurred historically along much of southern Lake Erie. If they were present at one time in the bay but are no longer, the reason may be anoxia along the bottom.

Overall, I feel that the discussion of use impairments spends far too much time debating whether an impairment exists. Instead, the value of this document lies in its ability to provide a documented baseline against which to compare any changes/improvements. No where else will the RAP committee have such a cohesive compilation of the available information on the use impairments for comparing to future conditions. Stage III RAP and any efforts to remove the Presque Isle Bay from the AOC list will depend on this data. Therefore, the effort should be devoted not so much to defend the present quality of the bay (it is an AOC; whether it has one or 14 use impairments is basically immaterial), but to documenting as well as possible all the information as it applies to the use-impairments.

TELECOPIER MESSAGE

International Joint Commission
Great Lakes Regional Office
100 Ouellette Avenue, 8th Floor
Windsor, Ontario N9A 6T3

Date: October 6, 1993

Time:

TO:	Kelly Burch
	FAX: 814-332-6831

FROM:	Mark Breederland
	International Joint Commission
	100 Ouellette Avenue, 8th Floor
	Windsor, Ontario N9A 6T3
	FAX: (519) 257-6740 Canada
	Phone: (519) 257-6716 Canada (313) 226-2170 Detroit

Number of Pages to follow:

5

COMMENTS:

From Tim Bartish - U.S. Fish & Wildlife
- will not be attending meeting

NOTE: PLEASE CALL IF THERE IS A PROBLEM WITH TRANSMISSION. OTHERWISE, WE WILL ASSUME THAT YOU HAVE RECEIVED IT IN GOOD ORDER.

Comments:

- ✓ 1. Need better sediment toxicity data to reach no impact conclusion. Baumann, Thomas
- ✓ 2. Need better data on the effects on the benthic community of sediment toxicity. Baumann, Binns, Knox
- ✓ 3. PAH levels in sediments are in the range where tumor epizootics can be expected. Baumann
- 4. Fish tumors are due to an environmental carcinogen. PAH is likely cause and sources need to be identified. Baumann
- ✓ 5. Zebra mussels need to be discussed. Baumann, Depinto
- 6. Elaborate on the public process and provide more detail on demographics. Binns, Knox, German
- 7. Habitat restoration in Erie. Binns, Bartish
- 8. Does PA water criteria cover the IJC contaminants of concern? Binns
- ✓ 9. Provide actual data sets in the report. German
- 10. Fish consumption concerns. Is the data adequate to reach conclusions. German, DePinto, Bartish
- ✓ 11. Eutrophication - study is not convincing and cause of correction is not demonstrated. German, DePinto, Bartish
- 12. Not an ecosystem approach. German (Borgeson and Thomas disagree)
- 13. Are the hydraulic model and numbers used to estimate flows in and out available? DePinto
- 14. Is resuspension of sediments a significant contributor to use impairments? DePinto
- 15. Has air deposition been measured? DePinto
- ✓ 16. Need more data on plankton in the Bay. DePinto
- 17. Need more data on non-point sources of pollution. Knox
- 18. Human Health issues not addressed. Knox
- 19. Need an historical description of the Bay environment. Borgeson

✓20. Need water column bioassays. Thomas

21. Outer Harbor not included. Bartish

✓, 22. Sediment coring

23. Enhanced maps



International Joint Commission

January 5, 1994

RECEIVED

JAN 10 1994

ENVIRONMENTAL RESOURCES
MEADVILLE REGIONAL OFFICE

Honorable Warren M. Christopher
Secretary of State
Department of State
2201 C St., NW
Washington, D.C. 20520

Dear Secretary Christopher:

The International Joint Commission (Commission) has reviewed the Stage 1 Remedial Action Plan (RAP) for the Presque Isle Bay Area of Concern in the Commonwealth of Pennsylvania, that was submitted pursuant to Annex 2 of the Revised 1978 Great Lakes Water Quality Agreement. The Commission's comments on the RAP are enclosed.

Consistent with its current policy, the Commission intends to release these comments to the public.

A similar letter is being sent to the Canadian Minister of Foreign Affairs and a copy is being sent directly to the Governor of Pennsylvania.

