Cal/EPA

Department of
Toxic Substances
Control

400 P Street,
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P.O. Box 806
Sacramento, CA
95812-0806

September 29, 1997

Pete Wilson
Governor

James M. Strock
Secretary for
Environmental
Protection

Judge Philip Callis
Hearing Office
State Personnel Board
P.O. Box 944201
Sacramento, California 94244-2010

APPEAL FROM 6 MONTH REDUCTION IN SALARY
Rash Ghosh Case No. 97-2950

Dear Judge Callis:

Please find enclosed a copy of the fully executed settlement agreement for the above entitled appeal. This matter was set for hearing for Monday, September 22, 1997, but was removed from calendar because the parties were able to reach a settlement.

Should you have any questions, please feel free to contact me at (916) 327-1184.

Sincerely,

Robert Hoffman
Chief Counsel

Joan A. Markoff
Staff Counsel

Enclosure

cc: Mr. Matt Austin
Labor Relations Consultant
California Association of Professional Scientists
1390 Market Street, Suite 925
San Francisco, California 94102

Mr. Phil Amen
Personnel Officer
Personnel Office
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P.O. Box 806
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Ms. Debbie Dolenga
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Sacramento, California 95812-0806

September 29, 1997

Judge Phillip Callis
Hearing Office
State Personnel Board
P.O. Box 942801
Sacramento, California 94244-2010

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BEFORE THE CALIFORNIA STATE PERSONNEL BOARD

STIPULATION FOR SETTLEMENT

In the Matter of the Appeal of RASH B. GHOSH from 6 Months Reduction in Salary	SPB Case No. 97-2950

In order to avoid the uncertainty and expense attendant upon litigating the above-captioned matter, the parties hereby settle the dispute between them as follows:

1. The parties agree that the six-month reduction in salary referenced in the adverse action is hereby amended to be a one-month, 5% reduction in salary.

2. The parties agree that the "statement of causes" shall be amended to read as follows:

"This action is being taken against you for causes specified in the following subsection of Government Code section 19572:

(e) insubordination"

3. Appellant agrees to and hereby does withdraw his appeal of the adverse action.

4. Both parties have had an opportunity to consult their representatives on this matter and enter into this agreement freely.

Rash B. Ghosh
RASH B. GHOSH, Appellant Date: 9/26/97

H. Mattson Austin
H. MATTSON AUSTIN,
Labor Relations Consultant,
California Association of Professional Scientists Date: 9/29/97

J-A. Wall
JOAN MARKOFF, Counsel
Dept. Of Toxic Substances Control Date: 9/29/97

Philip R Amen
PHIL AMEN, Personnel Officer
Dept. Of Toxic Substances Control Date: 9/29/97

TOTAL P.03

TOXIC CONTAMINANTS IN THE SAN FRANCISCO BAY-DELTA AND THEIR POSSIBLE BIOLOGICAL EFFECTS:

EXECUTIVE SUMMARY

DAVID J.H. PHILLIPS

AQUATIC HABITAT INSTITUTE
180 RICHMOND FIELD STATION
1301 SOUTH 46TH STREET
RICHMOND, CA 94804

(415) 231-9539

26 August, 1987

EXECUTIVE SUMMARY

INTRODUCTION

The Aquatic Habitat Institute (AHI) is required under the terms of contract WRCB No. 5-290-120-0 to prepare a report summarizing the results of studies which address the effects of pollutants on San Francisco Bay-Delta biota. This report has been produced in response to this contractual commitment between AHI and the California State Water Resources Control Board.

The San Francisco Bay-Delta is the largest estuary on the Pacific coast of the United States, and has been subjected to considerable anthropogenic influence over the last two centuries. In recent times in particular, there has been much concern over pollution of the estuary. This gave rise to upgrading of the treatment of sewage and industrial wastes in the 1960s and 1970s, which demonstrably improved the general quality of the Bay-Delta receiving waters. Present concerns have turned away from "conventional" pollutants and towards more toxic and persistent contaminants, including trace elements, chlorinated hydocarbons, and petroleum-derived hydrocarbons. This report deals exclusively with these toxic contaminants, reviewing the available data on their levels in various components of the estuary (water, sediments, biota) and discussing their possible biological effects.

The concentrations of toxicants in water, sediment, and especially biota of the Bay-Delta are of considerable relevance to discussions of the biological effects of such contaminants. Thus, biological effects of toxicants will be most likely to occur in areas of particularly elevated contaminant concentrations, especially if such contaminants are bio-available. The consideration of comparative levels of toxicants in different parts of the Bay-Delta is therefore a first step in attempting to delineate potential or existing biological effects of contaminants in the estuary. In addition, it is useful to compare data relevant to the Bay-Delta ecosystem with those from other estuaries or coastal waters, to place the local situation in a broader context.

