



IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE

Jean Lafitte National Historical Park and Preserve
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April 26, 2001

Memorandum

To: Brian Breaux, Regulatory Branch
New Orleans District, U.S. Army Corps of Engineers
From: David Muth, Chief of Resource Management
Jean Lafitte National Historical Park and Preserve
Subject: Louisiana Audubon Council Letter
Reference: EC-2-000-4600, Jefferson Parish

At the request of Linda Mathies, we have prepared below a detailed discussion about the issues raised in a letter to you dated October 20, 2000, from Dr. Barry Kohl of the Louisiana Audubon Council (LAC). We have done so with technical guidance from Charles Demas, District Chief of the Water Resource Division of the United States Geological Survey (USGS) in Baton Rouge, Louisiana. The LAC letter raises questions about the possibility of contaminated sediments. We appreciate the concerns about heavy metal contamination expressed in the letter. Since 1981 the park has been cooperating with the United States Geological Survey (USGS) on contaminant sampling and other water quality parameters. We have also consulted with the Louisiana Department of Environmental Quality (DEQ) since they began monitoring the area for mercury contamination in 1996. We have consulted other contaminant experts government-wide and in academia. We have concluded that, at present, there is no evidence of acute heavy metal contamination within the park or in adjacent waters. While the chronic effects of heavy metal loads bear continued monitoring and vigilance, all of the studies to date have indicated no acute health risk to humans or biota in the Barataria Preserve.

At present, we have available a broad range of spot data taken at various sites, at various times, by various agencies, using various protocols. Nevertheless, despite all the data thus far collected, no one can accurately answer a broad range of important questions. No one has defined natural background levels; the effects of atmospheric deposition; mechanisms of transport by water or sediment movement; the location (if any) of anthropogenic point sources; the rate of methylation; the rate or mechanism of bioaccumulation; the influence of various chemical properties in estuarine waters on sediment capture, methylation, or biotic uptake; the role of migratory organisms; or a host of other variables. What can be determined is that at the sites sampled, concentrations of heavy metals, pesticides, and other chemicals in park waters, sediments, and biota, are well below the acute levels seen in known contaminated sites. These concentrations occur in spite of the park's location adjacent to several urban effluent sources. We are also aware that despite conservative thresholds for fish consumption advisories based on mercury contamination, the state has issued no advisories for the park or adjacent waters after three years of testing.

In his letter, Dr. Kohl cites four data sets as the cause for LAC's concerns.

1) The first is the 1999 Annual Report *Mercury Contaminant Levels in Louisiana Biota, Sediments and Surface Waters, 1994-1999* issued by DEQ, which summarizes their own testing. Mercury levels in sediments at three sites are noted as being of concern:

- a) Site 0598 in northeast Lake Salvador south of Westwego which had a sediment concentration of 0.280 ppm (total mg/Kg as Hg dry wgt) and dissolved concentration of less than the detection level of 0.050 ppb (dissolved ug/L as Hg) when sampled 4/15/97. (The letter does not note that this site was re-sampled 10/28/98 and the sediment load on that date was found to be only 0.091 ppm);
- b) Site 0636 in Lake Cataouatche south of Avondale, sediment concentration 0.134 ppm, dissolved concentration below the detection level when sampled 11/03/97; and
- c) Site 0853 in Bayou Segnette south of Westwego, sediment concentration 0.106 ppm, dissolved concentration below the detection limit when sampled 10/28/98.

The letter states that these mercury levels are "elevated" and above the "normal background level of 0.04 ppm." No source for the number 0.04 ppm is given. Indeed, it is not clear to what the phrase "normal background" refers. Whether the source of mercury contamination for aquatic ecosystems is atmospheric, water-borne, or a combination, background levels are entirely dependent upon a host of variables. These include underlying geology, wind currents, atmospheric point sources, alkalinity, specific conductance, water pH, dissolved oxygen levels, water currents, water turnover rates, bio-activity levels, and the nature of the sediments. Organic sediments, which are characteristic of the area, would show much higher "background" levels than mineral sediments. (*Environmental Contaminants Encyclopedia, Mercury Entry*, July 1, 1997, NPS.)

USGS, in cooperation with NPS, took sediment samples from the bottom of the Bayou Segnette Waterway 8/25/99 at two stations, one located north of the proposed dredge sites, 4.6 miles south of Westwego, and the other south of the proposed dredge site, at the junction of pipeline canal. At both sites, total mercury in the sediments was measured at 0.03 ppm (ug/g as Hg), an order of magnitude lower than the DEQ numbers. (USGS sampled a number of water quality parameters at three park sites between June 1998 and May 2000. See discussion of USGS sampling under (2) below, and the draft results, attached.)