Yours sincerely,

David A. LaRoche
Secretary
United States Section

cc: Honorable Robert P. Casey
Governor of Pennsylvania

James Rozakis ✓
Pennsylvania Department of Environment Resources

International Joint Commission
Review of the Presque Isle Bay
Stage 1 Remedial Action Plan
December 7, 1993

PREFACE

The Presque Isle Bay Remedial Action Plan (RAP) was reviewed and the criteria for its evaluation were based on the 1987 Protocol to the Great Lakes Water Quality Agreement. The review process was performed under the auspices of the International Joint Commission.

PARTICIPATION

This review summary incorporates the comments from individuals with a wide range of technical capabilities and expertise, some of whom are active in neighboring remedial action plans (Cuyahoga, Buffalo). The individuals reviewing the Presque Isle Bay RAP were:

Timothy Bartish	Biologist
Paul C. Bauman	Fisheries Toxicologist
Mary Beth Binns	Planner
Dave Borgeson	Fisheries Biologist
Joseph V. DePinto	Environmental Engineer
Murray German	Environmental Scientist
Louise Knox	Public Participation Specialist
Richard L. Thomas	Sedimentologist

Mr. Mark Brederland of the International Joint Commission's Great Lakes Regional Office coordinated and synthesized the work of the individual reviewers. The International Joint Commission greatly appreciates the time and efforts of the individual reviewers in providing specific comments on this plan. These comments, both written as well as verbal, were provided directly to the Presque Isle Bay Public Advisory Committee and the Pennsylvania Department of Environmental Resources. It is hoped that long-term networking with these specialist reviewers will enhance the planning and, most importantly, effective and efficient implementation of the Presque Isle Bay RAP.

On the evening of October 14, 1993 representatives of the International Joint Commission, including United States Chairman Gordon Durnil, held a meeting in Erie, Pennsylvania, with the reviewers, representatives of the Public Advisory Committee, the RAP team, interested citizens and the media to discuss the specific reviewer comments and to gain a greater understanding of the ongoing activities and plans in this Area of Concern. Members of the Pennsylvania Department of Environmental Resources RAP team gave an update on progress on the RAP. The team also hosted a brief and interesting field tour before the review meeting,

particularly into the Presque Isle Bay State Park, for a number of reviewers and International Joint Commission affiliates.

An informative presentation was made at the review meeting by staff from the Pennsylvania Department of Environmental Resources on brown bullhead tumor studies which have been undertaken during the RAP process. The International Joint Commission wishes to note the creativity and partnerships developed with academic institutions and others to gain a vast amount of information on this impaired fish tumor use with relatively few fiscal resources. The personnel who conducted and facilitated these bullhead studies have also recently earned the *Pennsylvania Department of Environmental Resources Secretary's Special Achievement Award* in recognition of these efforts. Such partnerships are excellent examples of "synergy" in the RAP process.

INTRODUCTION

Presque Isle Bay, and the waters of Lake Erie in the immediate vicinity of Erie, Pennsylvania, was recognized as the 43rd Area of Concern in January, 1991, by the United States Department of State following a February, 1990, recommendation from the International Joint Commission. The Presque Isle Bay RAP is being developed by a team led by the Pennsylvania Department of Environmental Resources along with the Presque Isle Bay Public Advisory Committee. The Presque Isle Bay Public Advisory Committee is a group formed of local government, academic, industrial, environmental, recreational, citizen and other interests to guide the development of the RAP. The International Joint Commission is greatly impressed with the timeliness of the development of this Stage 1 report, which was produced in only two years. The International Joint Commission also wishes to note that this submittal complied with the deadlines contained in the Great Lakes Critical Programs Act of 1990.

POINTS OF EMPHASIS

The Great Lakes Water Quality Agreement states that RAPs shall "embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern or in open lake waters." In the International Joint Commission's view such an approach will assist in identifying and securing broad-based community support for the RAP process and the substantial long-term costs of implementing remedial actions. RAPs should, therefore, identify ways in which human activities within the community can be reintegrated with ecological processes to achieve the permanent restoration of beneficial uses and maintain sustainable economic benefits.

While the Presque Isle Bay RAP has begun to encompass an ecosystem approach in some aspects (i.e. inclusion of air quality information, watershed approach for Presque Isle Bay), the International Joint Commission would like to encourage the RAP team and Public Advisory Committee to consider two other aspects.