TRACE METALS IN THE BAY-DELTA

Most major estuaries exhibit enrichments of trace element levels compared to offshore coastal waters, and the San Francisco Bay-Delta is no exception to this general rule. Trace metals enter the estuary in Delta outflows, urban run-off, industrial and municipal effluents, and from other (generally more minor) sources. The relative magnitudes of such sources define the profiles of trace element enrichment within the Bay-Delta system. Thus, if Delta outflows are a major source of a given metal, a gradient of increasing contamination will be evident from the marine area of the Golden Gate through the northern reach of the estuary to

Suisun Bay and the Delta. Such gradients are also seen for some elements in the South Bay, probably because of their discharge in municipal and industrial effluents in South Bay, rather than the effects of river run-off. The Bay-Delta is a large and complex system, and each element exhibits unique characteristics with respect to its distribution and bio-availability within the estuary. Brief synopses are presented below for each element covered in the report.

Silver: The distribution of silver in the Bay-Delta is unusual, in that it is dominated by discharges of the element to the South Bay. Thus, the South Bay is heavily enriched by silver, while concentrations in the northern reach are much lower. Levels of silver in water, sediments, and biota of the South Bay are of sufficient magnitude to suggest the possibility of detrimental biological effects, although no such effects have been documented to date.

Copper: Moderate copper enrichment of waters and sediments of both the northern and southern extremities of the Bay has been documented. The element is introduced to the Bay through both Delta outflows and sources within the estuary (municipal and industrial effluents). Concentrations of copper in Bay-Delta biota are high compared to those in water and sediment, and it is possible that the element is of unusually high bio-availability in the system, which is particularly relevant in terms of regulatory controls required to reduce its effects in the estuary.

that, like copper, cadmium may be of unusually high bio-availability in the estuary. However, no major areas of particularly heavy cadmium enrichment have been documented in the Bay-Delta.

Lead: Local studies on lead have suffered from the same analytical difficulties as have investigations elsewhere. The database for lead in the Bay-Delta is thus poor. Such reliable data as exist show no evidence for major sources, but indicate the presence of a mosaic of minor lead sources in the estuary, causing only moderate contamination of a variety of sites. The ubiquity of lead in the estuary is in keeping with its introduction to the Bay through several routes, including both point and non-point sources.

Zinc: Both the northern reach of the Bay-Delta and the South Bay exhibit elevated concentrations of zinc, although levels of the element are not particularly high compared to other estuaries elsewhere. Delta outflows are a major source of zinc in the estuary, as are within-Bay municipal and industrial effluents. There is no evidence of biological effects occurring due to zinc contamination locally, and the levels of enrichment are such that these would be unlikely to exist.

Chromium: The database for chromium abundance in the Bay-Delta is poor, with disagreement between studies. However, there is little evidence that this element is unusually enriched in the estuary.

Nickel: Both the northern reach of the Bay-Delta and the South Bay exhibit elevated nickel concentrations compared to Central Bay or offshore marine waters. However, like zinc, it is unlikely that the degree of contamination present would generate problems with respect to biological resources in the estuary.

Tin: Very little is known about the concentrations of tin in the Bay-Delta. One recent study documented elevated tributyltin (and other butylated tin compounds) in waters of harbors and marinas. The levels found were similar to those reported from such sites elsewhere. Biological effects are likely at such concentrations, at least in poorly-flushed areas; however, no direct studies of such effects have been undertaken locally.

Other trace elements: Insufficient data are available on trace elements other that those discussed above to permit conclusions on their overall abundance or effects within the Bay-Delta.

ORGANOCHLORINES IN THE BAY-DELTA

Organochlorines (chlorinated hydrocarbon pesticides, and polychlorinated biphenyls or PCBs) are highly bio-accumulated and of extreme persistence in the environment, due to their lipophilic nature and resistance to biotic or abiotic degradation. These compounds are also of considerable toxicity to aquatic organisms, affecting many phyla in diverse ways.