There is no widely accepted scientific definition of a "normal background level" of mercury for the Barataria Basin or similar estuarine systems of which we are aware. Nationwide measurements of acute toxicity and various risk assessment analyses suggest that even the highest total sediment load reported for the area by DEQ (0.363 ppm) falls into a low risk or low effects range. High risk is generally associated with levels above 0.88 ppm or higher (Long; Hull and Suter). Statewide sediment sampling performed by DEQ in 1994-95 found the mean concentration of mercury in 73 samples to be 0.170 ppm with a range of 0-0.631 ppm. The Salvador-Segnette area totals fall near the observed mean. The highest total reported in the statewide survey (0.631 ppm) was below the maximums reported in a number of other comparable studies. Even this highest level is within the median effect range for toxicity. Of course, there is no strong statistical correlation between sediment levels of mercury and mean tissue concentrations. Furthermore, none of these studies distinguishes methyl mercury from total mercury. (*Mercury Contaminant Levels in Louisiana Biota, Sediments and Surface Waters*, second Annual Report, LDEQ, 1996).

Because all of these assessments measured total mercury, not biologically available methyl mercury, the degree to which any of these levels represent a threat to organisms or humans is unknown. However, unlike the situation for sediment and water where risk levels are not firmly established or understood, standards for acceptable risk levels in fish to be consumed have been established by state agencies. DEQ measured bio-accumulation in fish in the Lake Salvador area in 1996, 1997, and 1998. The 1996 data showed moderate levels below the threshold for human health concern. The 1997 data did show some elevated levels, above 0.5 ppm, the point at which the state begins analyzing whether or not a fish advisory for human health is appropriate. Repeat testing in 1998 showed levels that were in line with the 1996 levels and failed to replicate the 1997 levels. DEQ concluded that the 1997 levels were anomalous, possibly indicating contamination of the samples. The State of Louisiana has issued no fish advisories for Bayou Segnette, Lake Salvador, or Lake Cataouatche, and has not signaled to us any plans to do so. (See e-memo from C. Demas to L. Mathies, attached.)

Nevertheless, bio-accumulation of mercury in fish tissue is clearly going on, and is a serious concern. The USGS fish tissue samples summarized in the attached report show numbers that are consonant with the general levels shown by the DEQ sampling. There is no evidence, however, that a dredge project which moves organic sediments from the lake bottom and confines them into a smaller area, with far less exposure to the water column and to fish populations, will negatively effect bio-accumulation rates in this area. If the elevated levels seen in 1997 were accurate, then the results can only be interpreted to mean that factors other than location of fish populations and underlying sediments are at work, since there is no correlation among sediment level, tissue level and fish species in the data.

2) A 1982 USGS report, commissioned by the park service, which concluded that dissolved mercury levels exceeded the 1976 EPA standard of 0.10 ug/L for marine aquatic life (the 11 samples ranged from: <0.1 (n=1); 0.1 (n=5); 0.2 (n=1); 0.4 (n=1); 0.8 (n=1); 1.1 (n=1) to 1.7 (n=1) ug/L as Hg). Testing protocols and standards have, of course, changed since 1982. In particular, protocols for mercury testing have been tightened because of the very real possibility of sample contamination. As a result, USGS no longer considers the 1982 mercury data reliable. To quote Charles Demas, "USGS water data collected prior to 1994 is suspect because of sample or lab contamination because HgCl was used as a preservative for nutrient samples and may have gotten in the lab's air conditioning system...."

Furthermore, no subsequent sampling by USGS or DEQ has shown dissolved mercury levels as high as the three high samples reported in the 1982 study. (See attached USGS data taken from park sites 6/17/98, 8/25/99, 2/4/00, and 5/31/00. The three sites used for the 1982 analysis were variously re-sampled, including 4 samples taken 4.6 miles south of Westwego, in Bayou Segnette, below the mouth of the Millaudon Canal; three samples taken at the southern terminus of the Segnette Waterway; and two samples taken in the interior of the park in Kenta Canal. All of these samples showed dissolved mercury levels below the detection limit of 0.2 ppb (ug/L) {0.3 ppb (ug/L) total. The DEQ data from 1996-98, which also shows no high concentrations of dissolved total mercury, is summarized above.)

3) The letter also states "it is our belief that there could be additional pockets of contaminated sediments containing toxic heavy metals along the reach below the Millaudon Canal, which was a major discharge for sewerage (sic) on the Westbank of Jefferson Parish for 20 years. The dredging sites in Bayou Segnette are downstream of this out-fall. High levels of dissolved heavy metals (Cu, Pb) were detected at the Ames Pumping Station (water samples 1/84-5/88)." Unfortunately, no reference is given for this data. Perhaps it was collected by Jefferson Parish, at the old (now gone) Ames Pumping Station, which was located on Lapalco Blvd., approximately 7.5 miles by water from the northernmost borrow site proposed for this project.