First is the issue of geographic extent of the Area of Concern. There was significant discussion of the merits and challenges of inclusion of the nearshore areas and Outer harbor of Presque Isle Bay as part of the Area of Concern both in the RAP report and at the review meeting. The Public Advisory Committee has also spent significant time debating this issue, arriving at a decision to not include the nearshore areas of Lake Erie and the Outer harbor of Presque Isle Bay as part of the Area of Concern. Some of the basis for this decision seems to be that the Presque Isle Bay can be viewed as an isolated system and therefore can be considered independently from the waters of Lake Erie outside of the Bay.

While the Presque Isle Bay certainly is a relatively closed system compared to many other Great Lakes embayments, the International Joint Commission would urge the RAP team and Public Advisory Committee to continue to investigate if there are use impairments in the waters of Lake Erie in the vicinity of Erie, Pennsylvania, including the Outer Harbor of Presque Isle Bay. This recommendation is consistent with the original designation of the Area of Concern by the Parties and, more specifically, promotes a comprehensive ecosystem approach as called for in the Great Lakes Water Quality Agreement. The Outer Harbor receives effluent from the City of Erie and the watershed of the Presque Isle Bay through the wastewater treatment plant. From an ecosystems perspective, pollutants cannot be transported outside a defined geographic boundary of Presque Isle Bay without being considered.

This recommendation does not preclude the RAP Team and Public Advisory Council from targeting resources and efforts specifically at the Presque Isle Bay and its watershed as a primary focus of the RAP. The International Joint Commission does recognize that some data has been collected in the western portion of the Outer Harbor. Possibly an expanded study area could be defined and further efforts concentrated in this area. The International Joint Commission has urged other Areas of Concern (i.e. St. Louis River System RAP) to similarly include nearshore areas and consider downstream impacts.

As stated in the Great Lakes Water Quality Agreement, remedial action plans are intended to be a significant step towards virtual elimination of persistent toxic substances as well as restoration and protection of the Great Lakes Basin Ecosystem. They are significant building blocks for Lakewide Management Plans, focusing

on remediation as well as towards integrated prevention and management for particular geographic zones.

A second issue relates to integration of community information and community outreach as part of the RAP process, including the integration of human health information. Socio-demographic information of the Erie, Pennsylvania region, for instance, was not included. The International Joint Commission's experience with RAPs is that where all sectors of the community are engaged in the RAP process, momentum and resources will follow for needed protection and restoration efforts. The whole community can be involved to buy-into a vision of how remediation and protection of water quality and the watershed can lead towards a sustainable economy for the Erie, Pennsylvania region. The RAP process offers the opportunity to package and convey information on water quality progress to the public. To a large extent to date, this has not occurred in the Presque Isle Bay RAP. Other RAPs have begun to produce easily understood annual reports to help inform the public of RAP activities, often listing major accomplishments by various groups (e.g. municipalities, RAP team agencies, environmental groups, industries). The International Joint Commission encourages such initiatives and views them as positive examples of the iterative nature of the RAP process.

ADEQUACY OF PROBLEM DEFINITION

The problem definition of the Stage 1 Presque Isle Bay RAP is described in relation to the 14 use impairments outlined in the Great Lakes Water Quality Agreement. Table 1 outlines the conclusions of the RAP document, reviewers and the RAP Steering Committee. The following text discusses comments on particular use impairments. For the most part, data and information gaps are appropriately identified together with possible mechanisms for addressing them.

Fish & Wildlife Consumption is listed as not impaired by the RAP team. Several of the reviewers at least believe that more studies are needed on this impairment to substantiate the conclusion presented. Comments were posed on the descriptive evidence for methodology, location, quantity and types of fish collected. Particularly in light of the well-documented tumor impairment with brown bullhead, the International Joint Commission encourages additional studies on fish & wildlife consumption. Such information could be included as part of a Stage 1 update in an annual report or as part of the Stage 2 document.

Fish tumors or other deformities have been definitively shown to be impaired by a series of studies. Further work, building on these successful studies, is encouraged with specific regard to PAHs as a potential causative agent.

Degradation of Benthos is a use impairment which also is listed in the report as not impaired, though there is an admitted lack of data. A wide range of specialists who served as reviewers felt this use is probably impaired and much further assessment is required before concluding otherwise. At the review meeting it was stated that some benthos work is scheduled for Spring, 1994, and this is to be specifically encouraged. Further, model predictions could be run by the Canada Centre for Inland Waters (Reynoldson, et al) for comparison purposes on benthic community structure.

