- The staff continued its claim that the elutriate test bioassays used in the risk assessment do not provide useful information in support of the finding of no adverse impacts associated with the NCMT-area copper-contaminated sediment, by stating in paragraph 3 on page 3 of the Staff Comments,

  > *"In addition, a number of organic ligands and inorganic substances can be liberated from the particulate phase during the agitation. These substances also may bind free copper ions, thereby reducing the toxicity in the subsequent exposure."*

  The staff's hypothesis is just the opposite of what would be expected. The organic ligands would be expected to be most effective in tying-up copper in non-toxic forms in bedded sediments rather than in the watercolumn. The ferric hydroxide formed as a result of pore water's coming into contact with dissolved oxygen would be scavenge many organic ligands, not liberate them.

- With regard to the issue of the reliance on the use of infaunal organism tests for assessing the impacts of sediment-associated contaminants on water quality, the discussion in the risk assessment section of WCC (1991) discussed some of the key technical issues of importance. These issues were expounded upon further in other materials submitted to the SDWQCB and which are part of the Administrative Record, as well as in comments submitted to the WRCB on other matters. One of the fundamental issues that is being highly debated by professionals in the field of sediment impacts on water quality that is important in this matter. This issue relates to the reliability of "equilibrium partitioning" as a basis for judging potential toxicity of contaminants in sediments. Basically, the issue is whether pore water characteristics reliably predict impacts on benthic organisms, much less the designated beneficial uses of a waterbody. With respect to the latter, there is no doubt that highly significant designated beneficial uses of a waterbody, such as sportsfisheries and shellfisheries, occur in waterbodies with sediments that have severely altered benthic organism types and numbers. The US EPA (Latimer, 1992) has reported from its EMAP on the East Coast of the US that the primary cause of altered numbers and types of organisms in the sediments is deficiencies in dissolved oxygen. The US EPA found that only a small percentage of the sediments found to be "impacted" could have been impacted by toxic chemicals such as copper, other heavy metals, and organics.

  The US EPA EMAP studies, however, did not include measurement of either ammonia or sulfide in the sediments, two chemicals that can be present in very high concentrations in sediments and that can affect aquatic organisms. In their studies of sediments at approximately 100 locations in the US, the authors have found that ammonia is the most common and likely the most significant toxicant. It is very clear that today there is a very poor understanding of the difference between the alteration of the numbers and types of worms and other organisms that live in sediments and therefore are potentially exposed to pore water conditions where high concentrations of ammonia, sulfide, and other toxicants are present and the significance of this alteration to the designated beneficial uses of a waterbody such as sports fishing, shellfish propagation, etc. which are of importance to the public who ultimately have to pay for all sediment remediation programs. It is well-known that excellent sportsfisheries occur in waterbodies with what may be considered by some measures of infaunal species numbers and types to be very poor sediment quality. There is no doubt that natural conditions and natural toxicants, not related in any way to Priority Pollutants or anthropogenic sources, can drastically alter and control the numbers and types of organisms that live in sediments. To state as the staff has done that the studies conducted on the NCMT area sediments are deficient in properly addressing the potential significance of the copper ore concentrate in adversely affecting the designated beneficial uses of San Diego Bay reflects a lack of understanding of the information available today on the relationship between sediment characteristics ("quality") and waterbody quality. It is also important to note that the toxicity testing that has been done included highly sensitive organisms representative of species that would be considered to be important components of the designated beneficial uses of the Bay, such as oyster larvae and fish larvae.

Dickson *et al.* (1992) recently published their findings that watercolumn screening bioassays of the type being typically used today (and modified for incorporation into the risk assessment toxicity testing of WCC (1991)) are useful for assessing the potential for significant alterations of watercolumn and benthic organism populations. Their findings provide further support for the position adopted some years ago by the US EPA and Corps of Engineers, and reaffirmed last year in the release of the "Green Book" for sediment quality testing (US EPA and US ACE, 1991) that tests of the type that were used in this study of the potential toxicity of the NCMT-area sediments have validity in assessing whether contaminants in the watercolumn and sediments are having an adverse impact on the designated beneficial uses of a waterbody.

- The Staff Comments contended on page 3 paragraph 4,

> *"If the same tests had been conducted on pore water samples, then some rationale would be available for interpreting the results as reflective of the bedded sediments."*

The staff's contention that pore (interstitial) water testing should have been done is inappropriate for several reasons. First, there are no standard, well-evaluated and accepted tests that can be used for this purpose. It has been well-known for more than 20 years that results of pore water testing are depend largely on a number of aspects of the manner in which the pore water was obtained from the sediment and how the sample was handled. Pore waters in most sediments, and certainly in those of San Diego Bay in the NCMT area, are anoxic, i.e., without oxygen. In order to test aerobic (oxygen-breathing) organisms, oxygen has to be introduced into the water being tested. It is well-known that as soon as oxygen is introduced into an anoxic sediment the toxicity of the sediments can be significantly changed (e.g., see discussion in WCC (1991) page 3-12; 3-22 to 3-28). Typically, the iron in sediments with no oxygen is in the ferrous form; upon contact with oxygen it is oxidized to ferric iron. Ferric iron precipitates as ferric hydroxide which is a highly efficient scavenger for a wide variety of contaminants, including soluble copper, rendering the copper non-toxic.

The issue of the use of pore water evaluations for assessing the potential impacts of sediment-associated contaminants, specifically copper, on water quality was discussed at length in Appendix B (page 11) of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7. That information, therefore, is part of the Administrative Record on this matter. There it is stated,

> *"As discussed in the risk assessment report, the concentration of a parameter measured in 'interstitial water' is significantly controlled by the approaches used to collect the sediment, separate the interstitial water from the sediment, and maintain appropriate redox conditions during sample handling. Very few measurements of concentrations of chemicals in 'interstitial water' can be considered to be reliable assessments of the concentrations that actually exist in the interstitial water of bedded sediments. This fact has been reiterated recently by the US EPA (Ankley et al., 1991) in the draft report, 'Sediment Toxicity Identification Evaluation: Phase I (Characterization), Phase II (Identification) and Phase III (Confirmation) Modifications of Effluent Procedures.' There it is stated, 'Regardless of the aqueous fraction [of interstitial-pore water] used in the TIE [toxicity identification evaluation], the extraction method will strongly influence chemical composition and toxicity of the test sample.' Ankley et al. (1991) also concluded, 'Further research is required to extend existing knowledge of pore water's suitability for evaluating sediment toxicity.'"*

- In pursuit of its argument for pore water testing, on page 3, paragraph 4, the Staff Comments stated,

> *"Copper released from sediments will become soluble in those waters in intimate relation to the solid phase, i.e. pore water."*

The characteristics of San Diego Bay sediments are such that the sediment pore waters would be expected to contain sulfide. Copper sulfides are highly insoluble and are known to be non-toxic.

The authors (Lee and Jones-Lee, 1992a) have conducted an extensive review of the use of equilibrium partitioning within sediment pore water as a basis for regulating determining when sediments are excessively contaminated with available forms of contaminants that are adversely impacting the designated beneficial uses of the waterbody in which the sediments are located. In that discussion they pointed out that many of the benthic organisms that live in sediments isolate themselves from the pore water through the development of protective tubes. These organisms are breathing water that contains oxygen, from the sediment-water interface. That water has many of the same characteristics as elutriate test waters. Testing as pore waters as suggested by the staff is clearly not a reliable basis for evaluating whether contaminants in sediments are having an adverse impact on organisms within the sediments much less on the designated beneficial uses of a waterbody such as San Diego Bay.

- The Staff Comment statement in the last two lines of page 3,

  "Despite this fact, pore water tests are likely to be better indicators of bedded sediment toxicity than elutriates."

  is not supported by the technical information the topic.

- On page 4, first paragraph, the statement was made,

  "Secondly, no chemical analysis was conducted on elutriate waters."

  That statement was followed by statements regarding the importance of measuring the concentrations of copper in the elutriate.

  It is quite amazing to the authors that the Staff Comments would have made such a statement after having reviewed the Woodward-Clyde report. The Staff Comment statement quoted above is incorrect and indicates that the staff did not, in fact, review in any detail the risk assessment section of the Woodward-Clyde report (WCC, 1991). The concentrations of copper in the elutriates were presented in Table 3-2 of WCC (1991) and were discussed in Section 3.5.1.1.1 entitled, "Concentration of Copper in Elutriates" (pages 3-29 and 3-30). Furthermore, the concentrations of copper in the elutriates received specific attention in the review of this matter before the SDWQCB in December 1991 and is hence discussed further in the Administrative Record (Appendix B (page 4 to 5, 16 to 18) of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7).

  It is important to note, however, that while the information on the concentrations of copper in the elutriate are of interest in understanding the system, knowing that information does not contribute substantively to the conclusions drawn from the elutriate test results. This is because the concentrations of available forms of copper cannot be determined by chemical analysis; thus, measuring the concentrations of copper (total copper or some analytical-method-defined form of copper) in the elutriate does not provide an assessment of the amount of available copper to which the test organisms were exposed.

- The Staff Comments stated on page 4, paragraph 3,

  "The report contends that this test demonstrates that copper is not contributing to toxicity since no statistically significant difference in toxicity occurs among the test sites.

  "Closer examination of the data suggests this is an unsupported conclusion.

Large variability exists within laboratory replicates for a number of the samples tested."

As discussed in the attached letter from Dr. K. Kline (Attachment A), the variability among replicates found and reported was not unexpected for *Rhepoxynius abronius* especially in light of the fine-grained sediment being tested.

- On page 4, paragraph 4, the Staff Comments stated,

"The report relies on site 6/160 as a reference to compare among test sites. It is not appropriate for a reference site to exhibit 50% mortality, as is the case at site 6/160."

First, sediments from Yaquina Bay, OR were specified as the control against which toxicity in the test systems (including site 6/160) was determined. The sediments from site 6/160 were tested as part of the evaluation to determine if whatever toxicity may have been observed was a function of copper concentration in the sediment. The fact that 50% mortality was found at site 6/160 is not an indictment of the conduct of the test as suggested by the Staff Comments. As was discussed by WCC (1991) and previously in this report by citation and quotation and providing more current information regarding the use of *Rhepoxynius abronius* for testing San Diego Bay sediments, the substantial mortality of that particular test organism in low-copper sediments (site 6/160) attests to the unsuitability of that organism for testing these sediments and to the fact that it is not NCMT-area copper that is responsible for that response. Those familiar with this organism and the experience in using that organism for testing San Diego Bay sediments know that this situation occurs throughout San Diego Bay and reflects a condition of the Bay with respect to affecting the ability of this organism to survive in contact with the sediments. As noted above, the US EPA (Cotter, 1991) has concluded that *Rhepoxynius abronius* is not a suitable test organism for San Diego Bay.

Contrary to the staff's statement, the sediments at site 6/160 were appropriate for reference for the purpose of the tests. It is important to note that the purpose of the investigation was to discern whether the significantly elevated concentrations of copper ore concentrate in the vicinity of the NCMT were adversely impacting the designated beneficial uses of the Bay. It is therefore appropriate to use a reference to the NCMT area sediments taken from near that area that do not have the high concentrations of copper ore concentrate.

It should be noted in this regard that as discussed in WCC (1991) and above, the toxicity tests that had been conducted with another amphipod (*Grandidierella japonica*) showed no toxicity of the sediments containing as much as 6,000 mg Cu/kg.

- The Staff Comments continued their argument by stating,

"The assumption behind the evaluation is that the concentration of copper at this

site cannot be causing toxicity. However, there is no evidence on which to formulate this assumption."

The Staff Comment statement quoted indicates that the conclusion was predetermined. This was clearly not the case. Given the fact that the toxicity response of *Rhepoxynius abronius* caused by NCMT-area sediments containing more than 18,000 mg Cu/kg was the same as that caused by sediments containing 122 mg Cu/kg, and given the problems reported by other investigators in using that test organism for testing San Diego Bay sediments, and given the fact that the other type of amphipod tested did not show a toxicity response to NCMT-area sediments that contained more than 6,000 mg Cu/kg (the highest concentration tested), and given the fact that eight other sensitive test species (including the other amphipod) (some of which were particularly sensitive to copper and tested in embryo/larval forms) did not exhibit any toxicity response, the authors believe that there is compelling technical evidence that the copper in the NCMT-area sediments is not causing toxicity.

- On page 4, paragraph 4, the Staff Comments stated,

"Data from two reports, (Long and Morgan, 1990, MacDonald 1992), evaluate national data bases and identify the concentration range reported for site 6/160 as a concentration that is neither clearly toxic nor clearly nontoxic."

WCC (1991) (pages 3-38 to 3-40) discussed the foundation and nature and the inappropriateness of using the numeric values presented by Long and Morgan (1990) to suggest or evaluate the potential for cause and effect relationships between the concentration of an individual chemical and the "associated" toxic response. WCC (1991) stated (page 3-39) after review of the issues,

"The analysis made by Long and Morgan (1990) does not support the implications that the various concentrations of contaminants, including copper, listed by Long and Morgan as causing a toxic effect were actually the causative agents. It must also be understand (sic - understood) that sediment concentration data cannot be translated into effects on aquatic life (Lee and Jones, pers. comm., 1991). For example, while Long and Morgan (1990) listed an organism impact to a Massachusetts Bay sediment that contained copper at a concentration of 15 mg/kg, there is virtually no possibility that copper at that concentration in those sediments was responsible for that response. Those particular sediments contained a wide variety of other contaminants at concentrations that had a much higher probability of having caused the toxic response."

There also exists in the Administrative Record for this matter substantial additional discussion of the inappropriateness of using the numeric values presented in either of those two reports cited in the Staff Comments for assessing potential adverse impacts of sediment-associated contaminants (copper in particular) or for developing clean-up objectives for sediments (e.g., Appendix B (page 5, 21 to 22) of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7).

The authors (Lee and Jones-Lee, 1992a,b) provided detailed discussion of the technical issues and information that demonstrate why the Long and Morgan, and MacDonald co-occurrence approach for "relating" the concentration of copper in sediments to "adverse impacts" is not technically valid. That approach cannot be used to reliably determine whether or not toxicity found in toxicity tests of sediments is due to a specific chemical. **Both Long and Morgan and MacDonald explicitly stated that their approach should not be used for regulatory purposes.** As an example of why this is the case, Long and Morgan and MacDonald ignored or did not have available data on ammonia and sulfide in the sediments in which they were trying to develop empirical information on the relationship between a chemical in sediments and any kind of a measure of a perceived adverse impact. What Long and Morgan and MacDonald may have been reporting as toxicity that "co-occurred" with copper, for example, was an impact due to ammonia or sulfide which was not measured or was not included in their data analysis where the data was available.

Part of the Long and Morgan and MacDonald data were based on the use of impact assessment involving the Microtox toxicity procedure. That procedure is widely recognized as unreliable for assessing aquatic life toxicity. This was discussed in the Administrative Record in the NCMT matter (Appendix B (page 22) of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7). Significant problems are found in trying to correlate toxicities measured with that technique with those of standard aquatic organisms (e.g., Arbuckle and Alleman, 1992; Jacobs *et al.*, 1992). Jacobs *et al.* (1992) reported that elemental sulfur in aquatic sediments causes the Microtox procedure to yield unreliable results when measuring toxicity due to other constituents. Elemental sulfur is another chemical, like ammonia and sulfide, that is routinely present in sediments that is not measured by those who attempt to infer that the toxicity observed in a sediment is due to a priority pollutant like copper. Obviously, the so-called "toxic response" in any co-occurrence data manipulating procedures, such as those used by Long and Morgan and MacDonald, could be due to unmeasured parameters.

The complete critiques of Long and Morgan and MacDonald developed by the authors are available to the WRCB upon request. It is important to note that the authors' finding that the Long and Morgan and MacDonald approach is technically flawed is not theirs alone. Others with many years of experience in examining sediment quality and toxicity issues have independently developed the same conclusions.

- On page 5, first paragraph, the Staff Comments discussed the staff's perception of the current information on the role of acid volatile sulfides in detoxification of copper and other heavy metals in sediments.

In the 1960's the senior author pioneered in work in the significance of sulfides in influencing heavy metal concentrations in aquatic systems. In January 1992 the authors released a comprehensive review of this topic (Lee and Jones-Lee, 1992a) which discusses the current state of reliable knowledge on this topic. Some of the information presented therein was also discussed in the Woodward-Clyde report (WCC, 1991 pages 3-16 to 3-18). As has been pointed out in the discussions by the authors (including in the Woodward-Clyde report), the analytical methods used to measure acid volatile sulfides developed by the US EPA are not reliable for evaluating the potential toxicity of copper in the form of chalcopyrite, i.e., the form of the copper ore concentrate. Making such measurements as suggested by the staff would yield a totally unreliable conclusion.

The meaning of the remainder of the first paragraph on page 5 is not clear, but taken at face value, is not necessary in the survey of an area to measure acid volatile sulfides and heavy metals on every sample. Furthermore, as noted above, acid volatile sulfide measurements as performed in accord with the US EPA procedure are not valid for this situation.

- On page 4, last paragraph, the Staff Comments stated concerning the *Rhepoxynius abronius* test results,

> *"A more supportable conclusion than that presented in the report is that some unaccounted factor disrupted the test and the results are not useful."*

The authors agree that some unaccounted for factor "disrupted" the test; they do not agree with the implication that it was a result of improper conduct of the test procedure, however. This "disruption" is indicative of why that organism is not a reliable test organism for San Diego Bay sediments. The staff's statement that the results are not useful, however, is incorrect. Clearly, if the copper ore concentrate that was present in some sediments tested in concentrations up to 18,000 mg/kg, were significantly toxic to this organism, that would have been detected by the test conditions used. It is important to note that eight other test organisms (including another amphipod) all showed no toxicity to the copper ore concentrate at concentrations above the 4,000 mg/kg clean-up objective adopted by the SDWQCB. Some of these test organisms are known to be highly sensitive to copper.

Provision 4: Contribution to Exceedance of Water Quality Objectives (Staff Comments page 5)

- On page 5, under Provision 4, the Staff Comments stated,

> *"The report contains no analysis of the environmental fate of copper at the site or generally in marine environments."*

The SDWQCB requested that the Port conduct a risk analysis of the impact of the copper present in the NCMT area sediments on the designated beneficial uses of San Diego Bay. The authors designed a study to provide that information, building on the information that had been developed previously and their expertise in designing studies of this type over the past 25 years. The previous and the recently conducted studies all show that no significant detrimental impact to designated beneficial uses of the Bay waters is detected in the vicinity of the NCMT area, including those areas most contaminated with copper. The WCC (1991) report provided a discussion of the nature and behavior of copper of the form in the copper ore concentrate that fulfills the suggestion of the Staff Comments for a description of the "environmental fate of copper ... generally in marine environments." The three principal "fates" of the copper of water quality concern in the NCMT area are the water, the sediment, and aquatic organisms used as food. Since the availability and potential adverse impact of copper cannot be assessed based on chemical analysis, it makes little sense to do in-depth evaluations of the specific forms of copper in the various media. The risk assessment conducted for the NCMT-area copper-contaminated sediments reported by WCC (1991) shows that

- the copper in the watercolumn (whatever its forms and flux from the sediment) does not preclude the population of the NCMT area most-heavily copper-contaminated with *Mytilus edulis*, the most copper-sensitive organisms evaluated by the US EPA and upon which it developed its water quality criterion and upon which the water quality objectives was established
- the copper present in the sediment is not toxic to nine different organisms, several of which are particularly copper-sensitive organisms and tested in short-term chronic exposure situations, and
- the numbers and types of organisms found in the vicinity of the NCMT copper-contaminated sediments are not different from those in nearby areas

Faulting the WCC (1991) report for providing "no analysis of the environmental fate of copper at the site or generally in marine environments" not only reflects an inadequate review of the WCC (1991) report but also begs the findings of the risk analysis. The consistent findings of the WCC (1991) study demonstrate that the copper in the NCMT-area sediment is not toxic and not adversely affecting beneficial uses of the Bay. That is the issue of concern.

◆ On page 5, paragraph 2, the Staff Comments stated,

> *"Copper chemistry can be quite complex. In addition to insoluble forms many soluble chemically complexed forms can occur."*

The senior author is familiar with copper chemistry in aquatic systems through having been involved in studies specifically on the topic on several occasions over the past 30 years. Those studies included supervision of a graduate student's PhD dissertation on this topic. The fundamental issue in protecting the designated beneficial uses of San Diego Bay is whether the copper ore concentrate is likely to adversely affect these uses. The answer to that question is "no." Sufficient studies have been conducted to enable that conclusion to be drawn with a high degree of reliability.

- On page 5, paragraph 2, the Staff Comments stated,

  "Some assessment of the flux of copper from the sediments is required to assure that the ore is not contributing to the excedance (sic) of the water quality standard (sic)."

The Woodward-Clyde report as well as supplemental materials in the Administrative Record which were available to but not reviewed by the staff do address in detail the issue of the exceedance of the water quality objective for San Diego Bay. For example, this was discussed in WCC (1991) (pages 3-18 to 3-26), on pages 3 through 7, 9 and 10 of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7, and pages 2 through 14, and 20 to 21 of Appendix B of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7.

As indicated in those discussions, while no one can state with certainty that no molecules of copper from copper ore concentrate are present in the watercolumn in San Diego Bay, there is substantial evidence that the exceedance of the water quality objective for copper reported in the Bay (the most recent data were collected in 1986) has not been significantly impacted by the copper ore concentrate in the NCMT-area sediments. Of particular significance in this conclusion is the fact that the data collected prior to the PACO Terminal operations that led to the spillage of copper as part of a ship-loading operation, show copper concentrations in the watercolumn in San Diego Bay near the NCMT above the water quality objective established in April 1991. While the authors have seen no more-recent data on this situation, data collected in previous studies of the area show that the concentrations of copper found in the watercolumn after the copper ore concentrate spillage were similar to those found in the watercolumn before the PACO Terminal operations that led to the spillage. Therefore if the copper ore concentrate were contributing in a significant way to the exceedance that was reported in 1986, years after the spillage, it would be expected that a significantly elevated concentration of copper would have been found in the watercolumn after the spillage compared to that found before the spillage.

It is becoming widely recognized that the US EPA water quality criteria upon which the April 1991 objective for copper was based is significantly more restrictive than needed for the protection of the designated beneficial uses of waterbodies. Exceedances of the copper criteria are being found in marine bays at many locations throughout the US, such as in San Francisco Bay and New York Harbor. This situation is part of the general problem that exists today with trying to use the concentrations of total heavy metals as a basis for regulating potential heavy metal toxicity. As discussed by the authors in the Woodward-Clyde report and other documents, it has been known since the late 1960's that such an approach is technically invalid and can readily lead to massive waste of public and private funds in the name of achieving overly protective objectives and standards.

This past summer the US EPA finally took action to correct this deficiency in heavy metal water quality criteria. Its "Interim Guidance on Interpretation and Implementation of

Aquatic Life Criteria for Metals" released in June 1992 (US EPA, 1992) proposes to abandon the use of total heavy metals for this purpose in favor of soluble heavy metals. Such a step will go a long way to curbing, but not eliminating, the overly protective nature of the copper criterion-objective. Even criteria-standards-objectives based on soluble copper are well-known to be more restrictive than needed to protect most natural water situations. Recently, Florence (1992) reported that in marine bays natural organics interact with soluble copper to cause it to lose its toxicity to aquatic life. This situation has been known for over 20 years.

- The Staff Comments continued the argument by stating,

> *"The report speaks to this issue only in the most general terms by stating that it is not believed that copper ore contains copper in a bioavailable form."*

The quoted Staff Comments is a gross misstatement. The conclusions drawn have not been based on a "belief" that the sediment-associated copper is not available. The Woodward-Clyde report and the other materials in the Administrative Record that the staff did not take the time to review discussed in detail the technical foundation for the conclusion that the copper ore concentrate is not bioavailable. Much of that information was recounted in this report. The fact that it the sediment-associated copper in the NCMT area has been found to be non-toxic and that it is not causing organisms living in the vicinity of the area to accumulate excessive copper over what is found in other parts of San Diego Bay are the key issues as to why it can be properly and readily concluded that the copper ore concentrate is not bioavailable so as to cause an impaired designated beneficial use of San Diego Bay.

- The Staff Comments stated on page 5 in the final paragraph,

> *"Note: the report attempts to invalidate the water quality objective by claiming that it is overly protective. This point is irrelevant."*

To the contrary, this issue is highly relevant. First, as noted above, the copper ore concentrate is not a significant cause of the exceedance of the water quality objective that was reported some years ago in San Diego Bay. Basically what the staff is saying is that even though no significant adverse impacts of the copper ore concentrate can be found in the sediments or watercolumn after multifaceted investigation, the fact that an exceedance of the current overly protective objective was reported in San Diego Bay waters in 1986 should cause the Port (i.e., the people) to spend millions more dollars to achieve the proposed 1,000 mg/kg clean-up objective than would be necessary to achieve the 4,000 mg/kg clean-up objective. The Staff Comments recognized in an off-handed manner that only some forms of copper are available and that sediment-associated copper tends to be less available.

This situation is significantly different from that of a municipal or industrial NPDES permitted discharge where the contribution of the discharge to the exceedance of the objective can be fairly well defined. Large amounts of money can be spent in removing copper ore concentrate from NCMT area sediments and have little or no impact on the frequency and severity of the copper exceedance in the water column that occurs in San Diego Bay. As was concluded by the SDWQCB, the cleanup objective for the sediments should not be tied to the exceedances of the water quality objective. They are separate issues. The issues of why San Diego Bay has excessive copper compared to the overprotective standard should be addressed as separate items and not tied to the cleanup objective for the NCMT area.

OVERALL ASSESSMENT

It is indeed unfortunate that the staff did not have more time to critically review the Woodward-Clyde report or the other materials in the Administrative Record and the supporting documents referenced in that record which are pertinent to evaluating the appropriateness of the 4,000 mg Cu/kg sediment cleanup objective for the NCMT area before developing its "Comments." Such a review would have answered the technical concerns and "issues" raised in those "Comments."

It is important to understand that the recommended 4,000 mg Cu/kg clean-up objective, which is highly protective of the designated beneficial uses of San Diego Bay, is specifically limited to the copper-ore-concentrate-contaminated sediment in the NCMT area. As discussed in the Woodward-Clyde report, the copper ore concentrate that was spilled into those sediments was in a specific mineral form that would (as substantiated by the risk assessment studies) make it highly unavailable to adversely affect aquatic life or accumulate within their tissue. It is recognized that the specification of 4,000 mg Cu/kg for the clean-up objective was not based on the finding of adverse impacts of a higher concentration. A much higher clean-up objective could be justified. However, because of time constraints and political considerations discussed in the Administrative Record, it is felt that such a value should be used.

It is the authors' understanding that all parties involved with funding the clean-up have agreed to fund the clean-up to a 4,000 mg Cu/kg objective. The imposition of a 1,000 mg Cu/kg clean-up objective (which as discussed in the Administrative Record was also a highly arbitrary value that was developed based on faulty analytical procedures and data analysis) would not be supported by the responsible parties who have to fund the clean-up.

The Staff Comments have not raised one valid point of deficiency in or argument with the studies and information that led to the conclusion that the 4,000 mg/kg copper clean-up objective would be protective. Instead, the Staff Comments reflected the staff's failure to review the materials in the Administrative Record; in numerous instances the Staff Comments give the clear appearance of predisposition for opposition to the SDWQCB finding that the 4,000 mg/kg copper clean-up objective would be protective of the designated beneficial uses of San Diego Bay, and advocacy of the 1,000 mg Cu/kg clean-up objective previously proposed. It is strongly recommended that the WRCB support the SDWQCB conclusion that the 4,000 mg Cu/kg should be applied to the NCMT area sediments.

REFERENCES

Ankley, G., Schubauer-Berigan, M., Dierkes, J., and Lukasewycz, M., "Sediment Toxicity Identification Evaluation: Phase I (Characterization), Phase II (Identification) and Phase III (Confirmation) Modifications of Effluent Procedures," draft report, US EPA National Effluent Toxicity Assessment Center, Technical Report 08-91 (1991).

Arbuckle, W., and Alleman, J., "Effluent Toxicity Testing Using Nitrifiers and Microtox," Water Environ. Res., 64:263-267 (1992).

Cotter, P., US EPA Region IX, San Francisco, Personal Communication to G. Fred Lee (1991).

Dickson, K., Waller, W., Kennedy, J., "Assessing the Relationship between Ambient Toxicity and Instream Biological Response," Environ. Toxicol. & Chem. 11:1307-1322 (1992).

Florence, T., Powell, H., Stauber, J., and Town, R., "Toxicity of Lipid-Soluble Copper (II) Complexes to the Marine Diatom *Nitzschia closterium*: Amelioraton by Humic Substances," Water Res. 26:1187-1193 (1992).

Jacobs, M., Delfino, J., Bitton, G., "The Toxicity of Sulfur to Microtox from Acetonitrile Extracts of Contaminated Sediments," Environ. Toxicol. & Chem. 11:1137-1143 (1992).

Latimer, R., Acting Technical Director EMAP Program US EPA, "The Extent and Severity of Sediment Contamination in the Estuaries of the Mid-Atlantic Region," Presentation at US EPA 'Forum on the Extent and Severity of Sediment Contamination," Chicago, April (1992).

Lee, G. F., and Jones, R. A., "Comments on 'Workshop for the Development of Sediment Quality Objectives for Enclosed Bays and Estuaries of California,'" Submitted to D. Maughan, Chairman, California Water Resources Control Board, Sacramento, CA, Report of G. Fred Lee & Associates, El Macero, CA, May (1991).

Lee, G. F., and Jones-Lee, A., Sediment Quality Criteria Development: Technical Difficulties with Current Approaches, and Suggested Alternatives," Report of G. Fred Lee & Associates, El Macero, CA, January (1992). Condensed Version published as Lee, G. F., and Jones, R. A., "Sediment Quality Criteria Development: Technical Difficulties with Current Approaches, and Suggested Alternatives (Condensed Version)," IN: Proc. HMCRI R&D 92 Conference on the Control of Hazardous Materials, HMCRI, Greenbelt, MC, pp. 204-211 (1992a).

Lee, G. F., and Jones-Lee, A., "Comments on 'Development of an Approach to the Assessment of Sediment Quality in Florida Coastal Waters,' D.D. Macdonald, MacDonald Environmental Sciences, British Columbia, Canada, Dated May 31, 1992," Report of G. Fred Lee & Associates, El Macero, CA, August (1992b).

Long, E. and Morgan, L., "The Potential for Biological Effects of Sediment-Sorbed

Contaminants Tested in the National Status and Trends Program," NOAA Technical Memorandum NOS OMA 52, NOAA, Seattle, WA. March (1990).