PCBs: The concentrations of PCBs in sediments and biota of the Bay-Delta are notably elevated compared to offshore marine waters. Monitoring data suggest the existence of many sources of PCBs in the estuary and provide little evidence that PCB levels have decreased subsequent to the introduction of controls on their use in 1976. The general contamination of the Bay-Delta ecosystem by PCBs is not as extreme as that seen in certain other parts of the USA, but PCB levels locally are of concern and may be exerting detrimental effects on biological resources. In particular, there is suggestive (but not yet conclusive) evidence of effects on fish reproduction in the Bay-Delta. Additional studies of a direct cause-and-effect nature are warranted, and individual PCB homologues should be quantified in future studies.

DDT and metabolites: Like PCBs, DDT and its metabolites are found throughout the Bay-Delta. Their abundance has probably diminished since the use of DDT and related compounds in California was controlled in 1970, but the database is poor. It is probable that DDT continues to enter the estuary from soils in the catchment, as a result of its historical use in the Central Valley. The overall levels of DDT and its metabolites are probably not sufficiently elevated in the Bay-Delta at present to adversely affect biota, at least on a major scale.

Other organochlorines: Several other organochlorine pesticides are present at elevated levels in the Bay-Delta

and its catchment, especially the Central Valley. In particular, dieldrin, chlordane, and toxaphene are commonly found. Smaller amounts of other pesticides (hexachlorobenzene, endosulfan, chlorbenside, dacthal, heptachlor and its epoxide, and HCH isomers) are also present. There is no evidence for significant Bay-wide enrichment of such contaminants to levels which may interfere with biological resources. However, local effects are probable in small areas of particular enrichment, such as those receiving agricultural drainage waters.

HYDROCARBONS IN THE BAY-DELTA

The analysis of environmental samples for hydrocarbons is a challenging and taxing task at the present state of the art, and less is known of these compounds in the Bay-Delta than of trace metals or organochlorines. Nevertheless, there is reason to believe that significant contamination of the estuary by a variety of hydrocarbons exists (particularly given the urbanized nature of the estuary and the large local oil refining industry). Such monitoring data as exist tend to confirm the presence of significant levels of hydrocarbon contamination in the estuary. Both monoaromatic hydrocarbons (MAHs) and polycyclic aromatic hydrocarbons (PAHs) are present in sediments and biota, and it is conceivable that these pose a threat to biological resources in the estuary. However, insufficient data exist to substantiate this possibility at present.

BIOLOGICAL EFFECTS IN THE BAY-DELTA

While considerable effort and expense have been dedicated to monitoring contaminant levels in the Bay-Delta, much less study has occurred to date on the biological effects of toxicants in the estuary. This is partly due to the fact that proven methods for investigating biological effects of pollutants have in many cases only recently been developed. However, various techniques are now available, and some of these are beginning to be employed in the Bay-Delta.

The benthos of the Bay-Delta: Studies of benthic communities have been used extensively elsewhere to characterize pollution effects. In the Bay-Delta, it is known that great changes have occurred to benthic communities, driven principally by physical alterations of the estuary, changes in water quality, and the introduction of exotic species. Present-day benthic communities are heavily dominated by such introduced species, many of which are opportunistic in nature and have flexible life strategies, designed to deal with a dynamically changing environment. Thus, the benthos of the Bay-Delta is under a continuous state of flux, and benthic community structures cannot be predicted with any accuracy. The effects of natural variation largely obscure those due to anthropogenic influence (including pollution), and the monitoring of benthic communities to estimate the impacts of contaminants in the estuary is generally an imprecise technique, leading to little useful insight.

Fisheries of the Bay-Delta: Studies of fisheries in the estuary have been very extensive, and in many cases a long-term database exists to aid in discerning temporal changes in fish and invertebrate populations. There is evidence for considerable historical change in the status of many populations, although no factor appears to be solely responsible for such effects. Recent reductions in the populations of species such as striped bass and Dungeness crab remain a matter of controversy, and it is most likely that such effects are a result of a variety of impacts rather than being due to any single overriding factor. Striped bass populations afford an excellent example. Fishery statistics suggest an overall reduction in striped bass numbers in the Bay-Delta, although the precise timing of this reduction cannot be ascertained. Many factors may be at least partially responsible, including the reduction in Delta outflow (with possible consequent effects on primary productivity and food availability in the Delta), the physical removal of fish and food by water diversions, habitat change in the estuary, and the impacts of contaminants. The latter may be both acute (e.g. from direct toxic effects of pesticides in the Delta) and chronic (e.g. due to the interference of bio-accumulated contaminants in reproduction). However, the evidence for contaminant effects is inconclusive. For starry flounder, recent evidence is

suggestive that PCBs in the estuary may be interfering with fertilization; direct cause-and-effect studies should be undertaken. Finally, there is little evidence of pollutant-related impacts such as fin erosion or neoplastic effects in Bay-Delta fish populations. However, striped bass from the area close to the Chevron USA refinery outfall in Castro Cove were recently found to exhibit fin erosion, and both this species and shiner perch developed fin erosion in laboratory bioassays of the refinery effluent.