However, levels of copper or lead detected by USGS sampling on Bayou Segnette at the park site located 4.6 miles below Westwego, which is below the out-fall of Millaudon Canal, are not elevated. Sampling at this site by USGS for NPS spans the period April 1981 to May 2000 (see attachments). If the Millaudon Canal were a conduit for contaminants from developed areas to enter Bayou Segnette, then presumably this site would show elevated levels of contaminants. Similarly, if the bayou were a conduit for contaminants from the Westwego pumping stations, evidence of contaminants would be elevated at this site. The data indicate otherwise. Indeed, in the case of mercury, DEQ sampling summarized in the 1999 report (above), show levels in sediments in Bayou Segnette and at the mouth of Bayou Segnette in Lake Cataouatche that are *below* the levels detected in Lake Salvador (for 2 out of 3 samples). The difference between DEQ numbers for Lake Salvador and USGS numbers for the Segnette Waterway (see above) are even more dramatic. Thus, the source of the mercury is not indicated as the pumping stations that drain Westwego and Marrero directly and indirectly into Bayou Segnette.

4) The letter also references the Barataria-Terrebonne National Estuary Program's 1995 publication no. 22, *Status and Trends of Eutrophication, Pathogen Contamination, and Toxic Substances in the Barataria-Terrebonne Estuarine System*. That report analyzed site number 8, located in Bayou Segnette at the mouth of the Westwego Pumping Station out-fall, about 8 miles by water from the northernmost proposed borrow area. At this site, four metals, not including mercury, were at higher levels than elsewhere in the Barataria Basin. The report, however, was inconclusive about the seriousness of these levels of metals: for arsenic, "may be a human health problem in spite of the fact that levels are not exceptionally high;" for cadmium, "potential problem for Cd at this site;" for copper, "levels at this site may constitute a water quality problem;" and lead, "levels at this site occasionally may affect aquatic organisms and their uses."

In the Executive Summary, the authors state (p. xlii): "the status analyses did not reveal any major problems with respect to contaminants in the Barataria and Terrebonne basins; however, some minor contamination problems were evident." They continue: "The sites for which contamination problems are most evident [including Bayou Segnette]...all fall on the periphery of the study area. The interior of the basins appear relatively clean...." They conclude (p. xliii): "Contamination should therefore be a source of concern, though none of the problems appeared serious enough to warrant immediate and drastic actions."

Furthermore, as indicated above, USGS sampling in Bayou Segnette down-estuary from these sites does not indicate that elevated levels of these metals are making their way down the bayou to the vicinity of the dredge borrow areas in Lake Salvador and the Segnette Waterway.

In addition to the four contaminant references discussed above, the letter raises specific points about individual elements of the project: "Our concern is that contaminated sediments may be dredged from the bottom of Bayou Segnette and redeposited in clean areas." However, the material to be dredged from the bottom of the Bayou Segnette Waterway is to be deposited immediately adjacent to the borrow site to form a dike in the mouths of the adjacent canals. The histories of the Segnette Waterway and of the two side drill-hole canals are virtually identical, the side canals having been dredged at approximately the same time as the waterway, ca. 1958-1960. If the sediments in the bottom of Bayou Segnette were contaminated, the sediments in the mouth of the drill-hole canal would be contaminated as well, since they have been under identical hydrological and atmospheric influences for the 40 years that have elapsed since they were dredged through pristine marsh.

The Lake Salvador borrow area, on the other hand, has a somewhat different physical history. The shoreline on the lake is comprised of organic peat marshes, providing little resistance to erosion. Consequently, shoreline retreat in this area is severe, up to ten meters a year: in the not too distant past,

portions of the borrow area were actually marsh. The bottom sediments here are largely comprised of the organic detritus from that eroded marsh. Indeed, the sediments are comprised of the same soils that were dredged away when the drill-hole canals were constructed. It is precisely for this reason that the lake bottom sediments are desirable fill for this prototype effort to rebuild these peat marshes.

Generally, if lake-bottom sediments contain mercury, either at natural "background" levels or by absorption from the water, methylation is likely to have occurred only in the upper 10-30 cm of sediments (Krabbenhof). In this case, however, the organic peat sediments on the lake bottom are semi-fluid and unconsolidated. It is possible that methylation is occurring to a greater depth because the sediments may be continuously re-worked by storms. On the other hand, the stirring of the sediments may reduce the rate of methylation by changing the water chemistry. In either case, the proposed project will confine these sediments into containment with a much-reduced surface area and a drastically decreased exposure to the water column and aquatic benthos.

Conclusion

Chronic low levels of heavy metals, almost certainly anthropogenic in origin, are characteristic of sediments in the Barataria Basin. The park is deeply concerned about these heavy metals, especially about their potential magnification up through the food chain by bio-accumulation. The park is just as concerned about finding techniques for the restoration of habitat lost to human actions. The floating marshes of the upper Barataria and Terrebonne estuaries are globally unique, and no comparable resource exists anywhere in the National Park system. This project will help address that habitat concern, and will not materially exacerbate the heavy metal problem. At the present state of knowledge and technology, there is no ready solution to the problem created by heavy metals already deposited into this ecosystem. There is real hope, however, that restoration techniques, such as those being tested here, can materially improve habitat conditions and ecosystem function while we wait for viable answers and solutions concerning heavy metals.

References

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