US EPA, "Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria for Metals," US EPA Health and Ecological Criteria Division, Washington, D.C., May (1992).

US EPA and US ACE, "Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual," EPA-503/8-91/001, US EPA Office of Water, Washington, D.C., February (1991).

WCC (Woodward-Clyde Consultants), "Remedial Action Alternatives for National City Marine Terminal," Final Report, Prepared for San Diego Unified Port District, San Diego, CA, July (1991).

WESTEC (WESTEC Services, Inc.), "Evaluation of Copper in Interstitial Water from Sediments at Paco Terminals, San Diego Bay," Prepared for Paco Terminals, Inc., National City, CA, WESTEC Services, Inc., San Diego, CA, October (1986).

WESTEC (WESTEC Services, Inc.), "Bioassay on Sediments Collected in the Vicinity of Paco Terminals, Inc. San Diego Bay, San Diego, California," Draft Report Prepared for Paco Terminals, Inc., National City, CA, WESTEC Services, Inc., San Diego, CA, October 20 (1988).

Attachment A

MEC ANALYTICAL SYSTEMS, INC.
Bioassay Services Division
98 Main Street, Suite 428, Tiburon, CA 94920 (415) 435-1847

Sept 1, 1992

Dr. Fred Lee
G. Fred Lee and Associates
27298 E. El Macero Dr.
El Macero, Ca 95618

Dear Dr. Lee:

As you requested, I have reviewed the comments received from the State Board and as I stated yesterday I will respond to specific points raised in the comments.

1.) The biological testing of sediment was carried out on three of five sediment samples based upon the request of the client and was done to test the sediment with the lowest and highest copper values against a background reference site. No biological test data was omitted from the report.

2.) High replicate variability is common in bedded sediment tests using Rhepoxynius abronius. This species is difficult to use in fine-grained test material, such as encountered in the sediments at the test sites in south San Diego Bay. The original work be DeWitt et al (1988) on grain-size effects on this species found high variability in results as the grain-size became finer up to a level of 85% fines. Beyond that level, no data is presented by DeWitt. Performance of *R. abronius* in the MEC laboratory in sediments with finer grain size appears to corroborate the high variability observed between replicates. It is my opinion that these sediments were generally not particularly suitable for testing using *R. abronius*.

3.) The *Menidia* testing was carried out with laboratory seawater at the MEC Analytical Systems Bioassay Laboratory in Tiburon California. It is 0.45 µm filtered, UV sterilized seawater taken from the seawater intake at Tiburon. This water has been used extensively in testing of contaminated sediments from San Diego, Long Beach, Los Angeles and San Francisco. It has been tested extensively and has demonstrated excellent control performance for *Menidia*, as well as a wide variety of other marine test species. I feel that this water supply did not affect the results of the bioassays. While there is still a question as to whether the water from San Diego would yield different results, there is no significant reason for making this assumption.

I hope that this information is adequate for your use.

Sincerely;

Kurt F. Kline Ph.D.
Vice-President
Bioassay Division Manager

8

Comments on

Technical Review Memorandum by the Division of Water Quality to the Office of Chief Counsel (OCC) on File Nos. A-775 and A-775(a)

G. Fred Lee, Ph.D. and Anne Jones-Lee, Ph.D.
President Vice-President
G. Fred Lee & Associates
El Macero, CA 95618
(916) 753-9630

September 15, 1992

Mr. Diaz stated in his cover letter to the WRCB,

> *"We have concluded that the EHC is correct in that the Regional Water Board did not have the technical basis to set the cleanup level for sediments at 4000 mg/kg dry weight copper (Cu). The technical basis in the record justifies the cleanup level of 1000 mg/kg dry weight of Cu."*

While it is not clear how much of the Administrative Record for this matter that the staff reviewed, it is clear that their review failed to address key technical issues and information provided in the Administrative Record that clearly rebut the EHC and staff position that the 4,000 mg Cu/kg clean-up objective is without technical merit and that the 1,000 mg Cu/kg clean-up objective has technical merit. As discussed below, the staff has made significant errors in its analysis of this situation that reflect a lack of understanding of elementary aquatic chemistry, analytical chemistry, and, in particular, the expected behavior of copper in San Diego Bay sediments and waters.

The senior author has a Masters and a Ph.D. degree from the University of North Carolina and Harvard University, respectively, that focused on the field of aquatic chemistry. For 30 years he taught introductory and advanced-level aquatic chemistry courses in university graduate programs. He conducted over $5.5 million in university research on aquatic chemistry-water quality issues. He has supervised the work for approximately 100 Masters theses and PhD dissertations on aquatic chemistry topics, several of which were devoted specifically to issues of the aquatic chemistry of copper and its impacts on water quality. He has published more than 500 professional papers and reports devoted to various aspects of aquatic chemistry as they relate to water quality. He is knowledgeable in the field of aquatic chemistry as it relates to evaluating the water quality significance of copper in San Diego Bay sediments for the designated beneficial uses of the Bay. Both Drs. Lee and Jones-Lee have taught graduate-level water and wastewater analyses courses for many years and are highly familiar with the generation of reliable water analysis data and the appropriate interpretation of such data, especially as it relates to aquatic sediments. Throughout their professional careers they have served as advisors to various "Standard Methods" committees that develop analytical procedures for water, wastes, and sediments. They are therefore able to comment with authority and considerable experience on the analytical methods and approaches that have been used to assert that soluble copper is present in NCMT-area sediments at concentrations that could cause adverse effects on the designated beneficial uses of San Diego Bay, and to evaluate the merits of various "clean-up" objectives for copper-contaminated sediment.

The first four pages of the staff's comments provided historical information on the proceedings in this matter and do not address technical issues. At the bottom of page 4, it was stated,

> *"The specified water column limits in the EBEP were based on EPA's Water Quality Criteria for Water -- 1986. In that document, EPA recommended the national criteria for Cu in the water column to protect saltwater aquatic organisms as 2.9 µg/l as a 1-hour average not to be exceeded more than once every 3 years on the average."*

While that statement reports on the US EPA's views as of the mid-1980's, it has been well-known for many years and is now admitted by the US EPA, that that approach is significantly overly restrictive for protection and can cause significant, unnecessary expenditures for contaminant control beyond those needed to protect the designated beneficial uses of a waterbody due to the presence of copper in the watercolumn. The senior author (Dr. Lee) was a US EPA peer reviewer for the copper criteria document and pointed out the overly protective nature of those criteria to the US EPA in 1983. While the staff pointed out at the top of page 5 that the US EPA admitted that this approach could be overly protective, they did not specifically indicate that the US EPA is now beginning to address the overly protective nature of this value by

- allowing soluble copper rather than total copper to be used in assessing an exceedance;
- allowing much longer than 1-hour exposures to occur without its constituting an exceedance;
- allowing the frequency of the exceedances to be more than once in 3 years.

There is no question that the 2.9 µg/L copper criterion value as now being implemented for San Diego Bay is grossly overly restrictive for protection of beneficial uses of the Bay.

On page 5, paragraph 4, the staff stated that some of the chalcopyrite ore may have been heat-treated thereby causing some of the constituent compounds to be more soluble. An analysis of the data that were available to the staff in the Administrative Record shows, however, that that issue is moot. Even if the copper ore concentrate had been heat-treated and by that means exhibited greater solubility (indeed no matter what the processing and treatment the material underwent prior to being introduced into the Bay), highly copper-sensitive organisms in contact with NCMT copper-ore-concentrate-contaminated sediments containing more than 18,000 mg Cu/kg (more than 4 times the clean-up level adopted by the SDWQCB) did not exhibit toxicity. Whether the ore was heat treated or not is immaterial to this discussion. Such treatment, if it took place, had no impact on the designated beneficial uses of San Diego Bay.

Beginning on page 5, last paragraph, was a discussion that clearly demonstrates that the group preparing the document had exceedingly limited understand elementary aquatic chemistry. In an attempt to discredit the reliability of the authors' work as presented in the Woodward-Clyde report and to the SDWQCB which caused that Board to adopt the 4,000 mg Cu/kg clean-up objective for the NCMT-area sediments, it was stated,

> *"The Woodward-Clyde report (1991) states that 'copper sulfide is one of the most insoluble of the metal sulfides (page 3-16).' However, this information conflicts with information presented in the Chemical Rubber Company's (CRC) Handbook of Chemistry and Physics (1985). The CRC Handbook of Chemistry and Physics lists two copper sulfides, Cu_2S and CuS. Cupric sulfide, CuS, solubility is listed as 0.000033 g/100 ml of cold water (3.3 μg/l) (CRC, 1985). Therefore, the concentration of dissolved Cu from cupric sulfide could exceed the 2.9 μg/l water quality objective as measured in the water column adopted in the EBEP if dilution is less than 1.1 to 1."*

The quoted information is in considerable error in several significant and very fundamental ways. The first error that was made in this statement is in the handling of decimal points in converting "0.000033 g/100 mL" into units of "μg/L." The concentration, "0.000033 g/100 mL" is not equivalent to 3.3 μg/L, as the staff miscalculated; the 0.000033 g/100 mL is equivalent to 330 μg/L. Using the reasoning advanced by the staff in the quoted statement, the copper sulfide that the staff alleged may be present in San Diego Bay sediments should cause the San Diego Bay waters to have a copper concentration of over 300 μg/L. Numerous studies of San Diego Bay waters (see Woodward-Clyde report - WCC (1991)) including those in the NCMT area of greatest sediment copper contamination, have shown that the typical concentrations of copper in Bay waters are on the order of a few μg/L, not hundreds of μg/L. It is obvious that the staff "analysis" to discredit the Woodward-Clyde report's correct reporting of the limited solubility of copper sulfides has no relevance to the issues being addressed by the Board.

Discounting the staff's error in use of decimal points, and assuming the solubility of CuS were in fact 3.3 μg/L as they incorrectly claimed, they made another error in comparing that 3.3 μg/L value to the 2.9 μg/L objective. The solubility of CuS, i.e., how much of that chemical dissolves, does not translate directly to the concentration of copper in water. CuS is only about 65% copper; the remainder is sulfur. Therefore, the "3.3 μg/L" value would have to be corrected for the percentage of copper in the compound. When that correction is made (again assuming that the erroneous solubility value of 3.3 μg/L is correct) the resulting copper concentration would be about 2.2 μg/L, less than the water quality objective of 2.9 μg/L.

Those familiar with the fundamental principles of aquatic chemistry know that the *Chemical Rubber Company Handbook of Chemistry and Physics* is not necessarily a reliable source of information that has pertinence to the solubility of copper in San Diego Bay sediments. Those knowledgeable in the topic area would obtain solubility product data for the various copper species that could be present in the sediments. If this is done, it is found that CuS has a solubility product of about 10^{-36}. This means that the solubility of copper from a CuS solid is about 10^{-18} moles/L which translates to about $6x10^{-11}$ μg/L, not 3.3 μg/L or 330 μg/L. Further, those knowledgeable in the topic area know that the solubility of CuS in San Diego Bay waters is dependent on a variety of factors, including ionic strength which is related to salinity, pH, temperature, redox conditions, and other constituents in the water. Some of these factors increase the solubility of copper from CuS; others decrease the solubility of copper from CuS. None of the factors, however, would ever cause CuS to begin to dissolve sufficiently in the San Diego Bay water system to adversely affect the designated beneficial uses of San Diego Bay waters.

In addition, CuS is not a thermodynamically stable species in those waters and sediments. In oxygen-containing waters the sulfide in CuS is oxidized. In anoxic environments, such as found in the sediments, the copper in CuS is reduced. Therefore, the use of CuS as a basis to try to discredit the Woodward-Clyde report's discussion of copper chemistry reflects a lack of understanding of the behavior of copper in San Diego Bay waters and sediments. It is important to note that the authors presented in the Woodward-Clyde report what they considered to be key elements of the copper chemistry pertinent to the issue at hand of the sediment-associated copper in San Diego Bay waters. Within that discussion were references to a comprehensive review of the chemistry of sulfides and several metals, including copper, that was published in 1987 by Morse *et al.* The statement made by the authors in the Woodward-Clyde report which the staff attempted to discredit concerning CuS's being highly insoluble, is valid and supported by the Administrative Record.

Beginning in the second paragraph on page 6 and continuing through page 7 to page 8, the staff provided the WRCB with highly unreliable information on the amount of copper present in the interstitial waters of the NCMT-area sediment. It is, again, clear that the authors of that document have a limited understanding of copper chemistry in those sediments and analytical chemistry of heavy metals in aquatic systems. First, as discussed in detail in the Administrative Record (including the Woodward-Clyde report WCC (1991)) the analytical procedures used by WESTEC were obviously unreliable for assessing true interstitial water copper. The bias of the staff report is reflected by the fact that they chose not to discuss that issue or to point out why they believed the authors' discussion of the issue in the Administrative Record was in error. Instead they chose to present their own version of the chemistry of copper in NCMT-area sediments which, as discussed below, reflects their lack of understanding of the elements of aquatic chemistry and this topic area.

On page 6, paragraph 2, the report stated as though it were an undisputed fact, *"In situ dissolved total Cu in interstitial water of Cu contaminated sediments was measured to range between 80 and 480 μg/l (WESTEC 1986 as cited in Addendum 1 to Order No. 85-91, Finding #12)."*

An unbiased reporting to the WRCB of the information in the Woodward-Clyde report (WCC, 1991) would have pointed out that the authors discussed the unreliability of the analytical procedures used by WESTEC in determining the so-called interstitial water copper. It is clear that the staff did not understand that the analytical procedures used by WESTEC yielded concentrations of copper in apparent solution that had nothing to do with the amounts of either dissolved or particulate copper present in the interstitial waters. As discussed by WCC (1991), the sediment sample was filtered by WESTEC to recover "interstitial water," and some of the fine particles passed through the filter. Given that information, it was technically unjustified to assert, as the staff did in the last sentence of paragraph 2 on page 6,

"In any case, the chemical analysis technique, which does not distinguish between free Cu ions and complexed or sorbed Cu, detected Cu in the interstitial water."

indicating that the copper was clearly and only associated with the interstitial water and not with the sediment. The only way that the staff's statement could be true would be if a procedure existed to sample interstitial water without contaminating it with sediments that are not part of the interstitial water. A rudimentary knowledge of analytical water chemistry shows that the most likely source of particulate copper in a filtrate of interstitial water and sediment is sediment, not water. The above-quoted statement represents a significant error in their analysis of the data generated by WESTEC. This situation makes all of the subsequent analysis of the interstitial water data presented by the staff in significant error and technically invalid. It is clear that the foundation upon which their analysis is based, i.e., the separation of the copper in the interstitial waters from the copper on sediment particles that were not in the interstitial water, is technically flawed and in error. These issues and the technical aspects of the WESTEC determination and assessment of "interstitial water" concentrations of copper were discussed in WCC (1991).

On the bottom of page 6, continuing on to page 8, the staff resurrected the technically invalid, so-called "regression analysis" that led to the development of the 1,000 mg Cu/kg clean-up objective. The discussion and analysis reflected in the staff's comments contains a number of significant technical deficiencies have been discussed in the Administrative Record on this matter (Appendix B of Exhibit 1 of the Port of San Diego's June 3, 1992 submission to the WRCB in response to the EHC appeal of the SDWQCB's adoption of Addendum no. 7) are briefly summarized below.

i) The technical deficiencies in the determination and assessment of concentrations of copper in the "interstitial water" by WESTEC were discussed above and are thus not repeated here.

ii) The so-called "regression" developed by WESTEC (1987) discussed in the staff's comments, is appended to these comments as Exhibit 1. The lower graph in Exhibit 1, labeled as Figure II, was developed from the upper graph (labeled Figure I) by removing two points from the correlation and re-computing the associated statistics. (Figure I was represented by the staff by the equation of the line drawn labeled "Equation #1;" Figure II was represented by the staff by the equation of the line drawn labeled "Equation #2.") Examination of the WESTEC (1987) report that provided those relationships and equations reveals that those two points, denoted by the staff as "outliers," were simply dropped from consideration because *"each point was considered an aberrant value because it was so different from the other values, which suggests the sample may have been contaminated."* (WESTEC, 1987). It is technically unjustifiable and inappropriate to simply exclude and disregard data on the basis that they do not fit a preconceived notion of what the relationship should be, and then simply assume that the samples must have been "contaminated." There must be rigorous and compelling technical justification for eliminating data from consideration. If quality control and sample handling technique was so poor that the only evidence of "contamination" comes when points are "so different from other values" that appear to represent a positive relationship, all of the data must be suspect. The fact is that based on the environmental chemistry of sediment-associated copper and on the sampling and analytical procedures used for "interstitial water" analysis (as discussed previously), the scatter shown in Figure I of Exhibit 1 would indeed be expected. Since the justification given by WESTEC (1987) for the exclusion of the two points in question was technically inadequate, it must be assumed that the relationship shown in Figure I in Exhibit 1 is the more reliable. It is clear that there is no significant relationship between the concentration of copper in the sediment and that in the associated interstitial water demonstrated by that figure.

iii) Even if it were assumed that Figure II in Exhibit 1 were the more appropriate, that correlation also does not demonstrate a reliable, much less predictive, relationship between concentrations of copper in the sediment and those in the associated interstitial water. An "r" "correlation value" of 0.59 was presented for the "better," adjusted, relationship (Figure II in Exhibit 1); WESTEC claimed that that indicated a "significant" relationship between the interstitial water copper concentration and the copper concentration in the sediment. However, it is the r^2 value, the coefficient of determination, rather than the "r" value that should be used to judge the degree of relationship between the two. The r^2 value is a measure of the "strength" of the relationship or the proportion of the variation in the interstitial water concentration (in this case) that is explained or accounted for by, in this case, the concentration of copper in the sediment. Based on the r value presented, the r^2 value for that relationship is 0.35, which means that 65% of the variation is not explained by the sediment-associated copper. A relationship with an r^2 value of 0.35 is clearly a very poor relationship.

An unfortunate aspect of mechanical application of statistics that is apparently demonstrated here, is that numbers and relationships can be demonstrated to have some "statistical significance" that is an artifact of mathematical manipulation rather than indicative of environmental quality significance. It is clear that the WESTEC (1987) data show that there was no relationship between copper measured in the sediments and the copper measured in the interstitial water. If the two data points had not been eliminated (as should have been the case), and the strength of the correlation presented in Figure I of Exhibit 1 is examined, it is found that the r^2 value of that correlation is <0.14, clearly indicative of no relationship. A lack of relationship between the concentration of copper in NCMT-area sediment and the associated interstitial water had also been demonstrated in the preliminary (Phase I) investigation that WESTEC (1986) reported.

iv. The staff incorrectly assumed that the ability to draw a line-of-best-fit (what was called a "regression line") through a body of points and develop statistics for that line, establishes a cause-and-effect relationship. Such statistics cannot be used to determine or substantiate cause-and-effect. To develop such conclusions of cause-and-effect from such information is a misuse of statistics and can, as it did in this case, lead to erroneous conclusions.

v. Even if the relationships shown in Exhibit 1 were reliable and predictive, and demonstrated to be based on a cause-and-effect relationship (which they are not), there is no known environmental quality significance that can be ascribed to the concentrations of copper in the "interstitial water." This point was discussed previously in the Administrative Record. As recently as August 1991, the US EPA reported (Ankley *et al.*, 1991), *"Further research is required to extend existing knowledge of pore water's suitability for evaluating sediment toxicity."*

vi. Therefore while lines can be drawn through any set of data, and equations developed for those lines, and a value for one variable can be plugged into the equations to generate the corresponding value for the other variable, as was done by the staff, it has been demonstrated that the equation - the relationship - is not reliable (as demonstrated by the small r^2 values) and not a demonstrable cause-and-effect relationship, and has no predictive capability. Therefore the "interstitial water copper concentration" values generated by plugging values for sediment copper into the equations (as shown on the bottom of page 7) have no validity.

Thus, all of the analyses presented by the staff on page 7 for interstitial copper concentrations for various sediment copper concentrations are technically invalid and without merit. At best, the staff's poor discussion attests to an inadequate review of the Administrative Record (that was considered by the SDWQCB in adopting Addendum no. 7) in preparation for making comment on the Petition in opposition to Addendum no. 7. If the information on this matter that was previously provided by the authors in the Administrative Record was reviewed by the staff, the staff should have addressed the issues raised in their comments rather than simply repeating erroneous analysis and information. The WRCB should be informed of the information reviewed by the SDWQCB and upon which it determined that a 4,000 mg Cu/kg clean-up objective for NCMT area sediments was appropriate.

On the bottom of page 7, the staff attempted to address the "outliers" stating, *"It is unclear as to whether these points are artifacts or indicate a buffer interaction of Cu with complexing or sorbent agents."*

The principles of aquatic chemistry show that chemical reactions occur according to well-defined thermodynamics and kinetics. It is highly improbable that the interstitial water of one sediment sample will have significantly different complexing ability for copper than another sample taken from the same region. A much more plausible explanation of this situation is that in WESTEC's attempt to separate the interstitial water from the sediments greater amounts of particulate sediment passed through the filters used in one sample than occurred in another. The passage of particulates through filters is an erratic process that yields outliers of the type found in the WESTEC data. Another factor that was discussed in the Woodward-Clyde report, which tends to cause outliers is the handling of the samples with respect to their exposure to air. Those familiar with work on sediment interstitial waters know that all such work has to be done in such a way as to prevent any air (oxygen) from entering the sample. Once air enters a sample, sample integrity is lost; the sample cannot be considered to be the same as it was when collected from the sediments. Minor variations in the handling of the samples which caused air to be introduced into the sample during the sample handling and filtration process readily leads to erratic results - outliers.

On the top of page 8, it was stated,

"From the data it can be concluded that the equilibrium constants governing the solubility of Cu compounds contained in the sediments have not been reached. Cu apparently will continue to leach out until a point is reached where the rate of Cu dissolving out of the Cu ore particles in the sediment equals the diffusion of Cu out of the interstitial water into the water column or the amount of Cu that undergoes chemical transformation into a stabler compound resulting in a Cu form subject to a smaller equilibrium constant. The concentration of Cu in the interstitial water in relation to the sediment content would be expected to become constant when this point is reached."

The statement quoted is an invalid description of the applicable principles of aquatic chemistry. The data provide no support for the claim, *"that the equilibrium constants governing the solubility of Cu compounds contained in the sediments have not been reached."* As discussed in the Woodward-Clyde report, there is no statistically valid relationship between the amount of copper in the so-called interstitial water as measured by WESTEC and the copper concentrations in the NCMT-area sediments. This is one of the most inappropriate uses of statistics that the authors have ever seen. As discussed above and in the Administrative Record submitted to the SDWQCB, the r^2 values, the coefficients of determination, for those data are so low as to indicate that there is no relationship between copper in sediments and copper in "interstitial waters" as measured by WESTEC. It is therefore totally inappropriate for the staff to infer that the equilibrium constants for the solubility of copper in the sediments are not reached for the *in situ* sediments and that this in some way should cause the WRCB to overturn the SDWQCB's adoption of the 4,000 mg Cu/kg clean-up objective.

The fact that equilibrium conditions were not established in the samples that WBSTBC handled in conducting the interstitial water studies was an artifact of how they handled the samples, not what was happening in the *in situ* sediments. Elsewhere in this report to the Board, the authors comment on the role of ferric hydroxide as a scavenger in controlling the release of contaminants from sediments. This issue was also discussed in detail with a number of references provided, in the Woodward-Clyde report. Ferric hydroxide is a well-known scavenger for copper in aquatic systems. It is thermodynamically impossible to have copper diffusing out of the sediments, as proposed by the staff, and not at the same time have ferrous iron diffusing out of the same sediments. As discussed in the Woodward-Clyde report, upon contact with oxygen in the watercolumn, the ferrous iron is oxidized to ferric iron which precipitates and scavenges copper and other constituents, incorporating them into the sediments.

A much more plausible mechanism for the NCMT-area sediments' potentially contributing copper into the watercolumn occurs when the sediments are stirred into the watercolumn. The copper that is stirred from the sediments into the watercolumn associated with storms, ship traffic, etc., however, will be in a particulate form and will be non-toxic to aquatic life. It will also readily settle back to the sediments once the quiescent conditions are re-established. This situation occurs in every waterbody associated with every storm event. "Violations" of the April 1991 objective for copper as applied in all or essentially all waterbodies every time storms or high flow conditions occur. While such situations cause "administrative exceedances" of water quality objectives, they do not represent ecological damage or true impairment of the designated beneficial uses of the waterbody.

Page 8, paragraph 3, is another attempt by the staff to repeat its unfounded claim that the interstitial waters in the NCMT-area sediments contain copper in the 480 µg/L levels. It appears that they believe that if they keep making that statement, it will eventually become true. It is obvious, as discussed above, that the true interstitial waters in the bedded sediments of the NCMT area do not contain copper at those concentrations. The chemistry of copper in San Diego Bay waters is such that such copper concentrations are impossible to achieve in bedded sediment interstitial waters.

On page 8, last paragraph, the staff again presented distorted information to the WRCB in its attempt to discredit the 4,000 mg/kg copper clean-up objective. If the copper in the NCMT-area sediments were having a significant adverse impact on the numbers and types of organisms present in the NCMT area sediments, this would have been discernible through the data that have been obtained. This point was discussed in the Woodward-Clyde report and the presentations to the SDWQCB. The staff's summary of the findings of that study were distorted. The staff claimed,

> *"Those studies found variations, but the cause of variations could not be attributed to Cu because of confounding caused by dredging and other human activities on San Diego Bay according to the consultant."*

The authors do not know who the "consultant" referred to was; it was not the "consultant" who conducted the study and it was not the "consultants" who developed the Woodward-Clyde report. WCC (1991) stated with regard to that work,

> *"Species composition and abundance were determined and compared with the distribution of copper ore to evaluate the potential impact of the ore concentrate on the distribution and abundance of these organisms."*
>
> *"If elevated copper concentrations were having an adverse impact on infaunal communities reductions in N* [numbers of individuals] *and S* [number of species] *would be expected to be highest at the terminal and diminish with distance from the terminal. The data collected in the 1986 study does not indicate this trend."*
>
> *"These observations suggest that the major environmental features controlling biotic distribution in this region of San Diego Bay include relatively stronger water movement in the navigation channel, sediment instability, and sediment deposition rates in the bed of the navigation channel. Such impacts have been reported previously for other areas in San Diego Bay and elsewhere* [references given]."

Thus, contrary to the reporting by the staff, the lack of relationship between infaunal organisms and copper was not because of confounding effects of site perturbations. The potential for a relationship was examined and found not to exist.

On page 9, first paragraph, the staff attempted to discredit the toxicity tests that were conducted by claiming that San Diego Bay water should have been used as the control water in the bioassay tests. The bioassays were conducted by MBC Analytical using standard US EPA protocol. The use of San Francisco Bay dilution is approved by the US EPA for bioassays of the toxicity of marine sediments taken throughout California. Contrary to the statements made by the staff, and based on the authors' many years of conducting bioassays/toxicity tests on aquatic sediments and water, there is no justified reason to imply that if San Diego Bay water had been used in the toxicity tests the copper from the sediments would have been found to be more toxic. In fact, if there were an effect of water type, the San Diego Bay water taken from near the NCMT area would have a greater detoxification potential than waters taken from other coastal areas of the state. The organic content, suspended solids, and other characteristics that contribute to detoxification of heavy metals would be in the direction of being higher in San Diego Bay water than many other coastal marine waters. Therefore the staff's statements attempting to discredit the toxicity test results because San Francisco Bay water was used as the control and dilution water, are invalid.

Beginning on page 9, the staff presented its "analysis of issues." The so-called analysis presented is highly biased, and includes a significant amount of misinformation to the WRCB on the issues.. It totally ignores the key information that was presented to the SDWQCB and is in the Administrative Record, which was available to the staff but apparently not reviewed. It therefore is a noncredible presentation of the situation or summary of the facts pertinent to this matter.

On page 9, under Issue 1, it was stated,

> *"Generally stated, the objective of the EBEP is to assure that '(T)he concentration of toxic pollutants in the water column, sediments, or biota shall not adversely affect beneficial uses.' (EBEP, 1991, pg. 3) The removal of the spilled Cu ore concentrate is necessary to meet this objective."*

The final sentence quoted is not accurate and not supported. There is no indication that the copper ore concentrate in the NCMT-area sediments is a toxic pollutant or that it is having any adverse impact on designated beneficial uses of San Diego Bay. Furthermore, the technical information clearly shows that that material is not having any adverse impact on designated beneficial uses of the Bay. The removal of the spilled ore concentrate will not change the designated beneficial uses of San Diego Bay or change the achievement of the objective of the EBEP (1991) cited in that paragraph.

On page 9, the staff continued by stating,

> *"The Cu leaching or dissolving and entering the water column from the waste poses a risk to biological resources of San Diego Bay."*

There is no evidence that copper is leaching, dissolving, and entering the watercolumn which poses a risk to biological resources of San Diego Bay. There is substantial valid evidence to the contrary which the staff has chosen to ignore in presenting and discussing these issues to the WRCB.

On page 9, the staff continued further by stating,

> *"Waters overlying these deposits show elevated levels of Cu probably in conjunction with other sources of Cu. However, the elevated levels of Cu observed in the interstitial pore spaces of Cu contaminated sediments well in excess of the 2.9 µg/l water quality objective stated in the EBEP (Woodward-Clyde, 1991, figure 7-7) is indicative of the potential impact to water quality posed by this situation. Removal of the material will significantly reduce this potential, particularly since continued addition of Cu ore will not continue into the future. The 4000 µg/l Cu concentration makes it more probably (sic) that a violation of the EBEP will occur."*

Again, the staff has presented distorted information to the WRCB. As discussed in the risk assessment report, there are no valid data on the concentrations of copper in the NCMT-area bedded sediment interstitial water. Further, the water quality objective has no relevance to the concentrations of copper in the interstitial water. Even if the concentrations of copper in the interstitial water were found to be above the numeric water quality objective of 2.9 µg/L, it would not lead to the conclusion that such a situation would be causing, or would be a significant threat of causing, a significant adverse impact on the designated beneficial uses of San Diego Bay. The staff's logic necessarily lead to the conclusion that virtually all sediments from fresh and marine water systems that have un-ionized ammonia above a few hundredths of a mg/L are having a significant adverse impact on the designated beneficial uses of the surface waters in which they are located and should be remediated.