The RAP document lists beach closings as a limited impairment. This is primarily because there are no public beaches within the bay. However, a large amount of total-body recreation (i.e. water skiing, sail boarding, etc.) occurs within the bay. Reviewers specifically mentioned the need for bacteria work in the bay and Outer harbor areas due to urban runoff and concerns with combined sewer overflows along with associated human health impacts.

The RAP team acknowledges that the condition of phytoplankton and zooplankton populations requires further assessment to determine if this use is impaired. Reviewers fully concurred with this observation and discussed potential impacts that zebra mussels may have on the plankton system.

The RAP team also concluded that fish and wildlife habitat is not being lost or impaired. Reviewers agree that there appears to be an overall healthy sport fishery in Presque Isle Bay, though pike and muskellunge are not self-sustaining populations (as noted in a Great Lakes Fishery Commission report on Fishery Management in Great Lakes Areas of Concern). The International Joint Commission wishes to encourage, as stated in the RAP, habitat enhancement projects where feasible.

PUBLIC PARTICIPATION

The Presque Isle Bay Public Advisory Committee is comprised of people from across a broad section of the Erie region. Over 50 persons are on the mailing list for the Public Advisory Committee, with representation including local government, industry, Chamber of Commerce, Board of Realtors, academia, elected officials, environmental groups, and citizens. It was also stated at the review meeting that the Public Advisory Committee has been meeting bi-monthly for approximately 3 years, though attendance has waned in recent months. The International Joint Commission understands that Public Advisory Committee meetings will now be scheduled at times which are convenient for citizens to attend.

The Public Advisory Committee has been chaired by Mr. Jim Rozakis, RAP team leader from the Pennsylvania Department of Environmental Resources. While this arrangement has functioned for

the short term, it will be necessary for the Public Advisory Committee to have leadership from within the community. Community leadership of the Public Advisory Committee will lead towards long-term stability and form a partnership with the RAP team.

It was not clear the extent to which the Public Advisory Committee had direct involvement in writing the plan. Comments were voiced during the review meeting by Public Advisory Committee members that not enough credit had been given to their volunteer efforts. Now there appears to be much potential for the Public Advisory Committee to re-energize as work begins on the Stage 2 process. The International Joint Commission would also like to suggest further involvement with the local school systems as part of the RAP process. Successful student volunteer monitoring programs have helped build involvement in the RAP process and education in the local community.

CONCLUSION

The International Joint Commission is impressed with the amount of work which has gone into the Presque Isle Bay Stage 1 RAP process. A Public Advisory Committee was formed, allowing the opportunity for broad community involvement in the RAP process. The document itself contains a large amount of information on the Presque Isle Bay area and was compiled in a very timely manner, providing an opportunity to focus short-term resources on priority problem areas.

However, conclusions regarding several of the potential impairments must be regarded as tentative and will need to be reassessed in light of additional information and analysis. Several studies are either planned for the near future or are already ongoing which will contribute to this reassessment. Adequate funding to further these endeavors should be provided as available and multi-agency partnerships encouraged to leverage resources.

While recognizing significant uncertainties on various use impairments, the International Joint Commission urges the RAP team and the Public Advisory Committee continue working on the Stage 2 RAP process. Stage 1 deficiencies can be covered in an update section or through production of an annual report.