Bird populations: Very little information is available on the effects of contaminants on Bay-Delta bird populations. However, birds in the Central Valley have experienced reproductive problems in the Kesterson area, probably due to the impacts of accumulated selenium. The Bay and its catchment are of very considerable importance as a migratory and wintering habitat for birds on the Pacific Flyway. There is evidence that organochlorines are accumulated by birds during their stay in this area, but the concentrations attained are probably insufficient to elicit widespread problems. In the Bay-Delta itself, both selenium and PCBs may have impacts on waterfowl, but the evidence is insufficient at present to confirm the scope of such effects.

Mammalian populations, including Man: Studies of contaminants in aquatic mammals have not been adequately extensive to elucidate any adverse impacts. However, investigations elsewhere have suggested that PCBs interfere

with seal reproduction, and the extent of local contamination by PCBs may be sufficient for such effects to be present in the Bay-Delta. With respect to public health, it is notable that both selenium and mercury concentrations in certain fish and wildlife from the estuary and the Central Valley catchment are sufficiently elevated to give rise to concern; in some cases, public health advisories have been issued. Occasional values of cadmium exceeding those thought to pose a threat to public health have also been recorded in bivalve molluscs from the estuary. Studies of the chemical speciation of elements (especially mercury and arsenic) in local seafood have been inadequate to date to act as a basis for decisions on the protection of public health. The toxicological impact to Man of organic contaminants in Bay-Delta biota is almost completely unstudied.

Bioassay data: New bioassay methods have recently been introduced to enhance studies of the effects of toxicants in the Bay-Delta on local species. These represent a considerable improvement over previous methods, and promise to give rise to a better understanding of the direct impacts of both discharged effluents and in-place contaminants in the estuary. Studies of lethal and sublethal effects of diluted effluents have recently indicated the likelihood of significant impacts of at least some effluents close to outfalls. Sediment bioassays have similarly suggested that certain areas of the Bay-Delta pose a toxic threat to benthic

infauna and possibly demersal species. These techniques require further development and a more widespread application in the estuary, so that the overall understanding of the adverse impacts of contaminants in the Bay-Delta may be improved.

CONCLUSIONS

An adequate understanding of the biological effects of contaminants in the San Francisco Bay-Delta is attainable only through the accurate and comprehensive characterization of contaminant abundance in the estuary, coupled with carefully designed studies of the direct or indirect impacts of toxicants upon resident biota. There can be little doubt that the present documentation of such effects is inadequate. Neither the abundance and distribution of contaminants in the estuary, nor their impacts on wildlife, is sufficiently characterized at present.

Monitoring programs employed to define the concentrations of toxicants in waters, sediments, and biota of the Bay-Delta have provided some insight into the general levels of contamination of the estuary. However, problems related to analytical methodologies, or to the inadequate design of monitoring programs, or to insufficiencies in the spatial or temporal aspects of the database, combine to constrain the present level of characterization of contaminants in the Bay-Delta.

studies designed to document the biological effects of toxicants in the estuary have been few. Most of the investigations of this type to date have provided only suggestive correlations of biological parameters with contaminant abundance. Because of the covariance of contaminant profiles in the estuary with each other and with additional parameters (e.g. salinity, Delta outflow, sediment grain size, etc.), it is often impossible to derive conclusions of a cause-and-effect nature. In at least some cases, improved understanding will only be attained through direct cause-and-effect studies, which will frequently require both field and laboratory-based components.

Specific conclusions are possible with respect to individual contaminants. There is a need for more data on the sources, distribution, bio-availability, and toxicity of certain trace metals in the Bay-Delta (especially silver, copper, cadmium, selenium, and tin). The chemical speciation of arsenic and mercury in biota of the estuary merits further study. The impacts of PCBs (especially coplanar homologues) should be considered in greater detail, especially on fish and seals of the Bay-Delta. The toxicity of organochlorine pesticides in the Delta may be significant, and should be investigated further. It is recommended that hydrocarbons be quantified in samples analyzed in the State Mussel Watch Program, and that both monoaromatic and polyaromatic

hydrocarbons be better characterized in Bay-Delta sediments and biota. Additional studies of contaminant abundance and effects in fish and birds are also needed.