Based on the senior author's over 30 years of work on aquatic sediments and water quality issues, it is highly inappropriate to infer that because a concentration gradient exists between the concentrations of contaminants in interstitial waters and the overlying waters that this means that the sediments are an important source of contaminants to the overlying waters. As discussed by the authors in numerous publications over the past 20 years and again most recently Lee and Jones-Lee (1992), a concentration gradient between sediments and water does not mean adverse impact. A gradient shows only direction; it provides no information on the mass flux (actual transport). It is the mass flux of contaminants, from the sediments to the overlying waters, that remain in the watercolumn in a toxic form for a sufficient period of time that can lead to the potential for a sediment to have a detrimental impact on watercolumn organisms. If the critical concentration of the available forms of a contaminant in the watercolumn for the duration of organism exposure is not exceeded, then the concentration gradient referred to by the staff is irrelevant to assessing the impacts on the designated beneficial uses of the waterbody.

It is also clear that the removal of the copper ore concentrate from the NCMT area sediments below 4,000 mg/kg will have no significant impact on the designated beneficial uses of San Diego Bay and will represent a waste of public and private funds in an effort to try to achieve an overly protective water quality objective.

On page 10, under Issue 3, the staff stated,

> *"The 4000 mg/kg dry weight of Cu, as a clean-up level adequate to protect water quality, is not adequately supported technically based on the record of decision. The decision to set the Cu clean-up level at 4000 mg/kg by the Regional Board was largely based on the equivalence to the DHS definition of hazardous waste of 2500 mg/kg wet weight contained in CAC, Title 22, Sec. 66699."*

As discussed elsewhere in the materials being submitted to the WRCB in response to the staff's comments, the quoted statement is misleading in that it fails to point out that the 4,000 mg Cu/kg clean-up objective adopted by the SDWQCB was determined to be protective of designated beneficial uses of San Diego Bay. That clean-up objective could be significantly raised and still protect these uses. Obtaining a variance from the Title 22 requirements, should one be needed, would require more time than allowed for the SDWQCB-mandated clean-up of the sediments.

Page 11, paragraphs 2 and 3, again repeated the same errors made by the staff on the interstitial water analysis by WESTEC.

On page 11, paragraph 4, the staff stated,

"Since the Cu contaminated sediment is the result of spillage of concentrated ore, the Cu must first dissolve from the particles of concentrated ore to enter the water column."

This is yet another error made by the staff in reporting the technical information to the WRCB. The most likely reason for copper ore concentrate to be present in the watercolumn is due to stirring of the sediments into the watercolumn associated with storms, ship traffic, etc. This would be a short-term, transitory event where once the turbulent conditions subside, the copper ore concentrate would rapidly settle into the sediments again. It is important to note, as discussed in the Woodward-Clyde report, that there is considerable evidence that since the chalcopyrite is much denser than most other sediment particles it is accumulating in the deeper parts of the soft sediments in the NCMT area. This in itself tends to significantly reduce the tendency for the copper ore concentrate to be stirred into the watercolumn during storms.

Page 11, paragraph 5, represents another attempt by the staff to invoke diffusion of copper from interstitial water as a significant cause of the exceedance of the water quality objective. Those familiar with aquatic sediment transport processes know (as was published by the senior author 22 years ago (Lee, 1970)), the primary mechanism for transfer from the interstitial waters to the overlying waters is not diffusion. Diffusion processes can be readily demonstrated to be far too slow to ever be of significance in transferring contaminants from sediments to overlying waters. The primary mechanism for transfer is mixing processes in which the sediments are actually stirred into the watercolumn by aquatic organisms, wind, tide, flow induced currents, boat traffic, biogenic gas production processes, etc. It is clear that the staff does not understand or at least has not reliably reported on the fundamental factors determining the transfer of contaminants from sediments to overlying waters.

On page 11, last paragraph, the staff tried to claim that the situation with respect to sediments as a source of contaminants is different from a wastewater discharger where from the discharger a variety of chemical reactions would occur in the receiving waters which would detoxify the discharge. Again it is clear that the staff does not understand elementary aquatic chemistry. "Complexing" in the watercolumn would not tend to reduce the concentrations of copper in the watercolumn relative to the interstitial waters. The chemical reaction of complexation typically would tend to increase the concentrations of copper in the watercolumn relative to the interstitial waters, just the opposite of what the staff has claimed. Further, in its discussion, the staff has chosen to ignore the most important reaction that tends to cause sediment-associated contaminants to often not contribute significantly to the overlying waters, namely the ferric hydroxide scavenging discussed elsewhere in this statement and in the Woodward-Clyde report.

On page 12, under Issue 4, the staff stated,

> *"By not demonstrating that beneficial uses will be protected, the revised clean-up level adopted by the Regional Board does not conform with State Board Resolution 68-16."*

Again, the staff has presented unreliable information to the WRCB. There was substantial demonstration to the SDWQCB that the designated beneficial uses of San Diego Bay will be protected by the 4,000 mg/kg copper clean-up objective, i.e., just the opposite of what the staff stated.

The authors understand and appreciate the severe constraints that the State and Regional Board staffs face in addressing technically complex issues such as the chemistry and toxicity of copper in San Diego Bay sediments. As attempts are made to control subtle effects of contaminants that are potentially toxic in aquatic systems there will be need for increasingly sophisticated understanding and application of principles of aquatic chemistry at the Regional and State Board levels if technically valid approaches are to be adopted by these Boards to will protect the designated beneficial uses of the state's waters without unnecessary expenditures for contaminant control. This will be especially true for sediment-associated contaminants. In this case, careful analysis establishes that there are no biological or environmental benefits to be gained from changing the Regional Board's clean-up level of 4,000 mg Cu/kg.

If the State Board has any questions about these comments on the lack of technical validity of the staff's comments, please contact the authors.

REFERENCES

Ankley, G., Schubauer-Berigan, M., Dierkes, J., and Lukasewycz, M., "Sediment Toxicity Identification Evaluation: Phase I (Characterization), Phase II (Identification) and Phase III (Confirmation) Modifications of Effluent Procedures," draft report, US EPA National Effluent Toxicity Assessment Center, Technical Report 08-91 (1991).

Lee, G. F., "Factors Affecting the Transfer of Materials between Water and Sediments," University of Wisconsin Eutrophication Information Program, Literature Review No. 1, University of Wisconsin, Madison (1970).

Lee, G. F., and Jones-Lee, A., "Water Quality Aspects of Dredging and Dredged Sediment Disposal," IN: Herbich, J. (ed), Handbook of Dredging Engineering, McGraw-Hill, NY, pp. 9-23 - 9-59 (1992).

Morse, J. W., Millero, F. J., Cornwell, J. C., Rickard, D., "The Chemistry of the Hydrogen Sulfide and Iron Sulfide Systems in Natural Waters," *Earth-Science Reviews* 24:1-42 (1987).

WCC (Woodward-Clyde Consultants), "Remedial Action Alternatives for National City Marine Terminal," Final Report, Prepared for San Diego Unified Port District, San Diego, CA, July (1991).

WESTEC (WESTEC Services, Inc.), "Evaluation of Copper in Interstitial Water from Sediments at Paco Terminals, San Diego Bay," Prepared for Paco Terminals, Inc., National City, CA, WESTEC Services, Inc., San Diego, CA, October (1986).

WESTEC (WESTEC Services, Inc.), "Evaluation of Copper in Interstitial Water from Sediments at Paco Terminals, San Diego Bay, Phase II," Prepared for Paco Terminals, Inc., National City, CA, WESTEC Services, Inc., San Diego, CA, March (1987).

Exhibit 1

Relationship between Copper Concentrations in Interstitial Water and in Sediment near NCMT (from WESTEC, 1987; WCC, 1991*)

Figure I

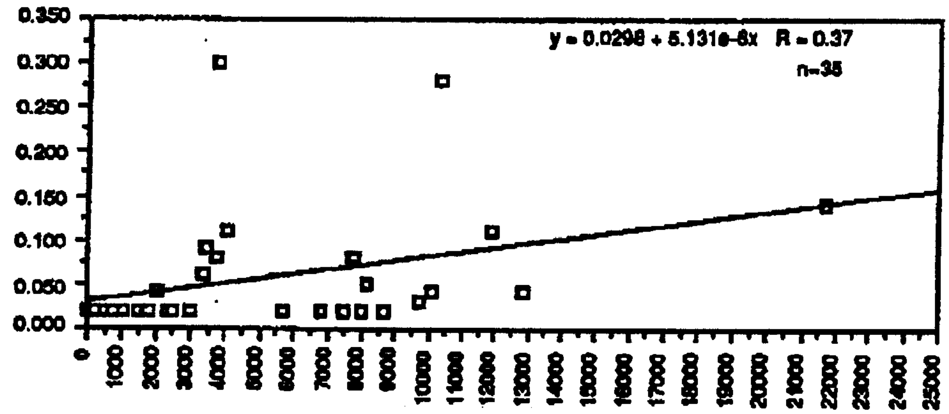
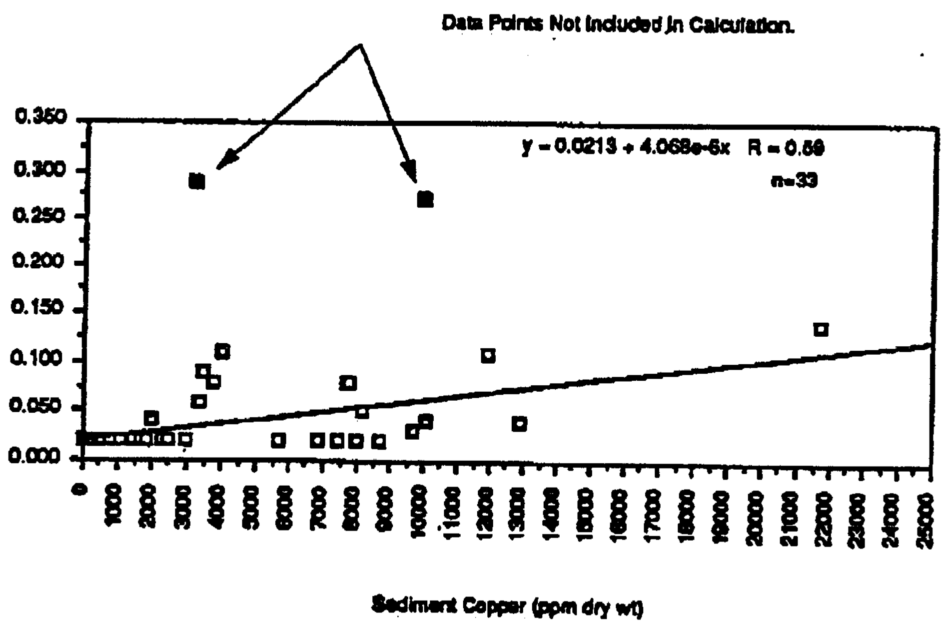


Figure II



*Woodward-Clyde Consultants, "Remedial Action Alternatives for National City Marine Terminal," Final Report, Prepared for San Diego Unified Port District, San Diego, CA, July 26 (1991).

9

Responses to Technical Issues Raised at September 2, 1992 Workshop on National City Marine Terminal Sediment Clean-Up Objectives

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September 15, 1992

This document responds to questions raised and statements made at the September 2, 1992 workshop on the clean-up objectives for the National City Marine Terminal (NCMT)-area copper-contaminated sediments regarding the protection of beneficial uses of San Diego Bay. This information would have been provided at the workshop had time and circumstance allowed. These comments are divided into two sections. The first section addresses specific questions that were asked by the Board members during the workshop with regard to the technical support for pertinent to the establishment of a clean-up objective and to the protection of beneficial uses of San Diego Bay. A description is provided of the response to the question that was provided at the Workshop along with the response to the question by the authors. The second section addresses technical aspects of unreliable or incorrect statements made at the workshop on those issues.

Responses to Questions Asked by State Board Members

- Question asked by Mr. Del Piero:
  "What baseline studies were done and what modeling was done to reach that conclusion [that the 4,000 mg/kg level would not result in adverse effects on beneficial uses of San Diego Bay]? *What type of analysis was done with regard to the particular habitat such as is in the vicinity of where their discharge took place, and what kind of baseline information was available prior to the discharge taking place that would enable you to determine what the consequences of the discharge spill were? Do we have any baseline data as to what the copper content in the sediment was before?"*

<u>Response Provided at Workshop</u>

Mr. Del Piero asked these questions first of Ms. McChesney who deferred to Mr. Lorenzato for response. Mr. Lorenzato's response to those questions reflected his lack of knowledge of the vast amount of information describing the work that has been done that was in the Administrative Record prior to the workshop. He responded that no mathematical modeling had been done. He was not familiar with the "baseline" information or the basis by which the Regional Board had selected a baseline concentration for copper in the NCMT-area sediment. When Mr. Del Piero noted, *"It ought to be available in the record."*, Mr. Lorenzato's response was, *"I didn't review that part of the record."*

Mr. Lorenzato followed that statement by saying, *"As far as the analysis of the various levels that were considered by the Regional Board, as far as I can tell, the data that might support 4,000 ppm limit was not collected at the site, it was collected from areas around the Bay other than the site. And it was based on elutriate tests..."* He then indicated that the testing that was done was inadequate because it did not focus on sediments containing 4,000 mg Cu/kg. Mr. Lorenzato's response reflects his serious lack of familiarity with the Administrative Record upon which he supposedly briefed the Board and developed the recommendation to the State Board in the staff's draft order. As discussed elsewhere, it is not necessary to test sediments containing exactly 4,000 mg Cu/kg in order to determine that that level would be protective of beneficial uses. Toxicity tests showed that sediments containing as much as 18,000 mg Cu/kg did not have an adverse impact on aquatic life. That notwithstanding, had Mr. Lorenzato properly reviewed the risk assessment study report (WCC, 1991) he would have known that sediments containing 6,000 mg Cu/kg were also tested and found to cause no adverse impacts to the test organisms.

We do not know where Mr. Lorenzato believed the samples tested to have been from. The sampling locations were clearly delineated in the risk assessment study report which he claimed to have reviewed. Contrary to Mr. Lorenzato's statement, the samples were not "collected from areas around the Bay other than the site;" all of the samples on which toxicity tests reported on in the risk assessment study were conducted were collected in the immediate vicinity of the National City Marine Terminal (NCMT).

Mr. Lorenzato stated also in response to those questions, *"They did some bedded sediment toxicity testing with an amphipod - one set of tests with an amphipod."* Again, his response reflected either a severe lack of familiarity with the report of the risk assessment study that was done or a deliberate misleading of the Board. Contrary to his specific statement, results of toxicity tests with two different amphipods were discussed in the risk assessment report. A set of toxicity tests was conducted with *Grandidierella japonica* by ERCE (WESTEC) in 1988 on NCMT-area sediments containing as much as 6,000 mg Cu/kg.

<u>Response to Questions:</u>

(1) *"What baseline studies were done and what modeling was done to reach that conclusion* [that the 4,000 mg/kg level would not result in adverse effects on beneficial uses of San Diego Bay]?"

The technical foundation for the conclusion that the 4,000 mg Cu/kg clean-up objective would be protective of beneficial uses of San Diego Bay was provided in the risk assessment (reported in Woodward-Clyde report (WCC, 1991), in submissions to and testimony before the Regional Water Quality Control Board, and again in detail in written response to the

Environmental Health Coalition's Petition to the State Board. A synopsis of the studies and their key findings are as follows:

- Toxicity Tests
    - Toxicity tests were conducted on NCMT-area copper-contaminated sediment using 9 different standard toxicity test organisms (including two "bedded sediment" amphipods) and evaluating 14 response characteristics.
    - An array of sediment samples from the pierface in the most contaminated sediments and bayward from the pierface were tested; the samples tested contained copper concentrations as low as 122 mg Cu/kg and as high as more than 18,000 mg Cu/kg, with a number containing intermediate concentrations.
    - The most recent toxicity tests were specifically directed to assessing potential chronic impacts (those impacts that could result from extended exposure and exposure during critical lifestages) to sensitive organisms. Organisms tested with standard short-term chronic testing methods included the Pacific oyster (embryo-larval test) which is recognized by the US EPA to be one of the most sensitive organisms to copper.
    - Each of the toxicity test series with the 9 different organism types included testing of NCMT-area sediment that contained greater than 4,000 mg Cu/kg. None of the toxicity tests showed any toxicity response to the exposure to the copper-contaminated sediments, with the exception of one response of the *Rhepoxynius*, one of the two amphipods tested. The response noted in the *Rhepoxynius* test was not related to the concentrations of copper and most likely reflected an effect of sediment grain size on the organisms. Those organisms do not live in San Diego Bay and are known to exhibit responses to grain size of sediment. They are now recognized to not be reliable for testing San Diego Bay sediments. The other amphipod tested showed no toxicity response.
    - Bedded-sediment and elutriate toxicity tests were performed. The elutriate toxicity test IS appropriate for evaluation of the potential toxicity of the NCMT-area sediment and its potential impact on water quality. It provides a more severe exposure of sensitive test organisms than would be expected to occur in the ambient water at the site. (Dr. Lee was involved in the creation, development, and subsequent application of elutriate toxicity testing as well as other toxicity testing procedures since the early 1970's and can speak authoritatively with regard to the applicability of that test procedure to evaluation of sediment-associated contaminants.)

- Surveys of the NCMT-area infaunal (bottom-dwelling) community diversity were reported in the Woodward-Clyde report as well as in other submissions that were part of the Administrative Record prior to the September 2 Workshop. Those surveys showed that differences and similarities between organism assemblages (numbers, types, and composition of organisms) in the NCMT area are not related to the amount of copper present in the sediments.

- The collection of bottom-dwelling and piling-dwelling (watercolumn) mussels in the highly copper-contaminated area of the NCMT and at a Water Quality Control Board sediment. When Mr. Del Piero noted, *"It ought to be available in the record."*, Mr. Lorenzato's response was, *"I didn't review that part of the record."*

Mr. Lorenzato followed that statement by saying, *"As far as the analysis of the various levels that were considered by the Regional Board, as far as I can tell, the data that might support 4,000 ppm limit was not collected at the site, it was collected from areas around the Bay other than the site. And it was based on elutriate tests..."* He then indicated that the testing that was done was inadequate because it did not focus on sediments containing 4,000 mg Cu/kg. Mr. Lorenzato's response reflects his serious lack of familiarity with the Administrative Record upon which he supposedly briefed the Board and developed the recommendation to the State Board in the staff's draft order. As discussed elsewhere, it is not necessary to test sediments containing exactly 4,000 mg Cu/kg in order to determine that that level would be protective of beneficial uses. Toxicity tests showed that sediments containing as much as 18,000 mg Cu/kg did not have an adverse impact on aquatic life. That notwithstanding, had Mr. Lorenzato properly reviewed the risk assessment study report (WCC, 1991) he would have known that sediments containing 6,000 mg Cu/kg were also tested and found to cause no adverse impacts to the test organisms.

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Response to Questions:

(1) *"What baseline studies were done and what modeling was done to reach that conclusion* [that the 4,000 mg/kg level would not result in adverse effects on beneficial uses of San Diego Bay]?"

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NCMT-area reference site, for the risk assessment study revealed that

- the concentrations of copper in the tissue of bottom-dwelling and watercolumn mussels were the same in the most heavily copper-contaminated area as they were in the reference area.
- *Mytilus edulis* was one of the mussel types collected from the most heavily copper-contaminated area of the NCMT. It was found living naturally at that location. *Mytilus edulis* was reported by the US EPA to be the most sensitive to copper of the marine organisms it evaluated in establishing the water quality criterion for copper. It was based specifically on the sensitivity of that organism to copper that the numeric criterion value was established. Sound scientific principle would lead one to conclude that if the most sensitive of the species, and the species upon which the 2.9 μg/L objective was established, is living naturally in the water in question, the aquatic life in that water is not being adversely affected by that copper. No organism considered by the US EPA in establishing its criterion was more sensitive to copper than *Mytilus edulis*.
- The results of the mussel tissue analysis obtained in the risk assessment study were consistent with those from the NOAA and State Mussel Watch Programs.
- As was noted in the risk assessment study, *"The Water Resources Control Board State Mussel Watch Program used a statistical treatment of data obtained from studies over the past 10 years of the accumulation of various constituents in transplanted, caged mussels, to define an EDL ("elevated data level") at various percentiles for data collected through the program. While that approach has some utility for identifying areas in which various contaminants accumulated in transplanted, caged mussels, exceedance of a certain percentile developed in that survey framework should not be considered to have any particular meaning in terms of potential problems of or risks associated with accumulation of the contaminants in the transplanted or native organisms."*
- State Board staff acknowledged that copper in aquatic organisms is not considered to represent a potentially significant health hazard to humans. There are no FDA Action Levels or other limitations for copper in food organisms.

- The chemistry and toxicology of chalcopyrite, the form of copper in the copper ore concentrate introduced into the water at the NCMT, was reviewed. As discussed at length in the risk assessment report, chalcopyrite is a highly stable, insoluble form of copper that is largely unavailable to adversely affect aquatic organisms. The chemistry of copper in that form in the marine sediment/water environment is such that copper would not tend to be released from the sediment; copper that might be released would be rapidly removed from solution.

- No adverse impacts from copper have been found that would suggest that there were aspects of potential impact that had not been considered in the risk assessment study.

- All of the above aspects of potential impact of the copper-contaminated NCMT-area sediment were carefully reviewed in the risk assessment conducted. That information clearly demonstrates that the copper-contaminated sediment that is currently in the NCMT area is not adversely affecting the beneficial uses of San Diego Bay. Therefore, sound technical review would conclude that since there is no evidence of water quality problems (after evaluating the community diversity, presence of the most copper-sensitive species, bioaccumulation, and toxicity (up to 18,000 mg Cu/kg in the sediment)), or of other problems not evaluated, and since the current contamination is at levels as high as 50,000 mg Cu/kg, there can be little doubt that copper residuals of less than 4,000 mg/kg would not adversely affect beneficial uses of the Bay.

- Mr. Del Piero asked what modeling was done to reach the conclusion that the 4,000 mg Cu/kg clean-up objective would be protective of beneficial uses. It is unclear as to what type or purpose of modeling Mr. Del Piero had in mind in asking his question. Modeling is a simplified mathematical or other representation of a system that is developed to help describe that system; some models have some predictive capability but many do not. Several modeling approaches were used.
  - The risk assessment work included review of aquatic chemistry models for copper (e.g., US EPA MINTEQ model) to determine if there were any possible way that chemical reactions could lead to the formation of toxic forms of copper from the stable forms present in the sediments. (Dr. Lee taught aquatic chemistry modeling and is highly familiar with its proper use and its limitations.)
  - Aquatic toxicology modeling in the form of toxicity tests was conducted as discussed above.
  - Mathematical modeling of sediment movement was determined to be unnecessary since there was already a sufficient assessment of the location and behavior of the copper in the NCMT-area and it would not contribute to the assessment of the appropriateness of the clean-up objective. Extensive surveys of the distribution of copper in the NCMT-area sediments have been conducted in 1985, 1986, 1989, and 1991. Based on the survey studies it is clear that the copper-ore remains most concentrated at the pierface, significantly decreasing in concentration with distance from the pierface; it is moving deeper into the sediment as would be expected from the nature of the ore. Such movement further into the anoxic (oxygen-free) environment of the sediments further maintains the unavailability of the copper. Mathematical modeling to described what has been found in the distribution surveys would not have provided useful information.

All of this information was reported in the risk assessment, in other submissions to the Regional Water Quality Control Board, as well as in the response to the Petition of the EHC to the State Board. It was all available to Mr. Lorenzato for review. Inadequate review of the information available by the staff resulted in an unreliable reporting of the information to the Board at the Workshop.

(2) *"What type of analysis was done with regard to the particular habitat such as is in the vicinity of where their discharge took place, and what kind of baseline information was available*

prior to the discharge taking place that would enable you to determine what the consequences of the discharge spill were?"

"Habitat" is a term used to describe the nature of the living-environment of organisms. To the knowledge of the authors, there were no detailed studies of the habitat characteristics at the NCMT pierface prior to the operations of PACO there. It is reasonable to presume that given the long-term history of use of the area for shipping, however, it has long been a "disturbed" system, subject to the influences of physical perturbations and introduction of chemical contaminants to the Bay from a myriad sources. It is not possible to determine the specific impacts that the introduction of the copper-ore concentrate at the NCMT had on the habitat or aquatic life at the time of its introduction. However, that issue is not relevant at this time since whatever effects occurred at that time would have been exceedingly short-term in nature. It is clear that at this time, and indeed when surveys of the community diversity were conducted in the mid 1980's, that the numbers and types of organisms populating the NCMT-area and surrounding areas are not controlled by or related to the presence of copper in the sediments. Further as noted above, the most copper-sensitive marine organism evaluated by the US EPA in establishing the water quality criterion for copper (*Mytilus edulis*) is currently inhabiting the most contaminated area of the NCMT. Thus even if the copper had been more available when first introduced into the NCMT area waters and sediments, any effect from that copper has been long gone.

The matter at hand is not remediation of effects that may have occurred 13 years ago, but rather to assess and address water quality problems that may currently exist in association with that sediment. The nature of fresh copper-ore concentrate is not the issue because the copper-ore concentrate that remains in the sediment at the NCMT area is aged. As discussed in the risk assessment report, whatever copper may have been in available forms at the outset would have been rapidly detoxified in the marine environment.

(3) *"Do we have any baseline data as to what the copper content in the sediment was before?"*

The risk assessment report (WCC, 1991) addressed the information available on the copper concentrations in the sediment prior to the PACO operations. The literature has reported concentrations of copper in sediments 0.3 mile north of the NCMT to have been nearly 900 mg Cu/kg in 1972, well before the PACO operations at the NCMT. As was discussed in WCC (1991) the sediments from many areas of San Diego Bay, including the NCMT area, have contained elevated concentrations of copper compared with sediments in many other bays, estuaries, and coastal marine waters in the US since before the copper ore concentrate transfer activities began at the NCMT. Since the concentrations of copper in sediment have no relationship to the potential toxicity of those sediments, the technical issue at hand is not the specific concentration but rather the impact that the sediment-associated contaminants may be having on beneficial uses and whether achieving the Regional Board's 4,000 mg Cu/kg clean-up objective would be protective of beneficial uses of San Diego Bay. The extensive studies that have been done to specifically address that issue show that the 4,000 mg Cu/kg would indeed be protective of beneficial uses of San Diego Bay.

Furthermore, there were data presented in the WCC (1991) report that demonstrate that the copper concentrations in the watercolumn near the NCMT in 1978 and 1979 were about the same as those reported in 1986 in an area of the NCMT in which the sediments contained some of the highest copper concentrations reported. This background information, as well, should have been included in the briefing provided to the Board by its staff.

- **Question asked of Lorenzato by Mr. Del Piero:**
  "In terms of discharges that might have taken place from the storm drains, was there any analysis in any of the analysis done in terms of plumes that might have resulted from stormwater discharges and what the magnitude of the expanse of the plume was?

<u>Response of Mr. Lorenzato</u>

Mr. Lorenzato responded, *"Yes, they did a lot of sediment chemistry at the site that pretty clearly defines where the contaminated sediments from this particular spilling extend to, and n part they've defined a plume of sediment deposition that is associated with the storm drains. But the biological data to assert the impacts of that plume, they don't match up really well with -- [thought terminated]"* When asked if any quantification of the nature of the plume or its movement had been done, Mr. Lorenzato responded that he had not seen any information on that issue.

<u>Response to Question</u>

The survey studies of the chemical composition of the NCMT-area sediment reported in WCC (1991) (i.e., was in the Administrative Record available to Mr. Lorenzato), included surveys of the quantification of the plume from the stormwater discharges. Mr. Lorenzato's attempt to discredit that understanding of that plume by claiming that *"the biological data to assert the impacts of that plume, they don't match up really well with..."* is a fabrication. There is no information upon which to develop such an argument by Mr. Lorenzato. The risk assessment and sediment-copper mapping studies reported in the Woodward-Clyde report fully responded to these issues.

- **<u>Question asked of J. Lormon, Paco attorney, by Mr. Del Piero:</u>**
  "You indicated that the nature of the copper generated from paints was different than the nature of the sediment that was present in or near the terminal site. Can you explain that to me?"

Response by Mr. Lormon

Mr. Lormon responded by recounting information provided in the risk assessment report that the copper in paint used on boat hulls was by design in a form that is toxic to aquatic life; that is the purpose of its use. He also indicated that it is not the same form or availability as the copper in the copper ore concentrate.

- **Mr. Del Piero continued his question by stating,**
  "It's not bioavailable unless it gets into the watercolumn."

Mr. Lormon responded that that was not the case and deferred to Drs. Lee and Jones-Lee for response. Mr. Del Piero did not ask that question of Drs. Lee and Jones-Lee during their presentation.

Response to the Question

Mr. Lormon's response was correct as had been fully discussed in the risk assessment report (WCC, 1991). **Mr. Del Piero's assessment that the copper in the copper ore concentrate *"it's not bioavailable unless it gets into the watercolumn"* is not correct.** As discussed in the risk assessment report, the copper in the copper ore concentrate is a highly stable, highly insoluble, unavailable form. Those characteristics have reference to the nature and behavior of that copper when it is introduced into a water. The chemical processes at work in the marine water and sediment environment act to maintain the copper in unavailable forms and to rapidly render unavailable forms that could become available through oxidation. The risk assessment report contained a substantial discussion of the key aspects of copper chemistry pertinent to the NCMT-area sediment contamination and water quality issues. The attempts by the State Board staff to describe the chemistry of copper have been highly unreliable; that may account for Mr. Del Piero's confusion on this issue.

- **Questions asked by Mr. Del Piero:**
  Mr. Del Piero asked a sequence of questions regarding the stipulation made by the Regional Board staff at the December 9, 1991 Regional Board hearing that the NCMT-area sediments as they currently exist in San Diego Bay are not adversely impacting water quality. With reference to the stipulation reported by Mr. Lormon, Mr. Del Piero asked whether that stipulation was made *"because there are no biological studies that have been conducted?"*

Response at the Workshop

Mr. Coe provided a partial recollection of the stipulation made and *"did not recall"* about the biological studies that had been conducted. Mr. Lormon responded that numerous studies had been done and deferred to question to Drs. Lee and Jones-Lee. Mr. Del Piero asked if those were the studies that Stephan Lorenzato had evaluated and Ms. McChesney responded that they were.

Response to Question

As discussed previously in these comments (and as is discussed at length in the Administrative Record) there were substantial, specifically directed studies to evaluate the impacts on Bay water quality of the copper-contaminated sediment currently in the NCMT area. Those studies have examined the issues and have revealed that those sediments are not causing adverse impacts, and that that finding is consistent with the known behavior of such forms of copper in a sediment environment. It was those studies that led to the stipulation by the Regional Board staff that there were no biological effects at 4,000 mg Cu/kg or higher. Subsequent to the above interchange at the Workshop, Mr. Hopkins quoted from the transcript of the Regional Board hearing with regard to the stipulation made. He stated,

"...on page 57 of that transcript Executive Officer Coe of the Regional Board stated, 'I think we would stipulate to the fact that there are no biological effects.' Question from Chairman Badger who is also here. 'At what, at 4,000' Executive Officer Coe, 'Yes, or higher.'"