**TABLE 1. INTERNATIONAL JOINT COMMISSION REVIEW OF USE IMPAIRMENTS
IN THE PRESQUE ISLE BAY REMEDIAL ACTION PLAN**

USE IMPAIRMENT	RAP CONCLUSION ¹	REVIEW COMMENTS ²	RECOMMENDATIONS ³
(i) RESTRICTION ON FISH AND WILDLIFE CONSUMPTION	Not Impaired.	Probably impaired. More studies needed.	Additional studies required for verification.
(ii) TAINTING OF FISH AND WILDLIFE FLAVOR	Not Impaired.	Concur for most part.	Continue to verify.
(iii) DEGRADATION OF FISH AND WILDLIFE POPULATIONS	Not Impaired.	Probably impaired.	Requires further assessment, including bioavailability and zebra mussels.
(iv) FISH TUMORS OR OTHER DEFORMITIES	Impaired.	Concur.	Continue successful studies, focusing on PAHs in particular.
(v) BIRD OR ANIMAL DEFORMITIES OR REPRODUCTIVE PROBLEMS	Not Impaired.	Concur.	Continue collection of informal data, particularly in Presque Isle Bay State Park.
(vi) DEGRADATION OF BENTHOS	Not Impaired.	Probably impaired - further assessment required. Lack of data noted.	Studies planned for Spring 1994 can be compared with model predictions as developed by Canada Centre for Inland Waters (Reynoldson et al)
(vii) RESTRICTIONS ON DREDGING ACTIVITY	Impaired.	Concur.	Consider wind effects for sediment resuspension impacts.
(viii) EUTROPHICATION AND UNDESIRABLE ALGAL BLOOMS	Not Impaired.	Concur.	Evaluate zebra mussel impacts.
(ix) RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS	Not impaired.	Concur.	none.
(x) BEACH CLOSINGS	Limited Impairment.	Concur.	Do comprehensive bacteria work in Presque Isle Bay.
(xi) DEGRADATION OF AESTHETICS	Not Impaired.	Concur.	none.
(xii) ADDED COSTS TO AGRICULTURE OR INDUSTRY	Not Impaired.	Concur.	none.
(xiii) DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS	Requires assessment.	Concur.	none.
(xiv) LOSS OF FISH AND WILDLIFE HABITAT	Not Impaired.	Concur.	Encourage habitat enhancement projects.

¹ Conclusion of Stage 1 document.

² Comments of reviewers related to this use impairment.

³ Recommendations by the IJC RAP Steering Committee.

ENGINEERING
PLANNING
MANAGEMENT

August 12, 1992

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Field Operations - Director's Office
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Attn: James D. Rozakis

Gentlemen:

ERIE, PA 16501

FAX 814/455-6596

At the Policy Advisory Committee meeting for the Development of the Remedial Action Plan for Presque Isle Bay, we discussed and suggested that the State consider inserting discussions about the zebra mussel within the plan document. Of special concern was the potential for this species to disrupt and change the ecosystem of Presque Isle Bay. This item is to be placed on the agenda for the August meeting.

814/453-4394

In reviewing the revision document prepared by the PA DER, we have reached a conclusion as to where we would recommend an insertation be made to discuss the zebra mussel. That would be in Section 3.4.1.2 under "Other Aquatic Species." We would suggest a paragraph describing the zebra mussels, their effect on the ecosystems, and their potential to replace several of the species discussed. Our primary concern would be the effect they would have on the two mollusk beds and their effect on the mollusks presently considered rare or endangered. We believe that Professor Masteller's work does show a significant danger to the continued survival of other mollusks. We would likewise question whether they may have an effect on turtles by establishing colonies on their shells which in turn would effect their mobility.

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We believe the plan should also discuss the effect of these organisms on other aspects of the ecosystem. As an example, it has been shown that water clarity in the Bay is improving. This most likely will result in additional weed growths where sunlight now is capable of penetrating to the bottom of the Bay where previously it had not been capable of doing so. This

could effect significantly the species types of fish to be found in the Bay.

In any event we believe that to ignore the zebra mussels at this time is to ignore a very huge potential effect on the existing ecosystem.

We have a second comment regarding Chapter 3 that is in Chapter 3.4.7 "Waste Disposal." Septic tank tile fields or subsurface disposal has not been discussed in this particular paragraph. We believe it appropriate that it be done inasmuch as some onlot disposal still do exist. This includes the sand filter systems located on the peninsula which discharge treated effluent into the underground waters of the peninsula. As previously noted in the discussions it is not truly known whether these waters should be defined as surface waters or ground waters because of the nature of the peninsula. It also is not known if these waters discharge to the Bay or lake, our estimate is both. Therefore we believe it appropriate to include these facilities in the discussion.

Also in Chapter 3 there is extensive discussion about the flushing time of Presque Isle Bay. No where in the past studies nor in this report do we see mentioned the fact that a major portion of the flushing water enters the Bay at or nearly at the channel exit. Fully two-fifths of the total water budget of the Bay (Millcreek) would normally only flush a very small percentage of the Bay. Thus the



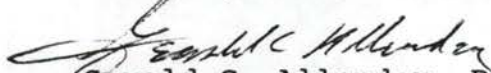
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residence time of the major portion of the Bay may be even greater than 2.45 years, reaching close to five years.

Very truly yours,

CONSOER, TOWNSEND & ASSOC., INC.


Gerald C. Allender, P.E.
Project Manager

GCA:lb

cc: Erie Sewer Authority
Truman Andrews
Bruce Yount


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