- **Mr. Del Piero made the following statement with reference to the studies that had been done and the support for the stipulation made by the Regional Board that there was no adverse impact of the NCMT-area sediments, *"I'm just trying to get a full picture here of what's been done and what hasn't been done. If these representations are being made, this may or may not be some copper generated from Paco. I'm trying to find what substantiation there is at the key of these assertions and it's not clear from what I've had in front of me."***

That information was provided in the risk assessment study report (WCC, 1991) and other materials in the Administrative Record of the Regional Board hearing on the matter and in subsequent submissions to the State Board on the petition. Those documents have been listed in the declaration of G. Fred Lee (September 15, 1992). Documents submitted prior to the Workshop should have been properly reviewed and reported on by the State Board staff so as to have reliably informed the Board members of the technical information. That was not accomplished by the staff in the draft order, other technical documents prepared prior to the Workshop or in the Workshop itself.

- <u>Question of Dr. Jones-Lee asked by Mr. Del Piero</u>
  Mr. Del Piero asked why no longer-term chronic toxicity tests were done.

<u>Response to Question</u>

As Mr. Lorenzato conceded the workshop, the standard approach to evaluation of potential chronic toxicity of a situation to aquatic life is to use what are termed "short-term chronic" toxicity testing. Conventional full-scale chronic toxicity tests involve testing from "egg to egg," that is from the "egg" stage of an organism through hatching, maturation, and reproduction, the production of eggs by that organism, to the evaluation of the survival of those young. For some organisms of significance such as fish, full chronic toxicity testing can take several years. Such tests also tend to be difficult to conduct because of the difficulties of maintaining test conditions and appropriate exposure over such extended time periods. Therefore, instead of trying to conduct full chronic tests, "short-term chronic" methods have been developed to test the "critical lifestages" of organisms. The results of such tests have been found to be comparable to the results of full chronic tests.

The toxicity tests that were conducted in 1991 for the risk assessment were such short-term chronic tests using embryo-larval forms of a fish and oyster. The Pacific oyster embryo that were tested had been found by the US EPA to be one of the most sensitive organism to copper. The toxicity test results showed no toxicity to that critical lifestage of that particularly copper-sensitive organism.

- <u>Question asked of Dr. Jones-Lee by Mr. Del Piero</u>
  Mr. Del Piero asked a series of questions of Dr. Jones-Lee and then made a number of statements that seemed to question the ability to rely on the credibility of the data that were generated in the risk assessment studies. He asked Dr. Jones-Lee, *"Did you manage the subcontractors?"* While Dr. Jones-Lee answered that question "no", that response was from a contractual standpoint. In fact from a functional standpoint, she and Dr. Lee directed the laboratory toxicity tests that were conducted. Mr. Del Piero followed that response with the statement, *"So you don't have any knowledge, firsthand, of the testing techniques done beyond what was represented to you by the subcontractors."*

Subsequently in that interchange, Mr. Del Piero stated, *"I asked you earlier, other than what's been represented to you, I mean no disrespect, but other than what's been represented to you, I don't know if you know if they've done any real biological analysis at all, but it appears to me from what I've got in front of me, it looks like at least the Port District has done some substantive analysis during the course of the last 24 to 36 months."*

<u>Response to Question</u>

All tests were done in conformity with standard methods and procedures. They were conducted under the direction and control of witnesses who have submitted testimony to the Regional Board and State Board. All opinions were based upon the authors' special knowledge, skill, experience, training, and education; upon the laboratory and testing results of the subcontracting consultants; and upon a critical evaluation of other references, all of which are of a type that reasonably are relied upon by experts in forming opinions of the types stated.

- **Question asked of Mr. Lorenzato by Mr. Del Piero:**
  "Is it realistic to assume that as was represented by the representatives of Paco that it is possible that copper discharges identified in 1974 are substantially contributing to problems in the watercolumn in 1992 or for that matter in 1986 when the original studies were done?"

Response to Question

There is no technical basis for any suggestion that the sources of copper to the NCMT area water prior to the PACO operations are of little significance to what the staff has characterized as an "exceedance" in 1986 of the current water quality objective for copper, because the flushing of the Bay would have removed that copper long before the watercolumn measurements were made in 1986. That reasoning is significantly flawed; the technical information does not allow that argument to be made.

There was before PACO operations at the NCMT, and continues to be, substantial input of copper into San Diego Bay from a variety of sources. Those sources were discussed in the risk assessment report and include non-NCMT-related stormwater discharges, paint from ship hulls, etc. Those sources of copper have not been eliminated. Whatever contributed to the elevated watercolumn concentrations of copper prior to PACO's operations would be expected to still be contributing copper to the watercolumn of the area. If the sediment-associated copper in the NCMT area were contributing notable amounts of soluble copper to the overlying water, one would have expected to see substantially more copper in the watercolumn of the area in 1986 than had been reported prior to PACO operations. The data do not show that. The 1986 watercolumn data showed concentrations of copper about the same as they had been in the late 1970's just north of the NCMT before the PACO operations. All of that information was presented, referenced, and discussed in the risk assessment report (WCC, 1991).

- **In response to Lorenzato's remark contending that the site is biologically impaired, Mr. Maughan stated,**

"I heard them say that 18,000 was not showing any biological effects."

Response from Mr. Lorenzato:

Mr. Lorenzato's response to Mr. Maughan's observation was, *"Well, I don't think that that's actually been shown. I think that they showed that an elutriate test didn't give them appreciable mortality, but like I said, I don't think that they have shown that on their other. I disagree."*

Response to Question:

Mr. Lorenzato's report conceded not having reviewed the entire Administrative Record, and his statements in the draft order and at the Workshop, and his responses to other questions at the Workshop indicated his lack of familiarity with the work that had been done and reported on to the Regional Board and in submissions to the State Board, or a severe bias in admission to knowledge of information. Based on the gross inadequacy of Mr. Lorenzato's review, the fact that he "doesn't think that that's actually been shown" should not be used to substantiate his support for a 1,000 mg Cu/kg clean-up objective for the NCMT-area sediment.

Mr. Lorenzato stated at the Workshop with reference to what he believed would be necessary in order to demonstrate that there are no adverse effects of the copper-contaminated sediments on beneficial uses of San Diego Bay,

> *"If they had done those same tests, using the same organisms, perhaps on pore water extractions, we'd have a pretty good argument that, yeah, pore water didn't kill it and if pore water didn't kill it there's really, you know, it's not likely that coming in direct contact with the particles is going to kill it either because if anything the particles are going to hold stuff stronger than pore water.*

Lorenzato's argument for pore water toxicity tests was technically incoherent and significantly flawed from several perspectives. First, toxicity tests on interstitial waters of NCMT-area sediments are not reliable for estimating the impact of sediment-associated contaminants on the beneficial uses of San Diego Bay sediments.

- Test organisms would not survive in tests of interstitial water because those waters lack dissolved oxygen, and have high levels of sulfide and ammonia.
- Oxygenation of the interstitial waters to allow survival of the test organisms would alter the chemical forms of copper. Thus the chemical character of the test system would be significantly different from that of the interstitial water in the bedded sediments at the site. The nature, degree, and impact on toxicity of that alteration could not be accounted for in interpretation of test results.

Second, watercolumn organisms are not exposed to "pore" water. Thus, even if such toxicity tests could be reliably conducted, the results generated could not be interpreted in terms of potential impacts on beneficial uses of the waters of San Diego Bay. Therefore, contrary to the contention expressed by Lorenzato, even if such tests could be reliably conducted, their results would have no relevance to determining the potential adverse impacts of the sediment-associated copper to water quality.

Rather than addressing the technical information presented on the issues, the State Board staff has demonstrated its lack of familiarity with what has been done and simply indicates that whatever it was that was done was not enough. The staff has put forth incorrect copper chemistry information, incorrect assessment of the toxicity testing procedures used, incorrect accounting of the testing that had been done, technically invalid use of amphipod toxicity test data, and unreliable reporting of testing that it believed should have been done as the only refutation of the technical information provided to the Regional Board and to the State Board in response to the petition that supports the 4,000 mg Cu/kg clean-up objective.

Discussion of Unreliable Technical Information
Presented to State Board at Workshop

- McChesney: *"In 1987, the Regional Board amended their order to specify a cleanup level of 1,000 mg/kg of copper and they primarily based this cleanup level on information that copper was discharging from the sediment and getting into the watercolumn and exceeding the Bays and Estuaries Plan."*

  Comment: This is an unreliable account of the foundation for the establishment of a 1,000 mg Cu/kg clean-up objective for the NCMT-area sediment. The objective was NOT established on *"information that copper was discharging from the sediment and getting into the watercolumn and exceeding the Bays and Estuaries Plan."* As discussed in the Administrative Record, that value was developed on the basis of inappropriate statistical manipulations of unreliable data on "interstitial water" concentrations of copper and concentrations of copper in the corresponding sediment.

- McChesney: *"They* [the Port and PACO] *based their request* [for the change in clean-up objective to 4,000 mg Cu/kg] *on several factors:"* The only notation in the "several factors" she mentioned, of the extensive review conducted on the water quality issues were the following statements, *"The technical report also concluded that the 4,000 mg/kg level would not have impacts on the marine habitat." "The dischargers also asserted that the 4,000 level would not contribute to the exceedance of the 2.9 [µg/L] water quality objective in the Enclosed Bays and Estuaries Plan."*

  Comment: Hers was an inadequate representation of the depth and breadth of study that had been conducted and that formed the foundation for the conclusion that the 4,000 mg Cu/kg objective would be protective of beneficial uses of San Diego Bay. There is substantial technical information to support that the 4,000 mg Cu/kg (or higher) clean-up objective, would be protective of beneficial uses of San Diego Bay. There is no technical information to support that a clean-up objective of 1,000 mg Cu/kg is necessary in order to protect beneficial uses of San Diego Bay.

- McChesney: *"That policy states that where clean-up levels are less stringent than background levels they should still attain a level that complies with applicable water quality control plans and policies, and in this situation the applicable water quality control plan is the Enclosed Bays and Estuaries Plan among other things. And that plan contains contain three objectives that are* *relevant to this petition. The first one is that there is a numerical water quality objective of 2.9 parts per billion. The other two objectives deal with our narrative water quality objectives that in essence state that toxic pollutants in the watercolumn, sediments, or biota shall not degrade or affect beneficial uses."*

Comment: The 4,000 mg Cu/kg clean-up objective complies with the narrative objective of causing no adverse impact on beneficial uses of San Diego Bay. Further, achieving the 1,000 mg Cu/kg objective (or even background conditions) will not eliminate the administrative exceedances of the current 2.9 μg Cu/L water quality objective that occurred before PACO operations. (See also next comment.)

- McChesney: *"The draft order concludes that the 1,000 mg/kg level is the level that is most likely to attain the 2.9 water quality objective of copper in the watercolumn." "The draft order also concludes that there is inadequate information to determine the effects of copper on the marine habitat."*

  Comment: The statements made regarding the content of the draft order are reflective of the technical deficiencies in that document. There is no technical substantiation for the staff's conclusion that the 1,000 mg/kg level is most likely to attain the water quality objective. The staff's conclusion of inadequate information reflects the incomplete review conducted of the Administrative Record. Furthermore, the suggestions made during the Workshop by Lorenzato regarding tests that would have been acceptable "proof" (i.e., toxicity tests on interstitial water) are technically inappropriate and would not yield meaningful or interpretable information. This issue is discussed in a subsequent comment. All of these issues were discussed in detail in another submission to the Record by the Port District (*"Comments on 'Draft Order WQ 92- for Review of Cleanup and Abatement Order no. 85-91, Addendum no. 7, of the California Regional Water Quality Control Board, San Diego Region'," "Comments on Technical Review Memorandum by the Division of Water Quality to the Office of Chief Counsel (OCC) on File Nos. A-775 and A-775(a) (August 27, 1992) Prepared by Tom Inouye" dated September 15, 1992,*and *"Comments on State WRCB Staff 'Preliminary Comments on the Woodward-Clyde Report on Copper Pollution at the National City Marine Terminal, San Diego Bay',"* all prepared by Drs. Lee and Jones-Lee.)

- McChesney: *"The State Board technical staff reviewed the technical information provided by the dischargers and concluded that their studies did not isolate copper as the contributing factor to [thought not completed] nor did they evaluate the effects of copper at the proposed clean-up levels. And basically there is not information to support the 4,000 clean-up level in the studies that they provided, although the record does support that 1,000 would at least attain the 2.9 parts per billion water quality objective."*

  Comment: The staff's criticism of the studies that were conducted on the impacts of the copper-contaminated sediment on the basis of their not "isolating copper as the contributing factor" or "evaluate the effects of copper at the proposed clean-up levels" represents a highly inaccurate assessment of the work that was done. It also does not reflect an understanding of how to proceed to evaluate the potential of a particular contaminant, such as copper, associated with a sediment that could contain a myriad known and unknown chemical contaminants from the copper ore concentrate or other sources to adversely impact the designated beneficial uses of a waterbody, such as San Diego Bay. There are several aspects of the response to that claim of the staff which are discussed in detail in another document submitted for the Record by the Port District (*"Comments on State WRCB Staff 'Preliminary Comments on the Woodward-Clyde Report on Copper Pollution at the National City Marine Terminal, San Diego Bay',"* prepared by Drs. Lee and Jones-Lee.)

As discussed there, first, the isolation of the copper from the sediment for testing, were it possible, would not have provided an assessment of the toxicity of the "real world" situation that exists near the NCMT.

Second, the study program reported in the risk assessment was, in fact, established in accord with standard, tiered hazard assessment technique specifically to investigate the role of the sediment-associated copper in causing toxicity. The risk assessment study thus focused on collecting sediments from the most heavily copper-contaminated area near the NCMT, from an area of the NCMT with little or no copper contamination, and from three locations with intermediate levels of copper. By conducting toxicity tests on area sediments containing various concentrations of copper, it is possible to evaluate whether the copper in the sediments were causing incremental toxicity in the tests and hence to examine the potential role of copper in the sediments in causing observed toxicity, i.e., whether there was a "dose-response" relationship that could provide insight into appropriate clean-up levels. Thus, contrary to the claims made by the staff, ample, technically responsible, provisions were made in the risk assessment study program to investigate the sediment-associated copper as cause of toxicity. The results of the extensive toxicity tests showed there to be no toxicity associated with copper in the NCMT-area sediments at levels of more than 18,000 mg Cu/kg (the highest concentrations tested) under worst-case exposure conditions. There were no "impacts" for which to isolate copper as a potential cause.

Third, it is unclear what type of testing the staff had in mind when it faulted the Woodward-Clyde study for not conducting tests to isolate copper's effect even if it were appropriate and indicated. It is not possible to reliably selectively extract the copper-ore-concentrate-derived copper from the sediment for toxicity testing. The only other approach that the authors can guess the staff had in mind would be "spiked" bioassays. As discussed in other comments on this issue in materials submitted to the State Board, such an approach would yield no useful information pertinent to assessing the potential beneficial use impact of the copper-ore-concentrate-contaminated NCMT-area sediments. Any information developed from such testing could in fact be highly misleading.

Finally, contrary to the statement quoted, the Administrative Record does not support that a 1,000 mg Cu/kg clean-up objective would be necessary to attain the 2.9 μg/L objective.

- Lorenzato: *"As far as the analysis of the various levels that were considered by the Regional Board, as far as I can tell, the data that might support 4,000 ppm limit was not collected at the site; it was collected from areas around that Bay other than the site. And it was based on elutriate tests which are tests that measure the short-term watercolumn effects from major disturbances of the sediment."*

  Comment: Mr. Lorenzato's statement reflected a lack of understanding of the nature of the sampling and testing that has been done and reported in the risk assessment and in other materials in the Administrative Record. The authors do not know to what data Mr. Lorenzato was referring in the first sentence quoted. However, the toxicity tests conducted, and the studies of the benthic populations and native populations, and bioaccumulation of copper were all conducted in the immediate vicinity of the NCMT.

  Mr. Lorenzato's characterization of the limits of applicability of elutriate test bioassays is incorrect. What is of importance is the ability of the toxicity test system to provide an appropriate model or surrogate system to evaluate the potential adverse impacts of the contaminant of focus on the ambient waters of interest. Aspects that govern the appropriateness of the testing approach include the materials to which the test organisms are exposed, the nature and duration of the exposure, the type of organism selected, and the organism's sensitivity to the contaminant of interest, all relative to the exposure that organisms of importance to beneficial uses/water quality would receive in the ambient waters of focus. The fact is that the elutriate toxicity test system used in the evaluation of the potential toxicity of the NCMT-area sediment provided a worst-case exposure situation to highly copper-sensitive important organisms in their critical lifestage in an environment in which the test organisms could survive (i.e., oxygen-containing). Such testing revealed that those sediments did not cause toxicity to those organisms. This issue is discussed further in the Administrative Record.

- Lorenzato: *"There was no assessment as far as I could tell in those studies of bedded sediment impacts other than bioaccumulation. The bioaccumulation studies were done in areas that didn't represent 4,000 ppm residual copper level. At the site there were some transects studied, but concentrations that they looked at in the transects, at least in the data that I got, were concentrations that went from below 200 ppm to around 2,200 ppm and then skipped up to about 10,000 ppm. So the 4,000 level, again, was missing in the analysis. They did some bedded sediment toxicity testing with an amphipod - one set of tests with an amphipod. And again in that they got 50% mortality in all the test sites with that. That was a test [amphipod, Rhepoxynius] done on-site and they had good control that was statistically significant but they didn't see any discrimination between the copper concentrations. Again, those copper concentrations did not test, or the data I received, did not test the 4,000 interval. They tested at 200, at about 1200 and then at about 16,000; there were big gaps in concentration. So my assessment is that there may be some information that indicates that 2,000 should be considered; this is some information that indicates that 1,000 is the appropriate level; but the testing that they've done by happenstance or by design, I'm not sure which, has somehow missed the 4,000* *level."*

Comment: Mr. Lorenzato was not only inconsistent and incorrect in his characterization of the "bedded sediment" studies that were done, but he was also inconsistent in his comments with regard to bioaccumulation assessments conducted. First, while he claimed that the only "bedded sediment" studies were of bioaccumulation, he later stated that the only "bedded sediment" test done was with Rhepoxynius. Both accounts are inaccurate. Two toxicity tests with "bedded sediments" were conducted, one with *Rhepoxynius* and the other with *Grandidierella.*

Second, he criticized the bioaccumulation studies conducted on the basis that they "didn't represent 4,000 ppm residual copper level." However, in subsequent testimony at the Workshop and in Staff Comments, staff acknowledged that the bioconcentration of copper was not at issue. Lorenzato stated at the Workshop, *"So the bioaccumulation data does support the contention that there isn't a human health problem of consumption of contaminated food* [the reason for potential concern about bioaccumulation]. *That's one of the evaluations that they needed to make, they did make it, and we agreed that that demonstration has been shown."* Staff's continuing to raise questions and comments around the issue of bioaccumulation, therefore, is inappropriate and misleading.

Third, as discussed in these comments, as well as in other submissions to the Record, the fact that sediment containing exactly 4,000 mg Cu/kg were not tested is irrelevant to the matter under consideration. The fact is that sediments containing more than four-times that amount of copper (plus whatever else may be in the sediment) were not toxic to copper-sensitive critical lifestages of test organisms. Further, the most copper-sensitive organisms reviewed by the US EPA in establishing its water quality criterion for copper, *Mytilus edulis*, populate the pilings in areas of the NCMT in which the sediments contain the highest copper concentrations. Further still, the differences and similarities between benthic organism assemblages in the NCMT area are not related to the amount of copper present in the sediments.

Fourth, the response noted in the *Rhepoxynius* test was not related to the concentrations of copper and most likely reflected an effect of sediment grain size on the organisms. Those organisms do not live in San Diego Bay and are known to exhibit response to grain size of sediment. The other amphipod tested, *Grandidierella*, exhibited no toxicity to sediments containing more than 6,000 mg Cu/kg. It is obvious that sediments containing less copper, at the 4,000 mg Cu/kg level, would also show no toxicity. The results and proper technical interpretation of the *Rhepoxynius* tests were discussed in detail in the risk assessment report as well as in other materials in the Administrative Record.

- Lorenzato: *"It may be that 4,000 is an appropriate level, but there is just no information to make that technical judgement."*

Comment: Mr. Lorenzato's statement quoted speaks to the inadequate review of the Record performed. The Administrative Record is replete with discussion of the technical foundation for the determination that a 4,000 mg Cu/kg clean-up objective for the NCMT-area sediment would be protective of the beneficial uses of the Bay. Specific studies were undertaken to examine the key technical aspects of this issue. The fact is that the copper-contaminated sediments in the NCMT area - containing as much as 50,000 mg Cu/kg - are not preventing the population of pilings with the most copper-sensitive of the marine organisms considered by the US EPA in establishing its criterion for copper; sediments containing as much as 18,000 mg Cu/kg (the highest concentration tested) are not toxic in worst-case exposure situations to critical lifestage forms of the copper-sensitive Pacific oyster as well as to eight other test organisms. The distribution of benthic populations in the area are not related to the copper concentrations in the sediment. Given these studies and results, it is abundantly clear that removing sediment containing more than 4,000 mg Cu/kg will be protective of beneficial uses of the Bay.

- Wharton: *"Your staff report and your technical report make it clear that the* [clean-up objective] level *should be 1,000 ppm and that there is no evidence to support a cleanup level of 4,000 ppm."*

  Comment: The staff report and the staff "technical report" do not provide justification for the need for a 1,000 mg Cu/kg objective and do not refute the substantial technical support for the 4,000 mg Cu/kg objective provided in the Administrative Record. The staff report and "technical report" fail to note the unreliability of the information and approach used to develop the 1,000 mg Cu/kg objective that was discussed in the Administrative Record. The staff report acknowledged that it was based on a review of only a small portion of the Administrative Record upon which the Regional Board adopted the 4,000 mg Cu/kg clean-up objective; the staff's statements reflected a fleeting review of the document it claimed to have reviewed. The technical deficiencies of the staff report and the staff's "technical report" are discussed in separate documents being submitted to the Record by the Port District (*"Comments on 'Draft Order WQ 92- for Review of Cleanup and Abatement Order no. 85-91, Addendum no. 7, of the California Regional Water Quality Control Board, San Diego Region'," "Comments on Technical Review Memorandum by the Division of Water Quality to the Office of Chief Counsel (OCC) on File Nos. A-775 and A-775(a) (August 27, 1992) Prepared by Tom Inouye" dated September 15, 1992,* and *"Comments on State WRCB Staff 'Preliminary Comments on the Woodward-Clyde Report on Copper Pollution at the National City Marine Terminal, San Diego Bay',"* all prepared by Drs. Lee and Jones-Lee.)

- Wharton: *"The respondents argue that federal and state law allow economic considerations to be considered in these cleanups. That's really the only argument they have; that's the why it should be 4,000 instead of 1,000, because it's cheaper. That's all, it's cheaper. They don't show that it's better, they know it's better at 1,000."*

  Comment: Clean-up to meet a 4,000 mg Cu/kg objective would be significantly less expensive than clean-up to meet a 1,000 mg Cu/kg objective. The issue is, however, whether there is any technical justification, from the point of view of protection of beneficial uses of San Diego Bay, to spend the additional money for the more extensive sediment removal. The answer is that there is substantial technical information to support the position that the 4,000 mg Cu/kg objective would be protective of beneficial uses of San Diego Bay and no technical substantiation for the position that a 1,000 mg Cu/kg objective is necessary to protect beneficial uses of the Bay. Therefore it would be a substantial waste of public and private funds to implement a 1,000 mg Cu/kg objective.

- Wharton: *"They also look to the Federal Antidegradation Policy and try to argue that that allows economic consideration. Well that allows accommodation of important economic development in areas; it applies only where the quality of the water exceeds a level necessary to support propagation of fish, wildlife and recreation. As you know, San Diego Bay has been listed on four lists of impaired waterbodies. One of these is the section 131.1 list. That is the segment which is affected by toxic pollutants, it has been determined that this is affected by toxic pollutants, namely copper."*

    Mr. Wharton has presumed that the NCMT-area water does not support the propagation of fish, wildlife and recreation. His presumption is contrary to the substantial information on the populations present in the area and the results of worst-case toxicity tests of the NCMT-area sediment. The fact is that *Mytilus edulis*, organisms known to be highly sensitive to copper are living naturally on the pilings in the area of the NCMT-area sediments that contain the highest concentrations of copper. It was on the basis of the protection of that organism from chronic toxicity to copper that the US EPA developed its water quality criterion for copper, which is the same value as the water quality objective for copper. This was thoroughly discussed in the risk assessment and other materials in the Administrative Record on this matter.

    The fact that San Diego Bay is on lists of "impaired waterbodies" does not reflect an impact of the copper-contaminated sediments in the NCMT-area. As discussed in the Woodward Clyde report and other submissions of the Port to the Administrative Record, that categorization of San Diego Bay as "impaired due to copper concentrations" is an artifact of the adoption of total contaminant concentrations as water quality objectives in April 1991 rather than available toxic forms. The concentration of total copper in a water has no relationship to the potential impact of that copper on water quality/beneficial uses of the waterbody. Further, those "administrative impacts" - exceedances of the water quality objectives - will likely no longer occur when the State Board begins to implement the objectives for soluble heavy metals in accord with the direction now being taken by the US EPA.

- Hunter: *"There are a couple of beneficial uses that I think did not get adequately addressed ..."* One apparently referred to the development of the waterfront at National City. *"Another important one, I think, that matters is that the channel will have to be dredged at some point in the future. ... Who then has to pay for all the copper that's in those dredge spoils? If it were clean, like it was before PACO Terminals came to town, ocean disposal ... would have been a cheap way to get rid of those dredge spoils but because the copper is in there it has been* *rejected at the ocean site."*

Comment: No indication was provided by Ms. Hunter of the manner in which she would contend that an adverse impact on waterfront development could be realized as a result of the support of the 4,000 mg Cu/kg clean-up objective for the NCMT-area sediments. The adoption of a 4,000 mg Cu/kg clean-up objective for the NCMT-area sediments would not adversely affect the development of the waterfront at National City. (See also *"Comments on the Environmental Health Coalition Submission to Water Resources Control Board dated September 2, 1992 Concerning the Clean-up and Abatement Order for the NCMT-area Sediments,"* submitted by the Port District.)

There would be no difference in the ability to dredged and dispose of NCMT-area sediment whether the 4,000 mg Cu/kg clean-up objective is supported, or whether the proposed 1,000 mg Cu/kg objective is adopted. The copper remaining in the NCMT-area sediments would not preclude their being disposed of at an ocean disposal site. Ocean disposal of dredged sediments is based on the potential toxic effects, not on the chemical content. Since the NCMT-area sediments have been repeatedly shown to be non-toxic using standard ocean disposal testing methodology, it would not be unexpected that a permit could be issued for ocean disposal. The senior author has discussed the specific issue of ocean disposal of the NCMT-area sediments with US EPA Region IX representatives. The issue that currently precludes ocean disposal is related to the fact that sediments containing more than about 4,000 mg Cu/kg dry weight would be in exceedance of the California Department of Health Services Title 22 limit for classification of the material as a hazardous waste. While it is readily acknowledged that the Title 22 classification value is not applicable to aquatic sediments, it would be necessary to obtain a variance from Title 22 requirements in order to obtain permission for ocean disposal of the NCMT-area sediments.

Finally, Ms. Hunter's presumption that the sediments in the NCMT area were "clean" prior to PACO's operations is not substantiated. The sediments certainly contributed to the episodic administrative exceedance of the current 2.9 μg/L water quality objective. It is known that the concentrations of copper in the watercolumn near the NCMT were about the same prior to the PACO operations as were measured above the most copper-contaminated NCMT-area sediment in 1986; that was discussed in the risk assessment report and elsewhere in the Administrative Record. It is more reasonable to presume that given the long-term history of use of the area for shipping, the NCMT area has long been a "disturbed" system, subject to the influences of physical perturbations and introduction of chemical contaminants to the Bay from a myriad sources.

- Jones-Lee: *"We have reviewed the State Board staff draft order under review in these proceedings and are very concerned about the technical information that is put forth in that document. Especially in light of the tremendous amount of information that is already in the Administrative Record, and that admittedly in some of the comments provided by the staff, wasn't reviewed [by the staff]. There is no evidence that the technical presentation that is in the*

Administrative Record was properly - was even - addressed. We have prepared a summary of these aspects that are of particular concern and these are raised in detail in the Administrative Record. We don't have time to go through them now unless you'd like to ask me a question that would allow me to go through each of these aspects with you. We have major concerns with the technical credibility of the document [draft order]."

Since the Board did not inquire into the nature of the technical deficiencies of the draft order, the summary referred to in the comment is presented here.

WRCB Staff Draft Order & Staff Technical Comments Focus on Justifying Proposed 1000 mg/kg Clean-up Objective and Dismissing the 4000 mg/kg Objective Adopted by SDWQCB

- There Are Significant Technical Problems with the Information Offered in Support of Need for 1,000 mg Cu/kg dry wt. Clean-Up Objective

- "Support" Relies on Assumptions Demonstrated to Be Inappropriate, or Invalid
  - Assumes "Violation" of Numeric Water Quality Objective for Copper (2.9 μg Cu/L) Caused by NCMT-Area Sediment - **Not Valid**

  - Assumes "Violation" of Numeric Water Quality Objective in NCMT Area Impairing Beneficial Uses - Sport and Commercial Fisheries - **Not Valid**

  - Assumes That Clean-Up Objective for NCMT-Area Sediments of 4,000 mg Cu/kg dry wt. Would Not Protect Beneficial Uses of San Diego Bay - **Not Supported by the Existing Data**

  - Used **Inappropriate Data and Statistical Manipulations** to Try to Show Relationship between Copper Concentrations in Sediment and Interstitial Water Used That Relationship in Establishment of Clean-Up Objective

  - It draws the **unjustifiable and undocumented conclusion** that a copper clean-up objective of 4,000 mg Cu/kg dry wt. would not comply with the Bays and Estuaries Plan requirement to protect beneficial uses of the Bay.

  - It draws **unjustifiable and undocumented conclusions** about the relationship between the copper ore concentrate in the sediment and the concentration of copper in the overlying water in the NCMT area, and contends that a clean-up objective of 1,000 mg Cu/kg dry wt. is needed in order to meet the numeric water quality objective.

- Each of these deficiencies is discussed in detail in the comments on the draft order submitted by the Port District.

- Lorenzato: *"The fact that there is a water quality objective that the requirements would indicate can't be exceeded, means that there has to be some kind of physical-chemical analysis to determine whether the ore there is contributing to an exceedance of that objective. It doesn't have to be totally responsible for that exceedance, but it has to have some kind of substantial contribution. That analysis hasn't been done partly because copper chemistry is probably the most complex of the toxic metals."*

  Comment: The Administrative Record contains the results of analyses that demonstrate that the NCMT-area sediment-associated copper is unlikely to be contributing available copper to an exceedance of the water quality objective. As discussed in the risk assessment, the concentrations of copper in the watercolumn in the immediate vicinity of the NCMT before the PACO operations were the same as those measured in 1986 by WESTEC in what was believed to be the most copper-contaminated area at the NCMT. If the copper ore concentrate in the NCMT-area sediments were contributing significantly to the "exceedances" of the water quality objective, it should be expected that the concentrations of copper in the watercolumn just above the sediment in the most copper-contaminated area would be substantially, or at least notably, higher than they had been prior to the PACO operations. That was not found. The chemistry behind that finding is discussed subsequently in these comments.

  As noted in other submissions to the State Board on this matter, the periodic resuspension of copper-contaminated sediment into the watercolumn during storms and passage of ships could contribute to "administrative exceedances" of the numeric water quality objective. That type of administrative exceedance occurs routinely in essentially all waterbodies of the states when sediments are stirred into the watercolumn. However, owing to the unavailability of sediment-associated copper, especially that which is in the form of chalcopyrite, the presence of that copper in the watercolumn would not have an adverse effect on water quality/beneficial uses. An exceedance of the numeric water quality objective for copper applied to the total concentration of copper in the watercolumn (an "administrative impact") cannot be presumed to be equivalent to an adverse impact on beneficial uses of the waterbody. This issue was discussed at length in the risk assessment as well as in several other submissions to the Regional and State Boards on this matter.

- Lorenzato: *"The particular ore that's been spilled at this site is generally insoluble and so the bulk of that material at any moment in time would be expected to be, you'd expect it to remain as copper ore. But over the course of weathering, over time, over when exposed to biological activities like ingestion and excretion from organisms, that solubility may shift and move around. It can go, copper can go into a number of different states, chemical states, evidenced in, the literature indicates that most of those chemical states are probably not very bioavailable. The state that's most likely to be bioavailable is a free copper ion and that's kind of the end product of weathering in this case. So its a long chemical process from the copper ore to free copper ion that would be toxic. There may be some intermediates that are less toxic, less potent than the free copper ion. In any case, the demonstration of whether this particular copper is contributing to a watercolumn exceedance is not, hasn't been shown as far as I can tell on the* *record."*

Comment: Mr. Lorenzato has presented a highly inaccurate accounting of the chemistry of copper (chalcopyrite) in the marine sediment/water environment. A proper discussion of key pertinent elements of the aquatic chemistry of copper was presented in the Woodward-Clyde report risk assessment. Chalcopyrite, the form of copper in the copper ore concentrate will not "weather" to free copper ion in the marine sediment/water environment. In anoxic (oxygen-free) environments such as associated with sediments, cupric ferrous sulfide (chalcopyrite) is stable, and highly insoluble; this means that it does not tend to go into solution or "weather" to form free copper. Because it is stable and highly insoluble, in that form it is largely unavailable to affect aquatic life. When in contact with dissolved oxygen, as would be found at the surface of the sediments or when the sediment gets stirred into the watercolumn (e.g., with storm or ship traffic activity), chalcopyrite could in theory be slowly oxidized and solubilized. However, sediments resuspended during such episodic events would rapidly settle to the sediment; this is especially true of the copper ore concentrate material because of its greater density. Furthermore, in oxic (oxygen-containing) environments such as the watercolumn, copper is readily removed from solution through a variety of precipitation reactions; copper also tends to strongly sorb onto sediment particles. Precipitated and sorbed species of copper are largely unavailable to aquatic life. Some of the soluble complexes of copper are also unavailable to affect aquatic life. Thus, Mr. Lorenzato's invocation of the "chemistry" of copper to lend support to his conjecture that the copper ore concentrate must in some way be contributing to the available copper in the watercolumn is incorrect and reflects a lack of understanding of copper chemistry.

As noted in other submissions to the State Board on this matter, the periodic resuspension of copper-contaminated sediment into the watercolumn during storms and passage of ships could contribute to "administrative exceedances" of the numeric water quality objective. However, owing to the unavailability of sediment-associated copper, especially that which is in the form of chalcopyrite, the presence of that copper in the watercolumn would not have an adverse effect on water quality/beneficial uses. An exceedance of the numeric water quality objective for copper applied to the total concentration of copper in the watercolumn (an "administrative impact") cannot be presumed to be equivalent to an adverse impact on beneficial uses of the waterbody. This issue was discussed at length in the risk assessment as well as in several other submissions to the Regional and State Boards on this matter.

- Lorenzato: *"From the toxicological standpoint, or the biological standpoint, there have been a number of studies done as the dischargers representatives indicated. I'm kind of in the same boat as they are, that I didn't do any of those studies; they didn't do any of those studies. We are looking at data that was presented to us and trying to evaluate its significance."*

Comment: Lorenzato's irresponsible innuendo was a follow-up to questions raised by Mr. Del Piero about whether the toxicity tests reported on by the Port and its consultants had really been done and could really be trusted. Lorenzato's statement reflects not only a disregard for professional ethics, but also a lack of familiarity with scientific endeavor. Anyone with scientific background and education knows that tests do not have to be run personally someone in order for that person to responsibly rely on their integrity. Clearly data should not be used blindly without proper screening with regard to the methods employed, reputation and experience of the laboratory, handling of samples and organisms, etc. It was as a result of such review that the information in the Mondal thesis, for example, has been determined unreliable.

- Lorenzato: *"So the bioaccumulation data does support the contention that there isn't a human health problem of consumption of contaminated food. That's one of the evaluations that they needed to make, they did make it, and we agreed that that demonstration has been shown."*

  Comment: While Lorenzato made that stipulation, he has at other points at the workshop, and indeed in the draft Order, raised the issue of the Mussel Watch data as though they provided some support for the staff's contention that a 4,000 mg Cu/kg clean-up objective would not provide protection of beneficial uses of San Diego Bay and that a 1,000 mg Cu/kg clean-up objective is necessary in order to ensure protection.

- Lorenzato: *"Where I guess I really disagree with them is that they really haven't looked at any bedded sediment tests other than one that had 50% mortality at all the sites that they reported and their contention is that while they had a grading of, a gradation of concentrations in that data set but they also had a tremendous amount of variability and they would have to demonstrate, to distinguish between the sites, among the sites that had 50% mortality to see if one site had more than another, you'd have to get 90% mortality in a site to get a difference there and 90% mortality is a fairly extreme response in that test."*

  Comment: Lorenzato's statement is incorrect in several respects. First, the *Rhepoxynius* (amphipod) tests on bedded sediment were not the only so-called bedded sediment tests run. A review of the Administrative Record would clearly show that tests on another amphipod, *Grandidierella*, were also run. The *Grandidierella* tests showed no toxicity associated with the NCMT-area sediments containing as much as 6,000 mg Cu/kg (the highest concentration tested). Further, "bedded sediment" tests are not singularly important or necessarily reliably interpretable for the purposes of evaluation of the impact of sediment-associated contaminants on water quality.

  Second, Lorenzato's rebuke regarding the results of the *Rhepoxynius* data was technically incoherent and inappropriate. Contrary to his statements, the results of the *Rhepoxynius* tests were quite clear. As discussed in the Administrative Record, those data clearly showed that reference sediments (containing essentially "background" levels of copper 122 mg Cu/kg) exhibited the same "impact" as that exhibited in toxicity tests with sediments containing about 1,000 mg Cu/kg and with sediments containing more than 18,000 mg Cu/kg. There is substantial reason to believe that the "effects" that were observed were a result of grain-size influences.

Third, there is no technical sense in Lorenzato's statement about having to have 90% mortality in a test. Clearly, if copper were a significant contributing factor to the "impact," this would have been reflected in the toxicity test results. Lorenzato is trying to find some way to justify his conjecture that those data show that a 4,000 mg Cu/kg clean-up level is inappropriate. They simply do not show that; they provide no justification for overruling the Regional Board's adoption of the 4,000 mg Cu/kg clean-up objective.

- Lorenzato: *"The bulk of the data that they relied on were, I think, was elutriate data and elutriate data, I think, really doesn't address the long-term bedded sediment problem which is the fundamental consideration in when you leave the sediments there over time. I think we all agree there's not, there not going to be frequently dredged, frequently turned up so the interpretation of the elutriate test which is really to evaluate the short-term watercolumn effects from stirring the stuff up, doesn't give you a good picture of what's going on over time."*

  Comment: The utility of an "elutriate bioassay" testing approach is not restricted to assessing dredged sediment. What is of importance is the ability of the toxicity test system to provide an appropriate model or surrogate system to evaluate the potential adverse impacts of the contaminant of focus on the ambient waters of interest. Aspects that govern the appropriateness of the testing approach include the materials to which the test organisms are exposed, the nature and duration of the exposure, the type of organism selected, and the organism's sensitivity to the contaminant of interest, all relative to the exposure that organisms of importance to beneficial uses/water quality would receive in the ambient waters of focus. Thus, the fact that elutriate test bioassays are in fact used in the assessment of dredged sediment, does not render them inappropriate for other appropriate applications. The fact is that the elutriate toxicity test system used in the evaluation of the potential toxicity of the NCMT-area sediment provided a worst-case exposure situation to highly copper-sensitive important organisms in their critical lifestage. Such testing revealed that those sediments did not cause toxicity to those organisms.

- Lorenzato: *"If they had done those same tests, using the same organisms, perhaps on pore water extractions, we'd have a pretty good argument that, yeah, pore water didn't kill it and if pore water didn't kill it there's really, you know, it's not likely that coming in direct contact with the particles is going to kill it either because if anything the particles are going to hold stuff stronger than pore water. But there were no pore water tests done. So I take exception to the characterization that no biological impacts have been demonstrated. I don't think that they have tested the realm of pertinent effects and in theses, in a least a couple of the tests that they rely on they did now biological impacts. They weren't able to, they didn't carry it out far enough to demonstrate whether copper was or was not the primary or a major contributing factor there. But they did show biological impairment."*

  Comment: Lorenzato's argument for pore water toxicity tests was technically incoherent and significantly flawed from several perspectives. First, toxicity tests on interstitial waters of NCMT-area sediments are not reliable for estimating the impact of sediment-associated contaminants on the beneficial uses of San Diego Bay sediments.

- Test organisms would not survive in tests of interstitial water because those waters lack dissolved oxygen, and have high levels of sulfide and ammonia.
- Oxygenation of the interstitial waters to allow survival of the test organisms would alter the chemical forms of copper. Thus the chemical character of the test system would be significantly different from that of the interstitial water in the bedded sediments at the site. The nature, degree, and impact on toxicity of that alteration could not be accounted for in interpretation of test results.

Second, watercolumn organisms are not exposed to "pore" water. Thus, even if such toxicity tests could be reliably conducted, the results generated could not be interpreted in terms of potential impacts on beneficial uses of the waters of San Diego Bay. Therefore, contrary to the contention expressed by Lorenzato, even if such tests could be reliably conducted, their results would have no relevance to determining the potential adverse impacts of the sediment-associated copper to water quality.

Lorenzato statement that *"in a least a couple of the tests that they rely on they did now biological impacts. They weren't able to, they didn't carry it out far enough to demonstrate whether copper was or was not the primary or a major contributing factor there. But they did show biological impairment."* was incorrect. The only toxicity tests that showed any response was the Rhepoxynius survival test. As was discussed in the Administrative Record, that organism is not reliable for use in the San Diego sediments because of grain size effects. His claim that the tests were not carried out far enough is grossly inaccurate; the data clearly showed that reference sediments (containing essentially "background" levels of copper 122 mg Cu/kg) exhibited the same "impact" as that exhibited in toxicity tests with sediments containing about 1,000 mg Cu/kg and with sediments containing more than 18,000 mg Cu/kg. Clearly, if copper were a significant contributing factor to the "impact," this would have been reflected in the toxicity test results.

References

WCC (Woodward-Clyde Consultants), "Remedial Action Alternatives for National City Marine Terminal," Final Report, Prepared for San Diego Unified Port District, San Diego, CA, July (1991).

10

Comments on Environmental Health Coalition Submission to Water Resources Control Board dated September 2, 1992 Concerning the Clean-up and Abatement Order for the NCMT-Area Sediments

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September 15, 1992

On September 2, 1992, L. Hunter of the Environmental Health Coalition (EHC) provided the Water Resources Control Board (WRCB) with a statement in the form of a draft order. Review of the technical components of the Hunter/EHC statement shows that that statement presented highly unreliable, distorted information to the Board; its focus was to try to provide technical support for the EHC's arbitrarily adopted position that the 4,000 mg/kg clean-up objective would not be protective of San Diego Bay's designated beneficial uses while the 1,000 mg/kg clean-up objective would be protective of those uses. Many of the issues that Ms. Hunter/EHC raised in that statement have already been addressed in detail in other submissions by the authors to the Board. These comments do not repeat the depth of response to the EHC claims and unreliable statements, but summarizes key components and provides references to where additional detail can be found in other submissions by us.

The September 2 Hunter/EHC statement is different from other statements that EHC has submitted in this matter in that it attempted to use data presented in the Woodward-Clyde report in support of their position. Their discussion, however, reflects a lack of understanding of the technical aspects of the issues and a lack of understanding of the appropriate use of the technical information they incorporated into their statement; they have provided convoluted and inappropriate "interpretation" of data to try to convince the Board that those data provide support for overturning SDWQCB's adoption of the 4,000 mg Cu/kg sediment clean-up objective. Rather than supporting EHC's position, it is strongly supportive of the SDWQCB and Port's position that the 4,000 mg/kg clean-up objective is protective of the designated beneficial uses of the Bay and is appropriate. These issues are discussed further in these comments.

On page 5, EHC stated,

"The Regional Board approved the cleanup level of 4,000 ppm even though the weight of the evidence indicates that this level will contribute to ongoing violations of the water quality standards set forth in the EBE Plan."

* * *

"The Plan also requires that 'Enclosed bays and estuarine communities and

populations, including vertebrate, invertebrate, and plant species, shall not be degraded as a result of the discharge of waste.' Enclosed Bays and Estuaries Plan, Ch. II(A)."

The implication given by EHC is that the 4,000 mg Cu/kg clean-up objective would result in violation of the Plans because it has or would degrade estuarine communities, populations, "vertebrate, invertebrate, and plant species." It is very clear from the data that such an assertion is highly inappropriate. Adequate testing and evaluation have been done to clearly support that the designated beneficial uses of San Diego Bay, including the beneficial uses within the NCMT area, would be protected by the 4,000 mg Cu/kg clean-up objective that the SDWQCB adopted and that imposition of that objective will not violate the Plan.

On page 5, Hunter/EHC stated that the Draft Order noted,

"...'to comply with the Plan the sediment must not contain levels of copper that would cause the exceedence of the numerical objective in the water column or a violation of the narrative objectives.'"

First, studies that have been done (as reported in the Woodward-Clyde report and supplemental information submitted to the SDWQCB) have shown that the sediments in the NCMT area are not contributing to any impairment of the beneficial use characteristics of the Bay. Thus, any exceedance of the water quality objective for copper is causing only an "administrative impairment."

Second, San Diego Bay, like many similar waterbodies across the US including San Francisco Bay, New York Harbor, etc., routinely experiences "exceedances" of the US EPA's water quality criterion/state of California objective for copper. While such "exceedances" may be considered to be an "administrative impairment,' they cannot be reliably considered to be synonymous with "impairments of beneficial uses."

As was discussed in the risk assessment (WCC, 1991) and in other submissions in the Administrative Record, this is a result of the manner in which the criteria were developed relative to the real world field conditions. The laboratory conditions that were used to develop the copper objective used available forms of copper. However, under real world conditions, such as in San Diego Bay, San Francisco Bay, etc., the copper is largely present in non-toxic, particulate forms. It has been well-established by numerous studies, including those conducted by the Port as presented in the Woodward-Clyde report, that copper concentrations in these Bays can greatly exceed the laboratory-based water quality objective without adverse effect on aquatic life.

Furthermore, the criterion value established for copper, which was used for the water quality objective, was based on the protection of the most copper-sensitive species on which it had data, *Mytilus edulis*, under chronic exposure (lifetime or critical lifestage) situations. *Mytilus edulis* are found naturally occurring on the pilings in areas of the NCMT that are known to have the highest concentrations of copper in the sediment. If the exceedances of the objective were real indications of aquatic life concern, it would not be likely that that highly copper-sensitive organism would colonize those areas.

The overly protective nature of the water quality criterion/objective was acknowledged in the US EPA's and the State Water Resources Control Board's discussions of the criteria and objectives when the criterion and the EBE Plan was adopted by the respective agencies. In the summer of 1992, the US EPA finally started taking steps to correct the grossly overly protective nature of the copper criteria and those for other metal contaminant by changing the focus of implementation from total metal (that includes particulate, non-toxic forms), to soluble metal. Since there are soluble forms of copper and other heavy metals that are not available, such criteria would also be overly protective, but they would provide a much more realistic assessment of contaminant toxicity than total metals (copper).

While it could be true that storms and ship traffic, etc. could result in some of the copper in the sediments in the NCMT area being stirred into the watercolumn where it could contribute to the perennial exceedance of the water quality objective for copper, such contribution would be very brief. Particulate copper that is stirred into the watercolumn rapidly settles out after the stirring action has ceased. This situation is significantly different from an exceedance caused by a wastewater discharge. A wastewater discharge-caused exceedance represents additional copper loading to the waterbody. The stirring of copper into the watercolumn from the NCMT-area sediments does not represent additional copper loading to San Diego Bay. The copper is already present in the Bay, and is rapidly removed from the watercolumn by settling. Moreover, exceedances of the current objective for copper occurred in the NCMT area watercolumn before the PACO operations there. Therefore, the copper-contaminated sediments are not the primary cause of that "exceedance." Such "exceedances" would be expected to continue to occur even if all of the copper in the NCMT area sediments that was derived from the PACO operations were removed from San Diego Bay, and in any event, a contribution to an exceedance of the water quality objective made by suspension of NCMT-area sediment has no adverse impact on the designated beneficial uses of San Diego Bay and is transitory.

Further, as was discussed in the risk assessment (WCC, 1991) and in other submissions to the Administrative Record, the leaching of soluble (available) copper from what may seem to the layperson to be a large reservoir of copper in the sediment, is not a significant source of copper. The chemistry of copper in the anoxic sediment is such that it tends to remain associated with the particulate matter and remain unavailable. Any copper that may be slowly oxidized at the sediment/water interface would be rapidly returned to the sediment.

The issue that is being addressed is not whether the PACO operations should have resulted in spillage of copper ore into the Bay. It is whether a 1,000 mg/kg clean-up objective is necessary in order to provide protection of the designated beneficial uses of the Bay or whether the 4,000 mg/kg clean-up objective adopted by the SDWQCB would be protective of those beneficial uses. Since the technical information from specific studies of the issues has demonstrated that the 4,000 mg/kg clean-up objective would be highly protective of designated beneficial uses, there is no justification (from the perspective of protection of water quality) for adopting a 1,000 mg/kg clean-up objective.

Further, as discussed in other materials submitted to the SDWQCB and the WRCB, the 1,000 mg/kg clean-up objective was established on the basis of unreliable data generated by inappropriate analytical procedures and inappropriate data use/interpretation. The ERCE investigators who did the original work that resulted in the development of the 1,000 mg/kg clean-up objective originally be adopted by the SDWQCB now recognize the deficiencies in the analysis made.

It would set a very grave precedent for the WRCB to accept the technically flawed arguments advanced by EHC and the staff that a short-term, episodic stirring into the watercolumn of copper from NCMT-area sediments requires a more stringent sediment clean-up objective when the episodic event contributes to a short-period "exceedance" of the numeric water quality objective. This is especially significant since the appearance of the exceedance has been found (after adequate study) to be an artifact of the way in which the US EPA developed the water quality criteria and the way in which the State Board implemented the criteria into objectives. If the State Board had adopted water quality objectives based on soluble copper, as it could have done, rather than on total copper (to which the stirring of the NCMT-area sediments into the watercolumn associated with storms, ship traffic, etc. contribute for a short time), there would be no discussion of this issue before the State Board. There is no question about the reliability of the technical foundation for the conclusion that the copper in the NCMT-area sediment is not contributing to the soluble copper in the watercolumn in San Diego Bay. It was based on field investigation and on what is well-known and expected based on many investigations of copper behavior in marine waters by numerous competent investigators throughout the world.

Marine waters rapidly detoxify copper by precipitation, formation of complexes, and adsorption reactions, rendering even many toxic forms non-toxic. It should be noted that the forms of copper in the copper ore concentrate spilled into the Bay in the NCMT area are non-toxic forms. Further, there is no mechanism in the San Diego Bay watercolumn or sediments by which those non-toxic forms would become toxic. In fact, the mechanisms that operate on this copper are all in the direction of maintaining it in a non-toxic form.

During the 1970's, the senior author conducted about $1 million in contract research for the Corps of Engineers directed toward evaluating the environmental impacts of dredging and dredged sediment disposal. Those studies involved a combination of laboratory and intensive field studies at a number of locations around the US. The authors have published more than 50 peer-reviewed technical articles and reports on this work, and have recently published an updated review of the topic as a chapter entitled, "Water Quality Aspects of Dredging and Dredged Sediment Disposal," in the Handbook of Dredging Engineering published by McGraw-Hill (1992). One of the key issues of the dredged sediment studies conducted by the author was whether particulate forms of heavy metals in sediments would cause water quality problems when suspended in the watercolumn associated with dredging and dredged sediment disposal operations. Those studies concluded without question that the stirring of sediments into the watercolumn associated with dredging and dredged sediment disposal that contain a variety of heavy metals and almost all other contaminants except ammonia associated with the sediments and for that matter the sediment interstitial waters do not contribute to water quality impairment. Numerous investigators, governmental regulatory agencies and others have conducted their own studies of these issues. The conclusions of all the studies have been that the short-term stirring of sediments into the watercolumn caused by a dredging or dredged sediment disposal operations do not contribute to impairment of designated beneficial uses of the waterbody. Federal and state agencies throughout the country have accepted that the exceedances that occur under such situations are not detrimental.

Episodic exceedances of water quality objectives based on total copper routinely occur in essentially every waterbody. The normal crustal abundance of copper without anthropogenic sources is such that only very small amounts of soil and sediment need to be stirred into the watercolumn to cause violations of the 2.9 μg/L water quality objective. Studies of the type that have been done in the NCMT area by the Port as presented in the Administrative Record provide a reliable basis for assessing conditions where true water quality impairment is occurring. If the Board should rule in favor of EHC's position on the NCMT area sediment clean-up objective overturning the SDWQCB's clean-up objective of 4,000 mg/kg, the State Board will open up the Regional Boards and itself to a Pandora's box requiring "clean-up" of waterbodies that have in fact incurred no damage to beneficial uses.

It should be further noted that whether the 1,000 mg/kg or 4,000 mg/kg clean-up objective is adopted, it is highly unlikely that there will be any significant difference in the magnitude of the administrative exceedances of the copper objective that will occur in the NCMT area. It is also likely that cleaning up the copper-contaminated sediments to "background" would not preclude such episodic "administrative exceedances."

The Port (i.e., the people) of San Diego should not be required to spend many millions of dollars unnecessarily to address "remediate" a non-problem.

On page 7, EHC stated,

> *"The State must mandate a cleanup level that complies with the water quality objectives outlined in the EBE or risk being named in a citizen suit. San Diego Bay is listed in the 1990 Water Quality Assessment as water quality impaired for 4 pollutants, one of which is copper. If a pool of copper is left in the Bay that will continue to contribute to an ongoing exceedence of the water quality objective, the State risks being named in a citizen suit under the Clean Water Act for a lack of due diligence in enforcement. For the maximum benefit to the people of California, this should be avoided and the burden of cleanup placed where it properly belongs, on the parties responsible for the discharge."*

In essence, Hunter/EHC are informing the Board that if they do not adopt the 1,000 mg/kg clean-up objective that the Board will face a citizen suit. Contrary to the statement made by EHC, it is not in the best interest of the people of California to adopt clean-up objectives for contaminated sediments based on episodic, short-term administrative exceedances of overly protective water quality objectives when there is no showing of any adverse impact to beneficial uses.

With respect to EHC's statement about placing the burden of clean-up on the discharger, such reasoning could be applied to all people who live near a waterbody which receives stormwater runoff. According to the US EPA (see Pitt and Field (1990) and Lee and Jones (1991)), normal stormwater runoff from urban areas across the US without specific pollutional sources contains copper at least a factor 10 greater than the 2.9 μg/L water quality objective. Such copper is largely in a particulate forms and rapidly settles out in the waterbody into which the stormwater is discharged, and it accumulates in the sediments.

With every storm, ship traffic, etc., some of the copper in the sediments, independent of the original source (including stormwater runoff) is stirred into the waterbody watercolumn causing or contributing to the exceedance of the water quality objective. Using EHC's approach, all the people who live in San Diego would have to pay for the copper being cleaned out of the Bay sediments (including some of that in the NCMT-area) since it was their activities that contributed in part, in some cases significant part, to the sediment-driven exceedances of the water quality objective. This should not be the case, however, when the copper present in the watercolumn associated with a storm, etc. is of no water quality significance to San Diego Bay's designated beneficial uses.

Hunter/EHC appended to their statement a figure from the Woodward-Clyde report that they claim shows that there is a relationship between the acid soluble copper in the elutriates on which oyster larvae toxicity tests were run and the concentrations of copper in the sediments. It should be noted that sediment elutriate bioassays were first developed by the senior author and his graduate students in the early 1970's. They have become standard procedures used by the US EPA and the Corps of Engineers to evaluate toxicity associated with dredged sediments. The experimental procedure followed in accord with the US EPA and Corps of Engineers-approved methodology involves mixing of the sediment and water, settling of the sediment, and syphoning of the water above the settled sediment. The syphoned water (the elutriate) contains some suspended sediment, the amount depending on the character of the sediment, and was used for toxicity testing. Thus, the toxicity test assesses the toxicity due to suspended sediment-associated contaminants and dissolved contaminants that might be released from the sediments during the elutriation-mixing process. The test is called a "liquid/suspended particulate phase" test.

It is obvious that if the elutriation is done on higher copper sediments there would be higher copper on the suspended sediments that do not settle in the settling period allowed for during the test. This is all that the Attachment 1 figures show. That finding bears no relationship to what would occur in the real world. This is a laboratory beaker situation and is not designed to simulate the hydrodynamic conditions that exist in a natural waterbody. It does, however, represent a much greater than worst-case simulation of potential toxicity to the aquatic organisms used in the test as a result of any dissolved or particulate associated contaminants present in the sediments.

It should also be noted that this test was run with organisms (oyster larvae) that are very sensitive to toxic forms of copper. It is also extremely important to point out that there was no toxicity to the organisms even for the sediments that contain more than 18,000 mg Cu/kg some of which had in the suspended sediment approximately 50 μg/L of total copper. It is clear that L. Hunter and others at EHC who chose to include these figures as an attachment did not understand the nature of the data they were bringing to the attention of the Board. They chose the best possible data to illustrate the lack of validity of their own position. **These data unquestionably show that the exceedance of the 2.9 μg/L water quality objective for San Diego Bay associated with any of the NCMT copper ore concentrate into the watercolumn would have no impact on the aquatic organisms in the water, even if the concentrations of total copper in the watercolumn were up to 50 μg/L for a two-day period. The conditions of this test are much more severe than would be encountered in the real world San Diego Bay situation.**

It should be noted that the analytical procedures used to measure soluble copper in the WESTEC studies involved a filtration step that probably resulted in overestimation of the truly soluble copper present in the water samples. The concentration of copper that was actually soluble in those samples was likely to have been less than the 2.9 μg/L water quality objective.

Table 3 in the attachments to the Hunter/EHC submission to the State Board presented the alleged "Concentrations of Copper in Interstitial Water" in the NCMT area sediment. As discussed in the Woodward-Clyde report and in detail in the Administrative Record - but ignored by EHC, the technical staff written comments, and in their presentation on this issue - the analytical procedures used to determine soluble copper in interstitial waters were not reliable for that purpose. The data presented were not and are not a reliable assessment of copper in interstitial waters. Further, even if those data were reliable, there is no relationship between the interstitial water concentration and the overlying-watercolumn copper concentration. This issue has been discussed in detail in materials submitted to the Board by the authors. Further, the water quality objective of 2.9 μg/L applies only to the watercolumn waters and not to the interstitial waters. Therefore, while the data are invalid for assessing copper in interstitial waters, even if it were valid it would have no relevance to exceedances of the water quality objective or to establishing the sediment copper clean-up objective.

On the bottom of page 6 and top of page 7, the statement was made,

> *"These documents also show that concentrations above 1,000 mg/kg in sediments appear to contribute to levels of copper in the water column above 2.9 μg/l (ppb). (See Attachment 1)."*

The statement quoted reflects more of the highly inaccurate and inappropriate information that EHC and the State Board staff who developed the Draft Order have used to try to justify the

1,000 mg/kg clean-up objective. In their Attachment 1, Hunter/EHC included Table 2 from a 1986 WESTEC report, the information on which was discussed in the risk assessment report and is hence part of the Administrative Record. That table presents the information that serves as a basis for the staff's conclusion that the exceedance of the 2.9 μg/L objective is occurring today. As discussed in the administrative record, those data were generated in the mid-1980's. The concentrations of soluble copper above the sediments in the NCMT area, as well as elsewhere in the Bay, are not known today. A review of the Table 2 data shows that while the concentration of total copper in the samples exceeded the 2.9 μg/L water quality objective adopted in April 1991, the soluble copper concentration was not statistically significantly different from the objective value. To the extent that those data represent today's conditions, the issue of the exceedance of the 2.9 μg/L objective will become a non-issue when the Board adopts soluble copper as the basis for implementing the copper water quality objective.

Page 7 stated,

> *"The State Board also noted that even a cleanup level of 1,000 ppm may not be stringent enough to satisfy the narrative water quality standards of the EBE, citing evidence submitted by Petitioner which demonstrates that many species of aquatic organisms suffer toxic effects from copper sediments at levels below 390 ppm."*

Again, Hunter/EHC have significantly misrepresented the technical information. They characterized the 390 ppm (mg/kg) value as a value in which "many species of aquatic organisms suffer toxic effects from copper sediments at levels below 390 ppm." As discussed in our submissions in the Administrative Record in response to the EHC petition, the 390 mg/kg value that EHC continues to try to use to justify their claim of adverse effects of copper on aquatic life in the NCMT area was extracted from the Long and Morgan "co-occurrence" information and **misapplied** to this situation. Contrary to the statement made in the Draft Order quoted above, the value of 390 mg Cu/kg is not a concentration which when present in sediments has been found to cause adverse effects to aquatic life. Long and Morgan did not make "cause-and-effects" determinations. What they reported was that in those sediments on which copper was measured, half of the sediments (50 percentile) that showed toxicity (the cause of which was not assessed) contained copper at that concentration. There was no presumption by Long and Morgan that that concentration of copper, or any other concentration of copper (or of other chemicals measured) was responsible for causing toxicity; they merely listed a number of characteristics of sediments that exhibited some laboratory toxicity. There is a wide variety of other contaminants not considered by Long and Morgan that are much more likely to be the cause of the observed toxicity than copper. Further, some of the ways in which toxicity was assessed (such as the Microtox procedure on sediment extracts) are known to be invalid and unreliable.

If EHC had realized what they were presenting to the Board in making this statement, they would have known that for San Diego Bay NCMT area sediments using the data that is specifically applicable to these sediments that the 390 mg/kg value would be changed to greater than 18,000 mg/kg as a result of the fact that no toxicity was found for copper at concentrations over 18,000 mg/kg but less than 19,000 mg/kg (the highest concentration that was tested) for the NCMT area sediments. **Therefore, rather than the 390 mg/kg value and approach supporting the EHC position, if the same methodology were used to develop a specific value applicable to the NCMT area sediments, it would cause the clean-up objective to be raised to between 18,000 and 19,000 mg/kg.**

It is very important to point out that while the focus of this testing procedure was on copper, the fact that there was no toxicity to any components of the NCMT-area sediments that were used in the tests shows that not only was the copper non-toxic to a very sensitive larval form of a key organism (oyster larvae) but also that all of the other components, whether derived from PACO's operations or from other sources, were non-toxic to this organism under worst case conditions.

On the bottom of page 8, Hunter/EHC mentioned that San Diego Bay has been included on US EPA lists of impaired waterbodies because of copper and other constituents. As discussed above, that categorization is due to the adoption of total contaminant concentrations as water quality objectives in April 1991 rather than available toxic forms. Those "administrative impacts" - exceedances of the water quality objectives - will likely no longer occur when the State Board adopts a more appropriate basis for implementing the water quality objective for copper than exists today.

Beginning on page 14, Hunter/EHC asserted,

> *"There are several beneficial uses of San Diego Bay that have been significantly impacted due to the discharges by Paco Terminal at the 24th Street Marine Terminal."*

EHC then asserted that the marine habitat and saline habitat in the NCMT area have been degraded by copper ore concentrate in the sediments. Theirs was not a factual representation. As discussed in the Administrative Record and the Woodward-Clyde report, the numbers and types of benthic organisms in the NCMT area contaminated with copper ore concentrate are not distinguishable from those in other nearby parts of San Diego Bay where the copper ore concentrate would not be present. All of the discussion by EHC on benthic organism impacts is without technical merit, and ignores the information in the Administrative Record that addresses that issue.

On page 16, Hunter/EHC were critical of using *R. abronius*, an amphipod, as a toxicity test organism because of its sensitivity to factors other than chemical toxicity. These points were discussed in detail in the Woodward-Clyde report. It is important to note as discussed in this report, however, that *R. abronius* was not the only amphipod tested. *G. japonica*, another amphipod that is found in San Diego Bay, was also tested; no toxicity was found to this organism exposed to copper-contaminated sediment from the NCMT area. That point, well-documented in the Administrative Record, was completely ignored by the State Board staff as well as by Hunter/EHC in their discussions of the sediment bioassay work done in the Port of San Diego-sponsored studies.

It is interesting to note that based on the transcript of the September 2 State Board Workshop, Mr. Lorenzato's sole foundation for his claim that there is a "biological impairment" caused by the NCMT-area sediment is the result of the *R. abronius* toxicity test. EHC's criticism of the use of *R. abronius* is just the opposite of statements made by State Board staff who in their discussion of the issues tried to assert that that organism is a valid organism for testing NCMT-area sediment toxicity even though it is not native to the area and has been found by the US EPA Region IX (subsequent to the conduct of the sediment bioassays for the Port) to be an inappropriate organism for testing toxicity in San Diego Bay.

Beginning on page 17, Hunter/EHC introduced the G. Mondal Masters Thesis report as providing a basis for rejection of the 4,000 mg Cu/kg clean-up objective in favor of the 1,000 mg/kg objective. A so-called "summary" of that thesis was presented in Attachment 3,4 of the Hunter/EHC statement. The authors have provided the WRCB with a detailed set of comments on the technical deficiencies in the thesis work and the inappropriateness of its use in the NCMT-area sediment clean-up objective matter. Problems included how the studies were set up, analytical methods used, and data presentation, manipulation, and interpretation.

As indicated in those comments, that study was a limited-scope masters thesis research project which was designed to provide an introductory research learning experience to G. Mondal. Based on the senior author's more than 30 years of university graduate teaching and research during which time he was involved in supervising and serving committees for more than 200 masters theses and doctoral dissertations (at the University of Wisconsin/Madison, University of Texas/Dallas, Colorado State University, and the New Jersey Institute of Technology), the Mondal thesis was of exceedingly poor quality. Her thesis advisor also stated to the senior author (Lee) that the data generated should not be invoked for regulatory purposes.

Notwithstanding the quality of the Mondal study and results, the Hunter/EHC so-called summary of the G. Mondal masters thesis was highly selective in what was presented to the Board. For example, it did not present and discuss the finding of G. Mondal that,

> *"Sediment grain size analyses in this study suggest that survival of G. japonica may be affected by sediment particle size during short-term toxicity bioassays. A significant positive correlation between sediment grain size and species survival (Pearson's Test, $r = 0.88$, $p < 0.05$) was observed. This suggests that with larger sediment particle size (sand verses silt or clay), survival of G. japonica. The results of this study do not agree with those of by Nipper et al. (1989) who found no statistically significant relationship between G. japonica survival and sediment particle size for short-term bioassays."*

While other investigators have reported that *G. japonica* is not sensitive to grain size, G. Mondal found that the results of her study were strongly correlated with grain size. Note on the bottom of page 16 and the top of page 17, Hunter/EHC stated,

> *"While it is recognized that there is a lot of data about R. abronius, one thing we know is that this amphipod is not tolerant of small sediment grain size in sediment and testing and that fine particle size alone can often bring a toxic response in R. abronius that is unrelated to any constituents in the sediment."*

It is clear that EHC is going beyond credible reporting of results when in one case it criticizes the use of an organism because it is sensitive to grain size yet when the G. Mondal study reports a strong correlation between percent survival of the organism and grain size EHC fails to bring this to the attention of the Board.

Those familiar with the elements of statistical analysis of data know that it is not possible to infer cause and effect from statistical correlations. The finest grained sediments which would have the greatest grain size impact, if there is one, were located next to the NCMT area where G. Mondal found the greatest so-called "toxic effect." In their reporting of the G. Mondal results, however, Hunter/EHC selectively reported only data they believed were supportive of their preconceived conclusion that in some way there is a relationship between copper in the sediments and the toxicity of the sediments to *G. japonica* under the test conditions used by her.

On page 18, Hunter/EHC stated that Mr. Rick Gersberg of San Diego State University "will be submitting a statement to the quality of the science done and his assessment of the study." Since such a statement has not been made available to the Port, the senior author contacted **R. Gersberg who, as reported in our discussion of the thesis, indicated that he felt that the study showed that there was no relationship between copper in the NCMT-area sediments and the "toxic effect" reported by G. Mondal.** If R. Gersberg does submit such a statement on the "quality of science," he needs to address the many problems that the authors (Lee and Jones-Lee) found with the quality of science in that work. His statement can then be peer reviewed by professionals in the field with expertise and experience in the topic area who are recognized authorities on the topic area to evaluate his assessment of quality of science should he attempt to assert that the obvious significant problems in this study did not significantly adversely impact the reliability of the results reported.

As discussed in comments submitted by the Port on the quality of the science in the G. Mondal thesis, the experimental procedures used by her make the results of her study unreliable for use for any purposes other than its original intent of being an educational training tool for an introduction to research techniques and approaches.

On page 19, Hunter/EHC asserted that maintenance dredging of the NCMT-area sediments would be much more expensive because the copper present would precludes ocean disposal of the sediments. Once again, they provided unreliable and misleading information to the Board. The senior author has worked for many years on dredged sediment disposal criteria. The copper present in the NCMT-area sediments would not preclude their being disposed of at an ocean disposal site. Ocean disposal of dredged sediments is based on the potential toxic effects, not on the chemical content. Since the NCMT-area sediments have been repeatedly shown to be non-toxic using standard ocean disposal testing methodology, it would not be unexpected that a permit could be issued for ocean disposal.

The senior author has discussed the specific issue of ocean disposal of the NCMT-area sediments with US EPA Region IX representatives. The issue that would likely preclude ocean disposal here, despite the sediments' having shown no toxicity in the toxicity tests, is related to the fact that sediments containing more than about 4,000 mg Cu/kg dry weight would be an exceedance of the California Department of Health Services Title 22 limit for classification of the material as a hazardous waste. While it is readily acknowledged that the Title 22 classification value is not applicable to aquatic sediments, it would be necessary to obtain a variance from Title 22 requirements in order to obtain permission for ocean disposal of the NCMT-area sediments.

The discussion of the feasibility of the ocean disposal of the NCMT-area sediments did not address the feasibility of ocean disposal of sediments remaining after remediation to the 4,000 mg/kg clean-up objective. Rather, that discussion considered ocean disposal for all the sediments, some of which had up to 50,000 mg/kg copper. That issue would no longer be an issue since the remediation of the NCMT area sediments to the 4,000 mg/kg clean-up objective adopted by the SDWQCB would, because of the over-dredging necessary to stay under that limit, result in a residual sediment in the region which would have less than the Title 22 limit of 4,000 mg/kg. Therefore, the Title 22 limit which potentially affected ocean disposal of all of the sediments because of hazardous waste classification issues would no longer be an issue for maintenance dredging of the area. Since those sediments after remediation to the 4,000 mg/kg clean-up objective would be non-toxic and would not contain copper at levels above a hazardous waste classification limit, there should, contrary to the statements made by EHC, be no technical problem with navigational dredging of the NCMT area sediments. Therefore, EHC's reporting of this issue is technically invalid.

On page 20, EHC stated under "Water Contact Recreation,"

> *"The City of National City intends to develop a bayfront park where citizens would have an opportunity to swim and recreate in the Bay. See attachment 8. Although this area is currently zoned for deep water berthing (Port Master Plan), the intent is clear that, at some point in the future, National City intends to have Bay access at this site. This beneficial use will be impacted if the dischargers are not required to clean the site to an adequate level of protection. In this case, a level of 110, or background, would provide the most protection for this future beneficial use."*

The senior author has worked for many years on recreational water quality criteria. This work has included his serving as an invited peer reviewer for the National Academies of Science and Engineering "Blue Book" of water quality criteria in 1972, which included a section on recreational water quality criteria. He has conducted numerous research projects on this topic and has served on a number of boards of advisors to public and private groups on it. He can state without reservation that **the copper ore concentrate in the NCMT-area sediments will have no impact on the development of any parts of San Diego Bay for contact recreation (swimming) or other recreational activities. There is no public health issue associated with the NCMT-area sediment copper ore concentrate situation.**

On pages 20 and 21, EHC tried to make a case for a need to evaluate the impact of the copper ore concentrate in the NCMT-area sediments on rare and endangered species. However, there is no reason to believe (as is normally done in all studies of this type, whether done by governmental agencies or private entities), that rare and endangered species are any more sensitive to copper than the species that have been used in the testing. The "rare and endangered species" issue is a non-issue. It has no technical merit.

Page 21, L. Hunter-EHC's title of section "III. PACO SHOULD BE REQUIRED TO CONDUCT TOTAL MAXIMUM DAILY LOAD STUDIES BECAUSE ITS DISCHARGES CAUSED SAN DIEGO BAY TO BE LISTED AS HAVING IMPAIRED WATER QUALITY FOR COPPER." This title represents more of the inaccurate and distorted information that EHC has presented to the Board. A review of the Administrative Record will show that prior to the PACO copper-transfer activities, San Diego Bay had copper concentrations in the watercolumn above 2.9 µg/L. It is totally inappropriate to assert that Paco discharges of copper *"caused San Diego Bay to be listed as having impaired water quality for copper."* The facts are that San Diego Bay is listed as having impaired water quality for copper is of an administrative exceedance of a numeric water quality objective applied to the total copper concentration. The technical information clearly demonstrates that the NCMT-area sediment-associated copper is not having any impact on beneficial uses of San Diego Bay. As discussed above and in the materials presented in the Administrative Record, the listing of San Diego Bay as having excessive copper will likely be significantly if not completely corrected once the State Board adopts water quality objectives based on soluble-toxic forms of copper. This will also be a major step toward correcting the problems that exist with administrative exceedances of water quality objectives for copper for several other waterbodies in the state where administrative exceedances occur without ecological impacts.

As discussed above, if Hunter/EHC are successful in getting the State Board to name PACO as a discharger that is a significant cause of the exceedance of the water quality objective in San Diego Bay, then EHC will have opened up all of the people in San Diego to be named as dischargers and to help pay for the massive unnecessary clean-up of sediments throughout the Bay which do in fact contribute to the administrative exceedance for copper and possibly other contaminants which are now present in the sediments and are derived from public activities such as runoff from streets, mooring or using boats on San Diego Bay, etc.

On page 21, Hunter/EHC stated,

"This copper has had detrimental effects on the benthic life in the bottom of the Bay, and the State Board may require mitigation measures to compensate for the damage done that

will not be remedied by this cleanup order."

Once again, Hunter/EHC have presented unreliable information to the Board. There is no basis in fact that the copper ore concentrate is having a detrimental effect on benthic organisms in San Diego Bay. In fact, the extensive studies that have been conducted show just the opposite.

The authors would be happy to answer any questions that the members of the Board may about any of these comments. If others dispute any of the technical information or positions reflected in these comments, the authors request that the point(s) of contention be articulated and substantiated in writing for their review and comment in accord with standard professional peer review approaches so that they may have the opportunity to provide the Board with an appropriate discussion of the technical issues pertinent to this matter.

REFERENCES

Lee, G. F., and Jones, R. A., "Suggested Approach for Assessing Water Quality Impacts of Urban Stormwater Drainage," IN: Symposium Proc. on Urban Hydrology, American Water Resources Association Symposium, November (1990), AWRA Technical Publication Series TPS-91-4, AWRA, Bethesda, MD (1991).

Lee, G. F., and Jones, R. A., "Water Quality Aspects of Dredging and Dredged Sediment Disposal," IN: Handbook of Dredging Engineering, McGraw-Hill, New York, pp. 9-23 - 9-59 (1992).

Pitt, R. E., and Field, R., 1990, "Hazardous and Toxic Wastes Associated with Urban Stormwater Runoff," Proc. of the Sixteenth Annual RREL Hazardous Waste Research Symposium, US EPA Office of Research and Development EPA/600/9-90 037 pp. 274-289.

WCC (Woodward-Clyde Consultants), "Remedial Action Alternative for National City Marine Terminal," Final Report, Prepared for San Diego Unified Port District, San Diego, CA, July (1991).

apparent toxic effect of the sediments of San Diego Bay for the test organism, **but that the apparent toxic effect was clearly not related to the copper content of the sediments.**

The MS thesis introduced by Ms. Hunter does not provide any credible evidence that should cause the State Board to overturn the Regional Board's 4,000 mg Cu/kg clean-up objective for the NCMT-area sediments; in fact it supports the position that the copper-contaminated sediments near the NCMT are not having an adverse impact. In her submission to the State Board the morning of the September 2 hearing, Ms. Hunter provided the Board with what purported to be "a summary" of that MS thesis which included excerpts from the these. While there was no indication as to who prepared the "summary," it was clear that the author of that summary exercised extreme bias in selecting what was excerpted from the thesis for presentation to the Board. Ms. Hunter's comments on the thesis did not reflect the context or the specific statements of finding or conclusion reported in the thesis. **Review of the thesis itself shows that it indeed reflected the conclusion reported to me last summer by R. Gersberg, that the study did show an apparent toxic effect in the sediments of San Diego Bay for the test organism, but that the apparent toxicity was clearly not related to the copper content of the sediments.**

In the conclusions of the thesis, Ms. Mondal stated (page 56),

> *"This study showed there was a significant negative correlation between the level of both copper (and the other metals combined) and survival of G. japonica."*

However, Ms. Mondal also stated on the bottom of page 50 and the top of page 51 of her thesis,

> *"Sediment grain size analyses in this study suggest that survival of G. japonica may be affected by sediment particle size during short-term toxicity bioassays. A significant positive correlation between sediment grain size and species survival (Pearson's Test, $r = 0.88$, $p < 0.05$) was observed. This suggests that with larger sediment particle size (sand verses silt or clay), survival of G. japonica. The results of this study do not agree with those of by Nipper et al. (1989) who found no statistically significant relationship between G. japonica survival and sediment particle size for short-term bioassays."*

As discussed in our previous submissions to the Board on this matter, some amphipods are known to be highly sensitive to sediment grain size, such that an undesirable grain size alone can cause the appearance of "toxicity" response. This makes the reliance on toxicity tests of some of the amphipods for evaluation and regulatory purposes of questionable validity, especially if the sediment grain size changes across the study area as occurs at the NCMT area.

- While the conclusions of Ms. Mondal's thesis, in fact, *supported the finding of our risk assessment* that the copper associated with the sediments in the NCMT area is not toxic to aquatic organisms, there are technical deficiencies in Ms. Mondal's thesis. It certainly cannot be considered to be "well-done" as it was characterized by Ms. Hunter.

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Comments on September 2, 1992 Letter from L. Hunter to Water Resources Control Board

G. Fred Lee, Ph.D., President
G. Fred Lee & Associates
El Macero, CA

September 15, 1992

In a letter dated September 2, 1992, L. Hunter, Director of the "Clean Bay Campaign" of the Environmental Health Coalition, provided additional comments regarding the EHC's position and contentions in the matter of the copper clean-up objective for the NCMT-area (San Diego Bay) sediments. That letter provided incorrect and misleading information regarding the technical issues of that matter that must be addressed.

- The subject of the first paragraph of her letter was introduced by her statement,

> *"Please find attached a copy of a study that provides evidence in opposition to Dr. Fred Lee's allegation at yesterday's workshop that Paco Terminal's contaminated sediment has no toxicity or impact to marine life."*

Ms. Hunter went on to characterize that study as being

> *"independent, well-done, and does show evidence contrary to his* [my] *claim."*

The "copy of a study" that Ms. Hunter provided to the Board was a Master's Thesis authored by Gita Mondal, entitled, *"Toxicity Assessment of San Diego Bay Sediments Using the Amphipod Grandidierella Japonica"* dated summer 1991. I have reviewed that Masters Thesis. **Not only do the results of that study not support Ms. Hunter's contention, but they also serve to support the position that Dr. Jones-Lee and I discussed at the September 2 hearing, as well as in materials that had previously been submitted to the Regional Board and the State Board on this matter, namely that the copper that currently exists in the NCMT-area sediments is not causing toxicity to aquatic organisms or adversely affecting beneficial uses of San Diego Bay.**

When Dr. Jones-Lee and I were conducting our risk assessment study in the summer of 1991 on behalf of the Port of San Diego, I contacted Dr. Rich Gersberg, who was the faculty advisor for Ms. Mondal's work, to learn if he had any information pertinent to the toxicity of the NCMT-area sediments. He informed me at that time that a study was being conducted by a graduate student working under his supervision, but that the data were not in a form that could be made available to me in time for inclusion in the Port of San Diego's report to the San Diego Regional Water Quality Control Board. He also informed me that that study did show an

During my 30-year career in graduate-level education and research, I have supervised the Master's Thesis and Dissertation studies of approximately 100 graduate student at several major universities in this country (including the University of Wisconsin, Madison, and the University of Texas at Dallas). I also served on thesis and dissertation committees of another 100 or so graduate students. Many of those students have worked on water quality issues associated with sediments. I am therefore highly familiar with graduate student's abilities, aspirations, and limitations, and I am qualified to comment on the quality of the study and thesis produced. Typically a Master's Thesis is the first experience that a student has with conducting research. It is the "process" of planning and conducting literature review and research that is the focus rather than accomplishment of publishable results. In contrast to a Ph.D. dissertation, a Master's thesis is not necessarily expected to produce significant results that would be published in refereed professional journals. Master's level research may also may be conducted in or include components that are in areas outside the primary area of expertise of the supervising professor. Further, while some supervising professors closely supervise the work, others do not. As noted elsewhere, R. Gersberg, supervising professor of the Mondal thesis, informed me that he did not believe Ms. Mondal's work was appropriate for use for regulatory purposes such as setting clean-up objectives for the NCMT-area sediments. A number of the key technical deficiencies in the Mondal thesis are discussed below.

First, the thesis stated explicitly that there had been no previous studies with the amphipod, *Grandidierella*, on the sediments in question, a position relied upon in part for justification for the conduct of the study. However, clearly sediments specifically from the same area of the NCMT had been tested with that organism several years earlier. Those data were reported by ERCE (WESTEC) (1988) and were available through the Port of San Diego and in the Regional Water Quality Control Board files. Since other similar reports developed by WESTEC were referenced in the thesis, she was aware of studies that had been undertaken by that group. I also informed R. Gersberg, Ms. Mondal's thesis advisor, of the existence of those data in the summer of 1991. The fact that the ERCE study with that organism was not referenced and further specifically excluded, is a deficiency of the work. When ERCE used the same species in their screening of the sediments for toxicity (ERCE, 1988) (See Table 2-2 of the Woodward-Clyde report) they found that sediments containing as much as 6,067 mg Cu/kg were not toxic to *G. japonica*. The average percent survival in the control, reference and two different site sediments from the NCMT area all ranged from 74 to 83 percent indicating that those sediments were not toxic to this organism.

Second, the conclusion reported by Ms. Mondal that there was a so-called toxic effect to the test organisms caused by the NCMT-area sediment was developed on the basis of a comparison of results on tests of pierface sediments with those on one sediment sample taken about 1000 meters from the terminal. The thesis reported that the toxicity response of the organisms was clearly not related to copper in the sediments and that it may, in fact, not have been a toxic effect of chemicals at all, but rather caused by particle-size.

Third, a critical review of Ms. Mondal's thesis shows that what was reported to be a toxic effect, while clearly not related to copper content of the sediments, may also not have been a real effect. Statistics are applied to toxicity test results to determine whether there is a statistically significant difference between the results of the reference and control sediments and those of the subject sediments. While statistics can be used to determine whether a set of numbers is statistically different from another, statistics cannot be used to assess whether a relationship is a cause-and-effect relationship or whether the "statistical significance" is in fact of "environmental or beneficial-use significance." Ms. Mondal made inappropriate use of statistics in her MS thesis to conclude cause-and-effect on the basis of her apparent finding of statistically significant differences between the survival of the test organism in a sample of sediment taken near the terminal and one taken about 1000 meters from the terminal. A review of the data, however, shows that the variability in percent survival in the three replicates run at each of the two locations was sufficient to readily lead to the conclusion that what was termed a difference in percent survival is well-within the normal variability that would be expected and that found for studies and tests of that type. Thus, the data presented by Ms. Mondal do not support the conclusion that there was any toxic response of the test organisms to the NCMT-area sediments that was different from the response of the organisms to sediments 1000 m from the pierface.

Fourth, in paragraph 2 on page 3 of the thesis, it was stated,

> *"In the early 1980s a direct contamination by chalcopyrite, a copper sulfate ore, occurred from an ore transfer station based on the [NCMT] Terminal."*

The characterization of chalcopyrite as a "copper sulfate ore" is a fundamental error that calls into question Ms. Mondal's understanding of elementary chemistry on the topic on which she is working, (as well as the understanding those who reviewed and approved the thesis). This may account for another significant error in chemistry in the study reported on page 33 (second paragraph) where it was stated,

> *"Efficiency in recovery of copper from the acid digests was measured by spiking known concentrations of cupric sulfate to a control sample and then analyzing by flame atomic absorption."*

No-one with a knowledge of sediment analytical chemistry would ever use cupric sulfate (copper sulfate) as a basis for determining the extraction efficiency of chalcopyrite (a copper iron sulfide). The degree of recovery of cupric sulfate added to a sediment bears no relationship to the ability to reliably extract and analyze the copper in sediment-associated chalcopyrite. As discussed below, the analytical procedures used in Ms. Mondal's study almost certainly resulted in significant errors in copper analysis.

Fifth, a review of the experimental procedures used by Ms. Mondal shows that she used a number of procedures that could cause her results to be significantly different from those of BRCE (1988). The BRCE studies were conducted by experienced professionals, using standard, widely accepted US EPA and Corps of Engineers protocols that are routinely used to evaluate sediment toxicity. A number of aspects of the sample handling, analysis, and testing employed is Ms. Mondal are recognized by professionals in the field as being inappropriate for use in a regulatory framework. For example, she indicated that the samples were frozen. It is well-known that freezing alters the physical and chemical characteristics of sediments in a manner that can drastically change the toxicity of sediment-associated contaminants; samples that have been frozen cannot be considered to be representative of the character of the sediment that exists in the waterway.

There are also serious questions about the reliability of the metal analytical procedure used in the Mondal study. While Ms. Mondal did not follow the conventional approach of providing specific reference to the analytical methods used, from the information provided it appears that the heavy metal analyses were done with procedures that are known to be unreliable for that purpose on this type of sample. This may account for her reporting concentrations of heavy metals such as copper that were almost a factor of 10 different from those found in other studies of sediments collected from the same general region within a few months of when she took her samples. Moreover, her handling of the sediment samples so drastically changed the character of the sediments from that which would be present in the area so as to make any inference about *in situ* toxicity invalid.

There is a strong tendency among inexperienced researchers such as Ms. Mondal to try to make the data tell far more than their reliability will allow in trying to develop significant conclusions from such studies. She has made the common mistake of many inexperienced investigators of misusing statistical techniques to infer cause and effect. Her database was not adequate to draw any reliable inference about the impacts of potential contaminants in the NCMT-area sediments on the test organisms, especially as such an impact may relate to what could happen to that or any other organism that would be present in the sediments in the NCMT area.

Ms. Mondal's attempt to "correlate everything with everything" led her to conclude that heavy metals must in some way be responsible for toxicity that she thinks she found since there was a "correlation" between "total heavy metals" and the so-called toxic response. Those familiar with sediment quality issues would never try to make such a "correlation" or cause-and-effect conjecture for a variety of reasons. First, she only selected a few of the heavy metals for analysis. Second, her heavy metal analytical methods were of highly questionable reliability. Third, the so-called toxic effect, if there was a real toxic effect due to chemicals, could have easily been due to a wide variety of constituents other than heavy metals whose concentration in the sediments happen to parallel the heavy metals.

For example, heavy metals and grain size often show strong correlations. This is because heavy metals tend to be associated with the smallest particles. However organics and other inorganic pollutants such as ammonia also tend to "correlate" with grain size. Ms. Mondal found concentrations of ammonia in her sediments that were of sufficient magnitude to cause toxicity to some forms of aquatic life. She evidently did not understand the toxicity of ammonia since she neglected to discuss the potential significance of her finding of ammonia. While, again, she did not follow the normal procedure of providing specific reference to the analytical procedure used for ammonia analyses, from the information provided it appears that she may have also had problems with reliable determination of ammonia in the sediment samples that she studied.

On pages 54 and 55 of her discussion, Ms. Mondal made a point of indicating that the copper exceeded the AET value. Even though she had available a detailed discussion of why a number of investigators who have experience and expertise on sediment chemistry as it relates to toxicology have determined that AET is not valid as a regulatory tool, Ms. Mondal tried to convince the reader that there must be some significance to the AET value. This situation clearly reflects a lack of understanding of aquatic and sediment chemistry and experience in conducting studies of this type.

In review of this thesis I found that not only was it not "well-done" but it also would not have been accepted as a Master's Thesis by faculties at universities at which I have taught over the past 30 years. In addition to making significant technical errors in experimental procedures, and data presentation, interpretation, and conclusion, Ms. Mondal has failed to properly represent the literature available at the time she undertook the study, on San Diego Bay sediment copper toxicity issues much less what is known in general in the refereed literature about the toxicity of sediment-associated copper.

Overall Ms. Mondal's discussion of her data is quite unreliable and largely without technical merit.

- In her letter Ms. Hunter stated,

  > *"Dr. Rich Gersberg was the supervisor of this project and would be glad to talk to answer any questions you may have."*

  Upon my review of the Mondal thesis I contacted Dr. Gersberg again to see if his impressions of the results of that study had changed since I discussed them with him over a year ago. He indicated to me that he believed that the survival of the test organism was different when exposed to the NCMT-area sediment as compared with the sediment 1000 m from the pierface, and stated again that that effect was not related to copper in the sediments. He characterized the Mondal study as a low-budget study conducted by a graduate student and stated that the results of that study should not be used to influence decisions on clean-up of copper-contaminated sediments in San Diego Bay.

- In the second paragraph of her September 2 letter to you, Ms. Hunter asserted that the work that Dr. Anne Jones-Lee and I have done on behalf of the San Diego Unified Port District in connection with the NCMT-area sediment is not reliable. She provided no technical foundation for that assertion. This is yet another example of the Environmental Health Coalition's taking an unsubstantiated and unjustifiably extreme position and then grasping at straws and presenting unreliable information to try to defend it. As the Board is well-aware, representatives of that Coalition testified at the September 2 workshop against the proposed changes in the industrial stormwater permitting requirements, changes that had been recommended by virtually every other group, the State Board's Stormwater Quality Task Force, and according to representatives at the hearing, other environmental groups as well. The irresponsibility of their approach can be tremendously wasteful of public and private resources.

- In the last sentence of the first paragraph on page 2 of her letter to you, Ms. Hunter stated,

> *"In this light, we request that the staff be directed to review all evidence available regarding this issue and not just that evidence available for the December hearing."*

We also wish to urge that the staff and the Board review the complete Administrative Record. It was clear from the workshop on September 2 that the Board was not getting a balanced reliable review of the technical issues and information available. It was particularly disturbing to not be able to comment on Mr. Lorenzato's comments to the Board, so as to correct the significant misinformation and incorrect impressions given by them. In his comments, which served as part of the basis for the draft order, he admitted that he had reviewed but part of the Administrative Record for this matter. As discussed in a separate submission to the Board by Dr. Jones-Lee and me, if he had taken time to review the record he would have found that some of the statements that he made to you on September 2 had, in fact, been addressed in detail in presentations made to the Regional Board in connection with the December 1991 hearing. It was those presentations that were the key to causing the Regional Board to conclude that, while protective, the 1,000 mg/kg copper sediment clean-up objective originally proposed by the Regional Board was based on inappropriate analytical procedures and data interpretation. After reading and hearing the discussions of these issues by Dr. Jones-Lee and me, the Regional Board concluded that a 4,000 mg/kg clean-up objective would be protective of the beneficial uses of San Diego Bay and that there was an adequate database to justify that conclusion.

If any of the members of the Board have any questions on any of the technical issues of this matter, please contact Dr. Jones-Lee and me. We would be happy to discuss them in detail. I am confident that given an adequate opportunity for such a discussion that the State Board would conclude, as did the Regional Board, that L. Hunter's position, including claim of support of the masters thesis by Gita Mondal, is not appropriate justification for overturning the Regional Board's adoption of the 4,000 mg Cu/kg sediment clean-up objective for the NCMT-area sediments. Indeed, the technical information in the Administrative Record unquestionably supports the Regional Board's 4,000 mg Cu/kg clean-up objective as being protective of the beneficial uses of San Diego Bay.

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CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Appeal Nos. A-775 and A-775(a)

Petitions of Environmental Health Coalition and Eugene J. Sprofera to Review Cleanup and Abatement Order No. 85-91, Addendum 7, of the Regional Water Quality Control Board (San Diego Region)

DECLARATION OF DAVID B. HOPKINS

Hearing Date: September 17, 1992

I, DAVID B. HOPKINS, being duly sworn, state as follows:

1. I am an attorney at law and a shareholder in the law firm Hillyer & Irwin, special environmental counsel to the San Diego Unified Port District in this matter. The purpose of this declaration is to provide evidence concerning events that have taken place since the Port District's Written Response Supporting the Regional Board's Addendum No. 7 (submitted June 3, 1992) and to respond to issues that have arisen since that submission.

2. As part of its efforts to implement the cleanup plan under the mining company option, the Port District has had reason to recalculate the costs of the cleanup plan, including the costs that will be charged by the mining company to complete the project. Our best estimate of the total costs was presented to the State Board on an overhead at the workshop. That overhead is attached hereto as Exhibit 1. The total cost of completing the sediment remediation at the current 4,000 ppm cleanup level is estimated to be $5,160,450. This amount is in addition to the $1.6 million already spent by the Port District on landside remediation and the approximately $1 million spent by the two responsible parties in consulting fees. Thus, if the 4,000 ppm cleanup level is maintained, the cost of cleanup is currently projected to be approximately $7,760,450. Obviously, this amount is far greater than the cost that was originally estimated to complete the 1,000 ppm cleanup through ocean disposal, which documents in the record (from the period prior to the Port

District's involvement in these proceedings) estimated to be $800,000.

3. As stated in the accompanying Declaration of Jean A. Nichols, Ph.D., certain elements of the $5,160,450 sediment cleanup total are likely to increase.[1]

4. The $5,160,450 total includes payments to the mining company totalling a minimum of $1,273,450 for the costs of recycling the material to reclaim the copper. These figures are included in the most recent draft contract prepared by the mining company, which was submitted to the Port District as part of the multiparty negotiations taking place before Magistrate McCue.

5. Petitioner Environmental Health Coalition in its latest submission to the State Board questions the financial arrangements with the mining companies and explicitly questions the Port District's past testimony that there is no offset to these costs for the value of the copper to be extracted from the sediment. That same draft contract referred to in the preceding paragraph specifically states:

> [The mine] shall, upon acceptance, acquire all right, title and interest to all valuable minerals, including, without limitation, copper; and neither Port nor any other person shall

---

[1]At the State Board workshop, Board Member Del Piero asked a question concerning the Port District's insurance limits applicable to these discharges. I inadvertently gave an incorrect answer to his question. The Port District's primary insurance limits are $300,000 for some years and $500,000 for others. Those are also the per occurrence limits. The Port District's carriers have asserted that the same $300,000 (of $500,000) limit is an aggregate limit under the policies, irrespective of the number of occurrences. They also have reserved rights and/or denied coverage based on a number of arguments, all of which are subject to pending litigation that is anticipated to be settled under an agreement being negotiated before Magistrate McCue, provided the cleanup level is not changed.

> receive any offset, credit or any form of compensation whatsoever for any copper or other mineral values extracted by [the mine] from the Sediment.

Thus, as I have testified in the past, there is no consideration to the Port District for the reclaimed copper. In addition, as Paco's representative stated at the workshop, seven mining companies named as defendants in litigation concerning this cleanup have agreed to pay $575,000 to the Cleanup Fund, as part of the settlement discussions before Magistrate McCue, which are contingent upon the 4,000 ppm cleanup level remaining in place. The mining company that will do the recycling is one company of that group. The Port District is not privy to the division among the mining companies of responsibility for that total contribution to the Cleanup Fund. However, as shown by the contract clause quoted above, there is no compensation flowing to the Port District for the recycled material; the issue is, and has always been, how much the mining company will charge the Port District for recycling the material. The mining company's current requirement is a minimum of $1,273,450.

6. Petitioner Environmental Health Coalition has erroneously stated that a reason for requiring a more strict cleanup level at this time is to avoid transferring to other parties any additional expense that would be incurred if future dredging were necessary. In fact, there is no such risk. Even if future dredging were required for access to the National City Marine Terminal, that dredging would be conducted by the Port District. Accordingly, any additional costs by the difference between the 1,000 ppm and 4,000 ppm would be borne by the Port

District, the same party that would bear those costs now. Moreover, the Port District has every reason to believe that any sediments from future maintenance dredging would be subject to ocean disposal. As has been shown in the Woodward-Clyde Report, the sediments pass bioassay and toxicity tests with flying colors.

7. There is no current cleanup plan for disposing of the sediment if the cleanup level is changed from the Regional Board's 4,000 ppm level. There is significant doubt that the mining company can or will accept the additional material. The current draft contract referred to above requires that <u>each</u> of the approximately 300 carloads of sediment required to be shipped to the mine must have an <u>average copper content of not less than 4,000 ppm</u>. The Port District is hopeful of negotiating a relaxation of that "per car" standard since satisfying the 4,000 ppm cleanup level will require shipment of substantial amounts of sediment with concentrations <u>below</u> the 4,000 ppm cleanup level set by the Regional Board. (See Declaration of Jean A. Nichols, Ph.D. (September 12, 1992), ¶ 5.) This problem would be exacerbated still further if the cleanup level were changed to 1,000 ppm. (See <u>Id</u>., ¶¶ 5-6.) The mining company has never indicated that it can accept for recycling all sediments subject to a 1,000 ppm cleanup level.

8. If the cleanup level is changed to 1,000 ppm, there is substantial doubt that the mining company option will be available for <u>any</u> of the sediments. The mining company that is recycling the materials is a party to litigation concerning the

cleanup costs and has been named as a potentially responsible party to the cleanup and abatement order in a petition before the Regional Board filed by Paco over one year ago. That petition has not yet been decided in light of the ongoing negotiations through Magistrate McCue. Those negotiations have culminated in a draft settlement agreement that will release all litigation claims regarding compliance with the cleanup and abatement order. However, the settlement proposal is contingent upon the Regional Board's 4,000 ppm cleanup level remaining valid. If the 4,000 ppm cleanup level is made more stringent, a condition to the agreement fails and no parties will be released from the litigation. The mining company representatives and its counsel have made it clear to me that the mining company will not participate in this project without releases from all parties that could assert claims against it. The only present mechanism (and likely the only possible mechanism) for obtaining such releases is the settlement agreement being reached through Magistrate McCue's negotiations, which are contingent on the 4,000 ppm cleanup level.

9. If the cleanup level is changed, and the mining company option is not available for any portion of the sediments, the total cost of the sediment cleanup will rise precipitously. The best estimates (which are admittedly rough) are that the $5,160,450 sediment cleanup figure would then exceed $20 million. (See Declaration of Jean A. Nichols, Ph.D. (September 12, 1992), ¶ 11.)

10. In addition to these additional cleanup costs, changing the cleanup level will reactivate several different federal and state court actions to which the Port District is a party. Thus, in addition to requiring the expenditure of many millions of additional public dollars to accomplish the cleanup, more public money will be spent as a result of the litigation if the cleanup level is changed.

11. There are many other uses for which these public funds have been earmarked, including other cleanup projects on Port District tidelands and the Bay, and public works projects. Moreover, the Port District requests that the State Board take judicial notice of Senate Bill No. 844 signed into law in early September, 1992 which calls for the sharing of Port District revenues with member cities to offset cuts in state funds provided to the cities as part of the 1992 budget cuts and political negotiations.

I declare under penalty of perjury under the laws of the State of California that this Declaration is true and correct and that it was executed on September 15, 1992, in San Diego County, California.

David B. Hopkins
HILLYER & IRWIN
Attorneys for San Diego
Unified Port District

CLEANUP COSTS PROJECTIONS
AND PAST EXPENSES

SEDIMENT CLEANUP COST PROJECTIONS
4,000 PPM MINING COMPANY OPTION

	DREDGING, HANDLING, LOADING ETC	$1,500,000
?	RAIL TRANSPORT	$1,000,000
	PROJECT MANAGEMENT	$ 300,000
	MINING CO. CAPITAL IMPROVEMENTS, AND OVERHEAD	$ 850,000
?	MINING CO. MINIMUM PROCESSING FEE ($28.23 PER TON 15,000 TON MINIMUM)	$ 423,450
?	HAZARDOUS MATERIALS TESTING (MINING CO. REQUIREMENT) ($1,790 PER RAIL CAR IN TESTING COSTS ALONE)	$ 537,000
	COMMON COSTS (PERMITTING, POST-CLEANUP SAMPLING, ETC.)	$ 550,000
	TOTAL	**$5,160,450**

EXPENSES ALREADY INCURRED

TESTING AND CONSULTING FEES (BOTH PARTIES) APPROX.	$1,000,000
LAND REMEDIATION COSTS TO ABATE RISK OF CONTINUING DISCHARGES PAID BY PORT DISTRICT	$1,600,000
GRAND TOTAL	**$7,760,000**

ALTERNATIVES IF CLEANUP LEVEL CHANGED: UNKNOWN

UNWORKABLE FOR MINES
DEADLINE PROBLEMS
BEST COST ESTIMATE EXCEEDS $20,000,000
PLUS CONTINUING LITIGATION EXPENSES

C:\DMS\CCL\CCL\0003945.WP

EXHIBIT 1

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August 31, 1992

IN REPLY REFER TO
OUR FILE

Via Facsimile: (916) 653-0428

8481.14

Mr. Walter Petit
Executive Director
STATE WATER RESOURCES CONTROL BOARD
Post Office Box 100
Sacramento, CA 95801-0100

Re: Your File Nos. A-775 and A-775(a)
Petitions of Environmental Health Coalition and Eugene J. Sprofera for Review of Cleanup and Abatement Order No. 85-91, Addendum No. 7, of the California Regional Water Quality Control Board, San Diego Region
Request by San Diego Unified Port District for Reconsideration of Request for Workshop and Hearing Continuance, on Due Process Considerations

Dear Mr. Petit:

This law firm is counsel for the San Diego Unified Port District (the "Port District") in this matter. The purpose of this letter is to request reconsideration of today's determination of the General Counsel's office to deny the joint request on due process grounds by the Port District and Paco Terminals, Inc. for a continuance of the workshop and hearing in this matter.

Basic due process consideration requires fair notice and a reasonable opportunity to be heard. The short time frames of the State Board Staff's handling of this matter has denied the responsible parties to the Order -- the Port District and Paco Terminals -- of those minimum basic due process considerations. The State Board Staff provided the three key staff documents on this matter to the responsible parties only seven days, five days, and less than two days prior to the State Board workshop on this matter.

We did not receive a copy of the draft order on this matter until after the close of business on Friday, August 21, 1992 when it arrived by fax. That short time line provided us only seven business days to respond to that draft order prior to the workshop scheduled for Wednesday, September 2. Nevertheless, we worked diligently with our technical consultants to review that material to prepare for the workshop even given the short time frames.

Our response time was shortened even further when additional relevant material arrived by fax from the State Board on Tuesday afternoon, August 25, after 3:00 p.m. At that time, we received a document entitled "Preliminary Comments on the Woodward-Clyde Report on Copper Pollution at the National City Marine Terminal, San Diego Bay." It was our understanding that this was the technical report on this matter. Our receipt of that report provided only five business days to respond to it before the workshop. Nevertheless, we continued to make every effort to meet the workshop deadline.

This morning, Monday August 31, we received yet another technical report from the State Board, this one consisting of 14 pages and addressing new technical considerations not addressed in the prior technical report. This report arrived less than two business days prior to the workshop.

While we made every effort to comply with a seven business day turnaround, and then a five business day turnaround, complying with a less than two business day turnaround finally seemed too much to ask. Accordingly, this afternoon counsel for Paco and I jointly requested that the General Counsel's office continue the hearing from the September calendar to the October calendar. The General Counsel's office declined, explaining that the delay could jeopardize the State Board requirement that decisions on petitions of this nature be rendered within a nine month time period.

The purpose of this letter is to renew the Port District's request for a continuance. For the reasons stated here, the deluge of materials from the State Board, first seven business days, then five business days, and then less than two business days prior to the hearing has simply placed too great a burden on legal counsel and technical consultants to respond properly. Moreover, a continuance, even for much longer than requested, would not jeopardize the requirement that decisions be completed within nine months. The nine month time frame runs from the date of notification that the petitions are complete. 23 CCR §§ 2050.5, 2050.5, and 2052(c). That notification was not until April 24, 1992. The petitions in this matter were not deemed complete until April 24, 1992. Nine months from that date is not until January 24, 1993. Thus, the decisions could be continued several more months before that deadline would be jeopardized.

As your staff knows from the Port District's submissions, this matter is of great importance to the Port District. Important legal rights, remedies and liabilities will be determined by the State Board's decision. The Port District should be given every opportunity to respond to the State Board's legal and technical considerations. The short advance notices of seven days, five days, and two days have not allowed that opportunity. The due process problems are exacerbated by the very limited time available to present these matters at the State Board workshop and the hearing. We have been informed that the Port District will be allowed only 15 minutes time at the workshop and probably less at the hearing on this matter on September 17. Those short periods for presentation are inadequate in any event and raise their own due process considerations. However, the due process concerns are greater when coupled with the State Board Staff's providing its key decisional documents so shortly before the hearing.

For all of these reasons, we request that the workshop and hearing be continued to the October calendar.

Very truly yours,

David B. Hopkins

David B. Hopkins

DBH:aj
cc: Interested Persons (See Attached List)
Mr. David T. Barker, Senior WRC Engineer
Joseph D. Patello, Esq., Port Attorney
(By U.S. Mail)

<u>INTERESTED PERSONS MAILING LIST</u>

PETITION OF THE ENVIRONMENTAL HEALTH COALITION AND EUGENE J. SPROFERA TO REVIEW CLEANUP AND ABATEMENT ORDER NO. 85-91, ADDENDUM NO. 7, OF THE REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION FILE NOS. A-775 AND A-775(a)

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R. DAVID MULCAHY
DIRECTOR OF ADMINISTRATION

September 14, 1992

IN REPLY REFER TO
OUR FILE
8481.14

Via Facsimile: (916) 653-0428

Craig M. Wilson, Esq.
Assistant Chief Counsel
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Post Office Box 100
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Re: Your File Nos. A-775 and A-775(a)
Petitions of Environmental Health Coalition and Eugene J. Sprofera for Review of Cleanup and Abatement Order No. 85-91, Addendum No. 7, of the California Regional Water Quality Control Board, San Diego Region
Due Process Objections

Dear Mr. Wilson:

For the record, the San Diego Unified Port District objects to the notice from your office dated September 4, 1992 (received September 8, 1992) that evidence relating to this matter will not be heard at the business meeting. At the workshop held on September 2, 1992, the responsible parties made an objection on due process grounds to both the short period of time available to respond to State Board Staff technical reports submitted on the eve of the workshop and to the short time available at the workshop to present argument and evidence. The State Board's response to that objection was that the workshop was only an informal meeting and that we would have ample opportunity at the hearing on this matter to make a full presentation. However, your letter of September 4 states only that "brief comments on the proposed order may be made." An opportunity to make brief comments does not satisfy minimal due process considerations.

The due process problems posed by this lack of opportunity to address the Board are exacerbated by the State Board's procedures on this particular matter and the highly technical nature of the matter itself. It is our understanding that the State Board has seen only the tentative order prepared by the Office of Chief Counsel and (perhaps) the Staff's two technical reports. In any event, the sole technical basis for the draft order is the first of the two Staff technical reports (as the other was not prepared until after the draft order was completed). The first technical memorandum states that it was not based upon a review of the entire record. Therefore, several submissions made by the Port District or its consultants have not been considered by the technical staff.

At the State Board workshop we requested more time than the 15 minutes we were allocated to allow the technical consultants adequate opportunity to rebut the inaccuracies in the Staff technical reports. However, we were denied additional time. While we appreciate that the record in this matter is still open, and we plan to submit additional documents, such submissions are not adequate since they generally are not reviewed by the State Board Members themselves. Your letter indicates that the Port District will have no opportunity at the hearing to present its technical case to the State Board Members. As a result, the Port District objects that there has not even been a semblance of due process in these proceedings.

In addition, the Port District objects on due process grounds to Petitioner Environmental Health Coalition's having submitted to the State Board on September 2, 1992 an entirely new study in the form of a thesis for a masters in public health degree presented to the faculty of San Diego State University. The San Diego Unified Port District had no knowledge of this submission until September 9, 1992 when we received a copy of the Environmental Health Coalition's cover letter to Chairman Maughan concerning the submission. The cover letter did not include the study itself. We were able to obtain a copy only by making a special request to the Environmental Health Coalition on September 9. However, apparently there were 22 missing pages, which we just received as this letter was going out to you.

This is not the first time that Petitioner has played fast and loose with procedural requirements. When we arrived at the workshop on September 2, we were handed a supplemental submission by the Environmental Health Coalition that had apparently been submitted to the State Board earlier that week. The first the Port District ever knew of its existence was during the proceedings.

It is obviously improper for any petitioner to make submissions to the State Board without simultaneously submitting the full submission to other interested parties (and particularly the responsible parties). It is also improper for entirely new studies to be submitted into the record so late in this proceeding. It is difficult enough for the responsible parties to respond to belated comments on existing studies which have been part of the record for at least several months, if not much longer. This belated submission of entirely new studies provides insufficient opportunity to comment. Any such new studies should not be considered by the State Board and should be excluded from the record. Because we know that we will not have a ruling on this objection until the beginning of the hearing at the earliest, the Port District will make every effort to respond to this belated submission. However, any such response is without waiver of these objections.

Very truly yours,

David B. Hopkins

David B. Hopkins
Counsel for the San Diego
Unified Port District

DBH:aj
cc: Interested Persons (See Attached List)

INTERESTED PERSONS MAILING LIST

PETITION OF THE ENVIRONMENTAL HEALTH COALITION AND EUGENE J. SPROFERA TO REVIEW CLEANUP AND ABATEMENT ORDER NO. 85-91, ADDENDUM NO. 7, OF THE REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION FILE NOS. A-775 AND A-775(a)

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Southern District of California
940 Front Street
San Diego, California 92189

Chambers of
Harry R. McCue
Magistrate Judge

August 31, 1992

Mr. W. Don Maughan
State Water Resources Control Board
901 P Street, Fourth Floor
Sacramento, California 95814

RE: Your File Nos. A-775 and A-775(a)
Petition of Environmental Health Coalition and Eugene J. Sprofera for Review of Cleanup and Abatement Order No. 85-91, Addendum No. 7, of the California Regional Water Quality Control Board, San Diego Region

Dear Mr. Maughan:

I am writing each member of the State Water Resources Control Board to urge that you affirm the cleanup level set in this matter by the San Diego Regional Board of 4,000 ppm copper. I am unable to attend your workshop in this matter on September 2, 1992 because I must be out of state on special assignment from the Ninth Circuit to conduct settlement conferences on a series of Indian property rights cases. I would welcome the opportunity to discuss these issues with you and/or members of your staff at any other time.

I have been a United States Magistrate Judge for the United States District Court of the Southern District of California for over 20 years. I first became involved in these matters in late 1988 when I was assigned the first of several actions filed in federal court involving Paco, the Port District, and various mining companies who were the shippers of copper ore handled by Paco at the Port District's 24th Street National City Marine Terminal (the Mines). In late 1991, based upon my familiarity with the issues, I was also asked by the state court judge presiding over two California state court insurance cases filed by Paco and the Port District against various of their insurance carriers to assist in the settlement of those cases. Our conferences have frequently included staff members from the Regional Board and other environmental agencies.

As a result of years of negotiations, we have reached the point where the cleanup is a reality that can be completed by the current deadline of April 1993, provided the Regional Board's current 4,000 ppm cleanup level is maintained. Reverting to the old cleanup level will likely delay the cleanup and will undoubtedly require the expenditure of millions of additional dollars of both private and public funds.

I am convinced that the 4,000 ppm cleanup level is conservative and sufficiently protective of San Diego Bay. I am acutely aware that the environmental health of San Diego Bay is critical to San Diego. I have a technical background - an undergraduate degree from MIT and ten years experience as a manufacturing engineer. I have lived in San Diego for 30 years and have presided over several environmental cases.

I am persuaded by the technical findings of the consultant of no toxicity at concentrations of as high as 18,000 ppm, that changing the cleanup level to 1,000 ppm instead of 4,000 ppm will produce no demonstrable benefit to the environment. I also understand that the Regional Board staff stipulated at the December hearing that there would be no impact on the beneficial uses of the bay at concentrations much higher than 4,000 ppm.

In late 1989 the focus of our conferences was to expedite implementation of ocean disposal, which was the preferred cleanup methodology, to comply with the then-existing 1,000 ppm cleanup level. It was then that the EPA first indicated that it would almost assuredly not approve ocean disposal, irrespective of the outcome of bioassays. Accordingly, I shifted the focus of the conference to funding additional studies to try to identify an alternative cleanup method.

In a series of conferences attended by Regional Board staff as well as the litigation parties, we succeeded in formulating an alternative method -- the mining company option, under which sediment would be dredged from the bay and shipped back to a mining company for recycling to reclaim the copper. Since then, the parties have held a long series of meetings requiring literally hundreds of personnel hours to refine and fund this plan.

Recent developments have shown that early cost estimates, including those that were reported to the Regional Board in December, were only that -- estimates. The total cost of the sediment cleanup project is now estimated to be almost $5 million. The mining company has supplied new cost estimates to construct the needed facility and to supervise the operation, which now totals $850,000 in capital, administrative, and overhead fees. The mining company will charge a minimum processing fee of $423,450, plus $28.23 per dry ton over 15,000 dry tons. In addition, the current estimates for the costs of dredging, screening, handling, transporting, management fees, materials, conformity testing, project costs and post-cleanup sampling total almost $4 million.

The responsible parties have already spent approximately $1 million on testing and other consultant reports on the sediment cleanup. The Port District has spent approximately $1.6 million on landside cleanup to comply with the portion of the order requiring the abatement of continuing discharges from the site. (These figures do not include attorneys' fees.)

Since the December 1991 Regional Board decision, all efforts have been geared toward devising a processing system at the mine to meet the 4,000 ppm cleanup level and the mining company has conceptually refined the needed improvements to its capital plant and the materials handling process needed to recycle sediment subject to the 4,000 ppm cleanup level. There is a minimum level of copper concentration that the mines can accept for processing. Although the mine's technical staff are comfortable with an average copper content of not less than 4,000 ppm, at this time, it is not certain that the mine's process could accommodate a reduction of the cleanup level.

The working group has found no feasible economical way to dispose of sediment subject to a lower cleanup level. As the staff's draft order notes, ocean disposal has been repeatedly denied for any level of concentration. As a practical matter, based on my years of experience with this case, even if the money were available to fund a stricter cleanup, I see no way that a new cleanup plan could be prepared, approved, and implemented before the end of this dredging season and the current cleanup deadline of April 1, 1993.

Even if a viable cleanup alternative at a more stringent cleanup level could be devised and implemented, it would cost an additional several million dollars. Paco's ability to contribute to the cleanup is entirely dependent upon contributions by its insurance carriers. The carriers are willing to contribute an amount that will make the cleanup at 4,000 ppm feasible. They are not willing to contribute more. If the 4,000 ppm cleanup level is changed to anything more stringent, the tentative agreement we have worked so long to achieve will completely break down.

If the agreement breaks down, the responsible parties will have no funding and will be forced to reactivate all of the pending litigation. This includes eight separate federal court actions, two California state court actions, and three Alabama state court actions. The end result of the litigation may be that Paco will have little or no money left from its insurance coverage or any other source to contribute to the cleanup. While there is no indication that the Port District will run out of funds, reactivation of this litigation will force it to spend millions of dollars of public money to try to recover all or part of the cleanup costs. To avoid the imposition of administrative penalties, I would also expect that the parties would file a writ in state court of any decision changing the cleanup level and to seek a stay of the cleanup order itself. That action would cause the expenditure of public money in the form of attorneys' fees, not to mention the expenditure of the public's judicial resources for all of these actions.

If your Board upholds the 4,000 ppm cleanup level, it is my sincere belief that the parties will promptly consummate their agreement, the proposed cleanup fund will be created and the cleanup will begin. The current schedule provides that the dredging will be completed on or before April 1, 1993. Please confirm Addendum No. 7 to Cleanup and Abatement Order No. 85-91 so that the parties' years of work on this project, and the cleanup, may be completed.

Very truly yours,

Harry R. McCue
United States Magistrate

HRM:gge

cc: Regional Water Quality
Control Board, Region 9
All Counsel
Clerk's Office, SWRCB

INTERESTED PERSONS MAILING LIST

PETITION OF THE ENVIRONMENTAL HEALTH COALITION AND EUGENE J. SPROFERA TO REVIEW CLEANUP AND ABATEMENT ORDER NO. 85-91, ADDENDUM NO. 7, OF THE REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION FILE NOS. A-775 AND A-775(a)

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PORT OF SAN DIEGO
ENVIRONMENTAL MANAGEMENT

PLAN FOR DEVELOPMENT OF FISHERIES DATA FOR SAN DIEGO BAY

by Bernard D. Fink, Fisheries Biologist and Consultant.

The five year action plan developed by the staff of the San Diego Unified Port District notes in its introduction that the port includes among its purposes the promotion of fisheries in the waters over which it has jurisdiction. The introduction also notes, quite correctly, that promoting fisheries requires "protecting" bay waters from additional pollutants, and then ultimately eliminating environmental degradation of the waters, sediments and biota of the bay. Interestingly, though no purposes other than promoting fisheries are mentioned in such an expanded form prior to the setting out of the plan's goals, the plan itself does not pay particular heed to fisheries-related issues, limiting itself to monitoring of what are described as the successful fish aggregation structures placed in the bay over past years.

San Diego Bay has in recent years become the site of a very important sport fishery. The perception of cleaner waters, availability of small-craft launch sites, and reasonably good catches of desirable sport fishes have been major influences in the bay's sport fishing development. Also, degradation of sport fishing in the near offshore areas and in local lakes may have induced fishermen to take a new look at the bay and to partake of its recreational potential. Though it is clear from the observations of long-time fishermen users that the bay is now utilized for sport fishing to a much greater extent than was previously the case, there is no apparent quantification of this increased usage (angler hours) nor are there any data to determine the species composition of their catches and the quantities taken (totally and per unit of effort, i.e., per angler hour). PREMISE 1 NEED

Though a large number of fish species are routinely taken in San Diego Bay, most fishermen are trying to catch barred sand bass (*Paralabrax nebulifer*) and/or spotted sand bass (*Paralabrax maculatofasciatus*), both of which are abundant from the mouth of the bay all the way to or beyond the Coronado Bay Bridge. When there is an influx of other desirable species, such as California barracuda (*Sphyraena argentea*), many anglers - including many that normally do not fish in the bay - will go out after these fish. There is also a cadre of enthusiasts who fish for California halibut (*Paralichthys californicus*), though most of those caught in the bay are smaller than minimum legal size. (The importance of bays in the early life history of the California halibut goes without saying. Hoever, according to National Marine Fisheries Service scientists, this highly desirable sport and commercial fish is not found as juveniles or adults in San Diego Bay in anywhere near the quantities expected, *a priori*, from an analysis of the quantities found in nearby, "similar" environments, such as San Diego's Mission Bay, Ensenada's Estero Bay, etc. This apparent deficiency should be separately studied, evaluated and, if it is real and possible, mitigated.) EXAMPLES EXAMPLE PREMISE 2 NEED

That sport fishermen spend enormous sums of money pursuing their quarry and recreational adjuncts is, or has come to be, an old adage but there has been no quantification of such spending by San Diego Bay fishermen. Some have suggested that such a fishery serves the needs of fishermen without the financial resources to pursue fish on the open ocean and that those who do have such resources do not use the bay except under special circumstances, such as inclement weather. There are, however, no data on the economic well being of the bay's fishermen nor, for that matter, those "local" fishermen who sometimes take their small craft outside the bay to fish, for example, about the abundant (in most years) Point Loma kelp beds and the "flats" off of Coronado.

PREMISE 3

NEED

EXAMPLE

To reiterate, there are little or no data on the levels of the catches of the various fishes of San Diego Bay, the sizes of the fishes taken and the imputed values of the bay's sport fishing activities. There is an equal or greater paucity of data on the biological abundance and availability (to sport fishermen) of any of the species taken in the bay. Little or nothing is known about the relationship of the populations of the two sandbass species taken in the bay with the populations of these same species outside the bay, although biologically, as well as from a management point of view, this is essential information. There is also little known about the species of fish targeted by the fishermen, particularly their patterns of movement and their growth, natural and fishing mortality rates. Gathering of data which can be used to provide such information should be an immediate goal and given a high priority by the port's environmental management group. It should be made an integral part of the five-year action plan, recognizing that it is likely to take the entirety of that period to gather the requisite data and to conduct the relevant analyses. It would represent a highly significant and necessary first step towards fulfilling a specific mandate of the San Diego Unified Port District, much overlooked in the past, the promotion of the bay's fisheries. Because the Port of San Diego does not have fisheries biologists on its staff, it is logical and appropriate that the program be developed with, and conducted by, an outside consulting firm. A moderately specific outline of a basic, three-part program follows. It is recommended that the ports Environmental Management Coordinator peruse this outline and, assuming his agreement that is appropriate and needed, that he then determine how it may best be promulgated and integrated into the total research program to be pursued under the five-year plan.

PLANNING GOAL

LEGISLATIVE MANDATE

CONSULTANT'S PROPOSALS

1) CREEL CENSUS:

After review and analysis of launching/landing and general fishing areas, and consultation with assigned port environmental management staff and harbor police, the consultant will determine appropriate shoreside areas for conducting and will conduct a census of fish catches, landings, sizes, all by species (i.e., in the parlance of the discipline, a creel census), total trip and fishing hours spent, as well as biographical data of the participants.

The interview periods will generally extend from 10 AM until one-half hour after sunset. During the first year of sampling, the sampling effort will be 100 days or more and include a minimum of three weekend days per month and five weekday days per month, all preselected by random methods. If the results of this initial study year indicate a lesser effort will give statistically reliable results, the sampling effort will in subsequent years be reduced to the minimum level necessary. Sampling locations for each sampling day shall be preselected for one half of the sampling days, and on a pragmatic, "most for the least" basis for the other half. No more than two samplers will conduct interviews and gather data on any one sampling day and, when there is more than one sampler, they shall work in different locations.

2) AREAL CENSUS:
To determine where in the bay the fishermen are fishing, the consultant or his samplers will, one weekend day per month (at approximately mid-month), survey the bay three times. This survey will be conducted from a small. reasonably fast outboard-driven boat supplied to the consultant by the Port of San Diego and clearly marked as a Port of San Diego vessel. The Port of San Diego will also supply identifying clothing and badges for personnel engaged in this and all other research related to the contracted study which will clearly indicate to the public that the surveyors are on port-related business. The results of this quantitative, angler-location survey shall be recorded, tabulated by quarters and placed on grid maps delineating major areas.

3) TAGGING PROGRAM:
The consultant will design and implement a tagging program to ascertain basic life history in the bay parameters for both species of sand bass. He will, on the basis of his extensive experience with fish tagging, determine the most suitable type of tag to use for the study. The consultant may, for this purpose, utilize the aquaria and holding tanks at the Southwest Fisheries Center of the National Marine Fisheries Service in La Jolla. The consultant has already determined the probable availability to him of these facilities (Dr. John Hunter, personal communication At a minimum, this will require payment by the consultant to NMFS of the costs of sea water pumped to the facility.

Tagging of fish will be done primarily by sport-fishermen volunteers, some and perhaps many of whom are presently practicing a catch and release program. To the extent that permits are made available by the California Department of Fish and Game and within the limits of practicality, the consultant will employ trap fishing and other commercial fishing gear to catch fish for tagging. All of the taggable fish caught by the consultant will be tagged. The size of each of the individuals tagged will be recorded to the nearest millimeter, in anticipation of receiving from sport fishermen detailed recovery information of some fraction of the tagged, released and recaptured population. To the extent that data are available on size of fish at time of release as well as recapture, the data be used for growth estimations. The program will be given widespread publicity. Posters will be used to enlist taggers and to solicit recovery data. These posters will be placed in landing areas, both public and partyboat, as well as in sportfishing-tackle and bait-supply stores. A nominal non-cash reward (T-shirts ?) will be offered for all returned tags and an annual drawing held to determine a "grand prize" winner.

As there are no estimates of the present catch or abundance of any of the bay fishes, there is no way to estimate in advance how many tagged fishes will need to be released to obtain reliable estimates of their vital parameters. It is reasonable to expect that hundreds of fish will need to be tagged each month and that, from these, it will be possible to obtain a fair indication of the efficiency of this program. In fact, with proper planning and an enthusiastic start, this should be forthcoming within the first year after commencement of the program. If there is a need to significantly modify the program during its course, this will be done only after consultation with, and agreement by, the port's Environmental Management Coordinator.

PORT OF SAN DIEGO UNIFIED PORT DISTRICT

Draft Environmental Impact Report/ Draft Remedial Action Plan

CONVAIR LAGOON REMEDIATION

TELEDYNE RYAN AERONAUTICAL
CONVAIR LAGOON
WDR ORDER: 86-92
ENF. REPORT **FILE:** 12 01/1995-07/2003
02-0381.06 STATUS:C

FILE: Tele... #02-0381.03

Draft

ENVIRONMENTAL IMPACT REPORT
(UPD #83356-EIR-225; SCH #92091011)
REMEDIAL ACTION PLAN

CONVAIR LAGOON REMEDIATION

Report by

Ogden Environmental and Energy Services
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San Diego, CA 92121

June 1993

San Diego Unified Port District
Post Office Box 488
San Diego, California 92112

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* These sections will be added to the Final EIR, printed on blue paper.

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* These sections will be added to the Final EIR, printed on blue paper.

1.0 PROJECT SUMMARY AND MAJOR ENVIRONMENTAL CONSEQUENCES

1.1 INTRODUCTION

The purpose of this Environmental Impact Report/Remedial Action Plan (EIR/RAP) is to determine and address the possible environmental impacts resulting from the remediation of polychlorinated biphenyls (PCBs) from the environment in Convair Lagoon in accordance with the Regional Water Quality Control Board's (RWQCB's) Cleanup and Abatement Order No. 86-92. Convair Lagoon is located in San Diego Bay, just west of the United States (U.S.) Coast Guard facility and south of Harbor Drive.

The proposed project entails the construction of a Nearshore Containment Facility consisting of a sheet-pile bulkhead with a riprap base to accommodate the volume of dredge material and effectively isolate the PCBs from the environment. In addition, a preferred remediation alternative of sand capping the Lagoon and the No Action alternative are evaluated.

The EIR/RAP is an information document written in compliance with the California Environmental Quality Act (CEQA) and Health and Safety Code Section 25356.1 for both the decision makers and the public. Sections of this document to follow: (1) describe the proposed project and its alternatives, their context and environmental setting; (2) evaluate potential environmental impacts resulting from the project and alternatives; and (3) describe measures to mitigate any potential impacts to a level of less than significant. The San Diego Unified Port District is the lead agency responsible for preparation of this document in compliance with CEQA.

Each of the alternatives (i.e., the proposed project, the Sand Capping alternative and the No Action alternative) are summarized below in Section 1.2. A discussion of potential impacts and mitigation for the proposed project (Nearshore Containment Facility) and the preferred alternative (Sand Capping) is also included in Section 1.2 as well as a summary table (Table 1) that compares the significance of impacts between all three alternatives for each of the applicable issue areas.

1.2 SUMMARY OF PROPOSED PROJECT AND VIABLE ALTERNATIVES

Following is a summary of the Nearshore Containment Facility, the No Action alternative, and the Sand Capping alternative. More detailed descriptions are provided in Section 3.0 Description of Proposed Project.

1.2.1 Proposed Project - Nearshore Containment Facility

The proposed project would hydraulically dredge approximately 13,300 cubic yards (cy) of sediment from Convair Lagoon and pump the material into a Nearshore Containment Facility (NCF). The NCF would occupy an area approximately 430 feet x 177 feet along the north side of the U.S. Coast Guard facility and would consist of sheet-pile bulkhead with a rip-rap toe protection blanket installed on the Lagoon floor outside the steel sheet wall to minimize erosion due to wave action. Construction of the inner facility would include placement of an impermeable inner liner of bentonite or similar material to prevent leaching of PCBs. The NCF would accommodate approximately 34,000 cy of dredged material.

A temporary water treatment facility is proposed adjacent to the NCF on U.S. Coast Guard property to treat water generated by the settling of dredged material within the NCF. Water treatment would occur at a rate compatible with the dredging and settling schedule and would consist of three treatment processes in series to remove PCBs and other contaminants before pumping the water back into the Lagoon.

After the dredged sediment has dried and consolidated, a high density polyurethane membrane would be laid over the top of the sediments followed by approximately 14,000 cy of imported fill to bring the facility to an elevation level with shoreside topography. One U.S. Coast Guard 30-inch drain outlet (30 east) as well as smaller drains would need to be relocated to accommodate the NCF.

Measures incorporated into the project to minimize its environmental impacts include the use of a silt curtain to contain suspended sediments within the project area and the replanting of eelgrass once the dredging activities are completed.

1.2.2 No Action Alternative

The No Action alternative would retain the project site in its current condition without cleaning up the PCBs. This is contrary to the RWQCB's Cleanup and Abatement Order No. 86-92.

1.2.3 Sand Capping - Preferred Alternative

The Sand Capping alternative would cover the existing sediment in Convair Lagoon with a layer of uncontaminated "clean" material, consisting of sand, gravel filter material, and riprap (or smaller quarry rock). The layer of clean material would vary according to the concentrations of contaminants, potential wave action, and the depths at which elevated concentrations of PCBs occur, but would be approximately 3 feet in thickness throughout the Lagoon area. Rock would be used in the intertidal areas where protection from wave action is needed. Sand would be used in the other areas of the Lagoon. Since PCBs have a tendency to stay entrained with the marine sediments and to sink deeper into the sediments, a sand cap can provide an effective barrier with minimal biological disturbances. Preliminary design of this alternative also includes the extension of an existing 60-inch storm drain to be anchored with rock.

Measures incorporated into the Sand Capping alternative to minimize its environmental impacts include the use of a silt curtain to contain suspended sediments within the project area, the replanting of eelgrass once the capping activities are completed, and the implementation of a long-term monitoring plan to ensure that the integrity of the cap is intact.

1.2.4 Environmental Comparison of Proposed Project and Preferred Alternative

An analysis of the project and its viable alternatives was conducted to determine significant impacts to the environment. Table 1.2-1 provides a comparative analysis of the level of environmental impact for the Nearshore Containment Facility, No Action alternative, and Sand Capping alternative. Impacts are discussed in greater detail in Section 5.0 Environmental Analysis of Potentially Significant Impacts.

Table 1.2-1

LEVEL OF ENVIRONMENTAL IMPACT FOR THE PROJECT AND TWO ALTERNATIVES BY IMPACT CATEGORY

	Water Quality	Marine Resources	Avian Resources	Utilities	Geotechnical/ Seismicity	Human Health and Safety	Land/Water Use Compatibility	Coastal Access	Coast Guard Operations/ Security	Recreational Boating/Navigational Safety
Nearshore Containment Facility	Significant - Mitigated	Significant - Mitigated	Significant - Mitigated	No Impact	Significant - Mitigated	Significant - Mitigated	No Impact	No Impact	Significant - Mitigated	Adverse - Not Significant
No Action	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Sand Capping	Beneficial	Significant - Mitigated	Beneficial	No Impact	Significant - Mitigated	Significant - Mitigated	No Impact	No Impact	No Impact	Significant - Mitigated
(Levels of Impact - Beneficial, No Impact, Adverse - Not Significant, Significant - Mitigated, Significant - Not Mitigated)										

1.2.4.1 Water Quality

Proposed Project

Disturbance and suspension of PCB-contaminated sediment is expected to occur due to NCF construction and the hydraulic dredging process. The resuspended sediment would eventually settle out, primarily within the project area due to the planned use of a silt curtain, but the contaminants would be spread out over the entire bottom surface within the silt curtain.

The design lifetime of structures such as the proposed NCF is typically in the order of several decades. Therefore, leakage of metal-bearing water into the Lagoon may eventually occur. This is considered to be a significant long-term impact of the proposed project.

Mitigation and monitoring for water quality impacts includes: the dredging of the project area with the highest levels of contamination first, moving from cell to cell in order of the level of contamination, and finally dredging the entire surface of the dredge and silt curtain area, even in those areas that did not originally require dredging; extensive sampling during dredging operations to confirm that the PCB-contaminated sediment has been removed and to determine where final dredging should be performed to remove recontaminated sediments; a continual monitoring program to verify that no leakage of the contaminants is occurring out of the NCF; and repairs of the facility as indicated by the continual monitoring program.

If mitigated as discussed above, long-term beneficial impacts to water quality would occur as a result of this alternative.

Sand Capping Alternative

The Sand Capping alternative has the potential for contaminants to migrate to the surface of the cap through chemical diffusion or bioturbation. However, the alternative includes a monitoring and repair program designed to identify and repair any "leaks" in the cap before significant amounts of contaminants have migrated. The design and precautionary measures already planned for use with this alternative (i.e., the removal of large debris from the area to be capped prior to installation of the cap and the use of a silt curtain during the capping activities) would prevent significant sediment suspension and migration. Therefore, no significant impacts to water quality would occur as a result of this alternative.

Long-term beneficial impacts to water quality would occur as a result of this alternative.

1.2.4.2 Marine Resources

Proposed Project

Approximately 0.39 acres of eelgrass, benthic biota inhabiting the 1.42-acre dredge footprint, and organisms inhabiting 0.31 acres of intertidal habitat in the combined dredge and silt curtain footprint would be lost during dredging operations as a result of the proposed project. This is considered to be a cumulatively significant, although temporary, impact and the project plans to reintroduce the eelgrass once the dredging activities are complete.

Another 1.75 acres of tidally influenced habitat, including 0.21 acres of upper intertidal, 0.29 acres of middle intertidal, 0.24 acres of lower intertidal, and 1.0 acres of subtidal habitat (with 0.39 acres of eelgrass meadows) would be permanently lost as a result of construction of the NCF. These habitat losses are also considered cumulatively significant.

To mitigate significant impacts to marine resources, the following mitigation and monitoring should be incorporated into the project: monitoring outside the silt curtain using real-time turbidity and water column chemical monitoring; return of the Lagoon bottom within the dredge footprint to its original depth using clean sand once the contaminated material is removed; the creation of new intertidal habitat and shallow subtidal habitat; a continual monitoring program (including a mussel watch station and tissue analysis of burrowing organisms) to verify that no leakage of the contaminants is occurring out of the NCF; repairs of the facility as indicated by the continual monitoring program; and sampling after dredging operations to determine if final dredging should be performed to remove recontaminated sediments. Several of these measures are similar to what is recommended as mitigation for water quality impacts.

If mitigated as discussed above, long-term beneficial impacts to marine resources would occur as a result of the proposed project.

Sand Capping Alternative

Construction of the cap would result in the modification of approximately 4.8 acres of tidally influenced habitat, including the modification and replacement of approximately 0.98 acres of lower intertidal habitat and the loss of 0.98 acres of subtidal habitat. The project design, however, includes the construction of a new intertidal area of equal size to the area lost through construction of the cap. Bioturbation, i.e., the potential for burrowing organisms to compromise the integrity of the cap, is considered to be potentially significant, but would be monitored closely by the post-construction monitoring program.

Recommended mitigation and monitoring include: the placement of an 1-foot layer of crushed rock on the existing lagoon bottom to act as a deterrent to deep-burrowing organisms; conducting additional field studies and lab investigations to identify the types of deep-burrowing organisms that might occur and how they might compromise the sand cap integrity; and a contingency plan to describe how significant damage to the cap will be repaired.

If mitigated as discussed above, long-term beneficial impacts to marine resources would occur as a result of this alternative.

1.2.4.3 Avian Resources

Proposed Project

The proposed NCF would extend the northeastern shore of the Lagoon, reducing the open water surface and other marine habitats by 1.75 acres. This loss is considered to be a cumulatively significant impact to avian resources, including the endangered California least tern. Short-term disruption to foraging habitats due to dredging activities is not considered to be significant as long as the dredging activity occurs during the non-breeding season.

Mitigation measures for impacts to avian resources include: limiting remediation activities to the period from late September through early March; providing for the restoration of bottom habitats, specifically eelgrass beds, in the portion of the Lagoon not permanently lost to shoreline extension; and enhancement of degraded eelgrass beds in one other shallow portion of San Diego Bay at a 1:1 ratio for areas of permanent loss of marine habitats.

Sand Capping Alternative

No significant impacts would occur. In fact, increased intertial habitat with eel grass will provide forging areas for other avian species such as the least tern; this is a beneficial impact.

1.2.4.4 Utilities

Proposed Project

No significant impacts would occur; the proposed project includes the reinstallation of an existing 30-inch storm drain that would otherwise be adversely affected by the project.

Sand Capping Alternative

No significant impacts would occur; the Sand Capping alternative includes the extension of an existing 60-inch storm drain that would otherwise be adversely affected by the project.

1.2.4.5 Geotechnical/Seismicity

Proposed Project

Potentially significant geologic and soil constraints to the proposed project include ground settlement due to consolidation of the estuarine/fluvial deposits and the artificial fill soils on site and seismic hazards, including ground shaking, surface displacement, liquefaction and tsunamis. Mitigation for these conditions include incorporating the results of a site-specific geotechnical engineering investigation into the design and construction of the project. A site-specific geotechnical engineering investigation should be performed for each proposed separate structure and should include adequate subsurface explorations and analyses to determine the potential for, and degree of, short- and long-term settlement, expected seismic ground acceleration values, and the potential for seismic ground failure (including liquefaction). Site modification to improve the support capacity of those existing soils, and to reduce long-term post-construction settlement may also be necessary. An evaluation should also be made to consider the stability of the embankment during expected seismic and hydraulic conditions. A site-specific hydrology study should also be performed to address such issues as flooding during high-tide conditions and the effect of wind-driven waves generated within San Diego Bay.

Sand Capping Alternative

The potential for the integrity of the cap to be disturbed and recontamination to occur as a result of boat anchoring is considered to be a potentially significant impact of this alternative. Mitigation includes the adoption an ordinance by the San Diego Unified Port District (SDUPD) that prohibits anchoring within Convair Lagoon. Upon adoption of this ordinance, the SDUPD should notify the San Diego Harbor Police and the U.S. Coast Guard of the anchoring restriction and signs should be posted within the water area along the mouth of Convair Lagoon notifying boaters of the anchoring restriction.

1.2.4.6 Human Health and Safety

Proposed Project

No significant direct short-term or indirect long-term adverse human health impacts should occur as a result of the proposed project as long as exposure to PCB-containing sediment is minimized. To that end, a human health and safety plan that addresses the appropriate use of personal protective equipment and guidelines for containment procedures that minimize contamination migration from the site should be implemented.

Sand Capping Alternative

Significant human health impacts could occur due to direct short-term exposure and indirect long-term exposure if the integrity of the cap is not maintained; however, a monitoring plan would be prepared and implemented to determine whether short-term and/or long-term exposures to PCB-containing media are reintroduced.

1.2.4.7 Land/Water Use Compatibility

Proposed Project

No significant impacts to land/water use would occur as a result of the proposed project; therefore, no mitigation measures would be required.

Sand Cap Alternative

No significant impacts to land/water use would occur as a result of the Sand Capping alternative; therefore, no mitigation measures would be required.

1.2.4.8 Coastal Access

Proposed Project

No significant impacts to coastal access would occur as a result of the proposed project; therefore, no mitigation measures would be required.

Sand Cap Alternative

No significant impacts to coastal access would occur as a result of the Sand Capping alternative; therefore, no mitigation measures would be required.

1.2.4.9 Coast Guard Operations/Security

Proposed Project

No significant long-term impacts to the Coast Guard facilities would occur as a result of the proposed project; therefore, no mitigation measures would be required.

Sand Capping Alternative

No significant impacts to the Coast Guard facilities would occur as a result of the Sand Capping alternative; therefore, no mitigation measures would be required.

1.2.4.10 Recreational Boating/Navigational Safety

Proposed Project

The project has the potential to optimize use of the Lagoon for recreational boating activities by correcting the inadequacies of the size of the land side support. No significant impacts to recreational boating/navigational safety would occur as a result of the proposed project; therefore, no mitigation measures would be required.

Sand Capping Alternative

The potential for the integrity of the cap to be disturbed and recontamination to occur as a result of anchoring within the Lagoon is considered to be a potentially significant impact of this alternative. Mitigation includes the adoption an ordinance by the SDUPD that prohibits anchoring within Convair Lagoon. Upon adoption of this ordinance, the SDUPD should notify the San Diego Harbor Police and the U.S. Coast Guard of the anchoring restriction and signs should be posted within the water area along the mouth of Convair Lagoon notifying boaters of the anchoring restriction.

1.2.4.11 Short-Term vs. Long-Term Productivity

Proposed Project

The proposed project would result in short-term impacts such as disruption of the water and the Lagoon bottom during dredging, construction-related impacts on noise and security to the adjacent U.S. Coast Guard facility, and temporary closure of the Convair Sailing Club. However, the project would create gains in the long-term productivity of the Lagoon area in terms of an overall improvement in water and sediment quality and a reduction in significant bioaccumulations of PCBs in fish and shellfish. A decreased health and safety risk to the human population would result from the project and the creation of a developable water frontage as a result of the proposed fill activities could allow for future long-term socioeconomic benefits.

Sand Capping Alternative

The Sand Capping Alternative would also result in short-term impacts such as disruption of the water and the Lagoon bottom during capping and construction-related impacts on noise and security to the adjacent U.S. Coast Guard facility. The alternative would create gains in the long-term productivity of the Lagoon area in terms of an overall improvement in water and sediment quality and a reduction in significant bioaccumulations of PCBs in fish and shellfish. A decreased health and safety risk to the human population would also result.

1.2.4.12 Cumulative Impacts

No significant unmitigatible adverse cumulative impacts are expected to occur as a result of either of the two alternatives. Either of the two alternatives in conjunction with the proposed removal of copper contaminated sediment at the Paco Terminal would, however, result in a cumulative improvement in both water and sediment quality in San Diego Bay. The cumulative improvement in water quality would also improve conditions for certain marine and avian resources as well as for human health and safety.

1.2.4.13 Growth Inducement

No growth inducement would occur as a result of either of the two alternatives.

1.2.4.14 Unavoidable and Irreversible Significant Environmental Effects

The proposed remediation project or its alternative would result in the incremental loss of water area within San Diego Bay. This is not considered to be significant.

1.3 STAFF RECOMMENDATIONS

To be added to Final EIR.

2.0 INTRODUCTION

2.1 ENVIRONMENTAL PROCEDURES

This Environmental Impact Report (EIR) has been prepared in accordance with the California Environmental Quality Act of 1970 (Public Resources Code, 21000, et seq.), as amended, the Guidelines for Implementation of the California Environmental Quality Act of 1970 (California Code of Regulations, Section 15000, et seq.), as amended, and the Port District's Procedures for Environmental Review (Resolution 83-356). Additionally, this document and its referenced documents meet the requirements for a Remedial Action Plan (RAP) per California Health & Safety Code 25356.1.

2.1.2 Environmental Impact Report

The District has CEQA, Coastal Permit, and public trustee responsibilities for this project. It should be noted that typically hazardous waste remediation activities are exempt from CEQA review under a Class 8 Categorical Exemption. CEQA Guidelines, Section 15308 states that "Class 8 consists of actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption."

Because Teledyne Ryan intends to pursue a remediation activity that involves significant construction (the proposed nearshore containment facility) which involves constructing a bulkhead containment structure, the proposed project is outside the scope of a Class 8 exemption. Therefore, CEQA would require an EIR. As such, the District will act as the lead agency under CEQA.

This EIR/RAP evaluates the environmental effects associated with the remediation of PCBs in Convair Lagoon by constructing a Nearshore Containment Facility (NCF) adjacent to the U.S. Coast Guard station and placing the contaminated sediments within the NCF. This EIR is intended to serve as an informational document in considering whether or not to approve or grant discretionary approvals or permits in connection with the proposed project.

The Port District is designated as the Lead Agency under CEQA in the preparation of the EIR while the Regional Water Quality Control Board is the lead in approving cleanup levels and methods. The project may require the Port's approval of an amendment to the Port Master Plan and issuance of a Coastal Development Permit.

The Regional Water Quality Control Board also has discretionary approval power over the project and will issue a National Pollution Discharge Elimination System (NPDES) Permit, a Report of Waste Discharge Requirements, and a State Water Quality Certification under Section 401 of the Clean Water Act.

The U.S. Army Corps of Engineers (Corps) is a federal agency, and, therefore, is not a Responsible Agency pursuant to CEQA; the Corps, nevertheless, is expected to consider the EIR in granting Section 404/Section 10 Permits.

2.1.2 Remedial Action Plan

Health & Safety Code Section 25356.1 states the potential responsible parties shall prepare a Remedial Action Plan (RAP) for removal and responses to release of hazardous substances. All RAPs are modeled after the National Oil & Federal Substances Pollution Contingency Plan, 40CFR 300.61 et seq. Either the Health Department or Water Quality Control Boards have the authority to approve a RAP.

The contents of a RAP include health and safety risks posed by the hazardous conditions at the site, affects of contamination upon future land uses, beneficial uses or threatened resources in the area, and the affect of remediation efforts on groundwater. A RAP addresses site specific characteristics including mobility of hazardous materials, types of soil and hydraulic conditions, and determine the background level of contaminants prior to the current contamination.

Like an EIR, a RAP evaluates the environmental impacts associated with remedial action alternatives that address treatments which significantly reduce the amount of contaminants or their mobility. Offsite transportation and disposal of hazardous materials will not be considered if other cost effective technologies will treat the contaminated material. In addition, the cost effectiveness of each alternative needs to be included in the evaluation. Each cost needs to address the public health risk and the environmental health risk for each alternatives associated with that cost.

In order for a RAP to be approved by the Health Department or the Water Quality Control Board, the draft document needs to be circulated for 30 days for public comment including, but not limited to, notifying local and state agencies, newspaper notices, and notifying owners of adjacent properties. Public meetings can be held with the lead agencies and responsible agencies overseeing the cleanups. The final RAP will be issued by the Health Department or the Regional Water Quality Control Board after considering all public comments and revised the draft plan, if necessary.

2.1.3 Functional Equivalent Document

This combined EIR/RAP has also been prepared to satisfy the requirements of both the CEQA Guidelines and Health & Safety Code 25356.1 pursuant to Public Resources Code 21080.5 for functional equivalent documents.

2.2 Responses to the Notice of Preparation

The District circulated a Notice of Preperation (NOP) to the Governor's Office of Planning and Research, Responsible and Trustee Agencies, and other interested parties. The District received responses from the following agencies, organizations, and individuals:

- National Oceanic and Atmospheric Administration
- California Department of Fish and Game
- State Lands Commission
- California Coastal Commission
- Environmental Health Coalition
- County of San Diego, Department Health Services
- City of San Diego, Planning Department
- Citizens Coordinate for Century 3
- Thomas K. Wilson

The following issues were raised by the respondents:

- Water quality
- Marine resources and habitats including eelgrass
- California least tern

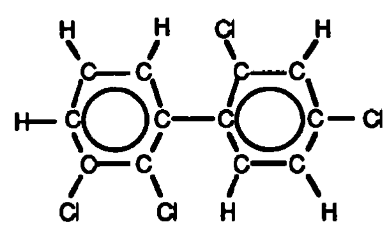
- Land/water use compatibility
- Geotechnical/seismicity
- Human health/safety

2.3 BACKGROUND

Convair Lagoon was created during the 1930s as part of a major project to reclaim land from San Diego Bay. This filled-in portion of the Bay is now occupied by Teledyne Ryan, portions of San Diego International Airport, General Dynamics, and other commercial and industrial activities. The current storm drain system was installed at that time.

The nature and chronology of the events that led to the contamination of Convair Lagoon with PCBs (polychlorinated biphenyls) is unknown. However, much, if not all, of the contamination is suspected to have resulted from industrial and commercial activities taking place on properties north of the Lagoon. The PCBs are suspected to have been accidentally spilled during operations on these properties, entering the storm drains, and ultimately entering the Lagoon.

The term "polychlorinated biphenyls" refers to a large number of chlorinated biphenyl compounds with the following general structure:



The foundation of a PCB molecule is the biphenyl ring (two benzene rings connected together). Any combination of chlorine (Cl) and hydrogen (H) atoms may be connected to the ten available positions on the outside of the ring. Up to 209 combinations are possible.

PCBs were manufactured and commonly used as industrial chemicals with a wide variety of applications for several decades up until the mid-1970s, when production was stopped. In the United States, PCBs were manufactured by Monsanto Chemical Company and were marketed under the trade name "Aroclor." A number of commercial grades were manufactured and were categorized by the relative amount of chlorine atoms in the molecule.

The properties that made PCBs desirable as products in the past also create the environmental and health hazards. These properties include very high stability, especially at high temperatures; very low volatility (ability to evaporate at ambient temperatures); low solubility in water and a high affinity for organic compounds; nonflammability; and a density greater than water. In the environment, PCBs can accumulate to high concentrations in biological tissues, they are relatively resistant to biological degradations, and they adhere strongly to soil and sediments, particularly clays and fine sediments. For these reasons, PCBs are persistent, presenting a long-term environmental impact.

The presence of PCB contamination in Convair Lagoon was first determined during tissue sampling associated with the State of California's Mussel Watch Program (SMW). In 1977, the Regional Water Quality Control Board (RWQCB) established the SMW program to monitor the coastal marine, bay, and estuarine water quality on a long-term basis. SMW used specimens of Bay and California mussels (*Mytilus eduliss* and *Mytilus californianus*) to evaluate the bioaccumulation of trace metals and synthetic organic compounds. From 1979 to 1985, SMW conducted tissue analysis on Convair Lagoon mussels. Results of these analyses and additional sediment samples indicated the presence of PCB contamination in mussel tissue and sediment.

On October 17, 1986, the RWQCB Executive Officer issued "Cleanup and Abatement Order No. 86-92 for Teledyne Ryan Aeronautical near Lindbergh Field, San Diego County" for alleged violations of the "Comprehensive Water Quality Control Plan for the San Diego Basin," and for allegedly contributing to the condition of pollution in the Convair Lagoon portion of San Diego Bay. These violations pertain to the alleged discharge of waste containing PCBs, several trace metals, and volatile organic compounds to the storm drains on Teledyne Ryan Aeronautical property. Cleanup and Abatement Order no. 86-92 required cleanup and sampling of certain storm drain lines and sumps located on the Teledyne Ryan Aeronautical leasehold, sampling in Convair Lagoon, and full characterization of contaminated sediments in Convair Lagoon. On December 9, 1991, the RWQCB issued a final order to Teledyne Ryan to cleanup the PCBs in the Lagoon below 10 parts per million (ppm) by June 1, 1994.

On July 14, 1992, the Board of Port Commissioners (Board) considered Teledyne Ryan's proposed remediation project to remove PCB-contaminated sediments in Convair Lagoon, San Diego, California. The Board directed the preparation of an environmental document to evaluate the potential environmental effects of such a project and consider alternatives to the intrusiveness of the confined disposal facility.

3.0 DESCRIPTION OF PROPOSED PROJECT

3.1 PURPOSE AND OBJECTIVES OF THE PROJECT

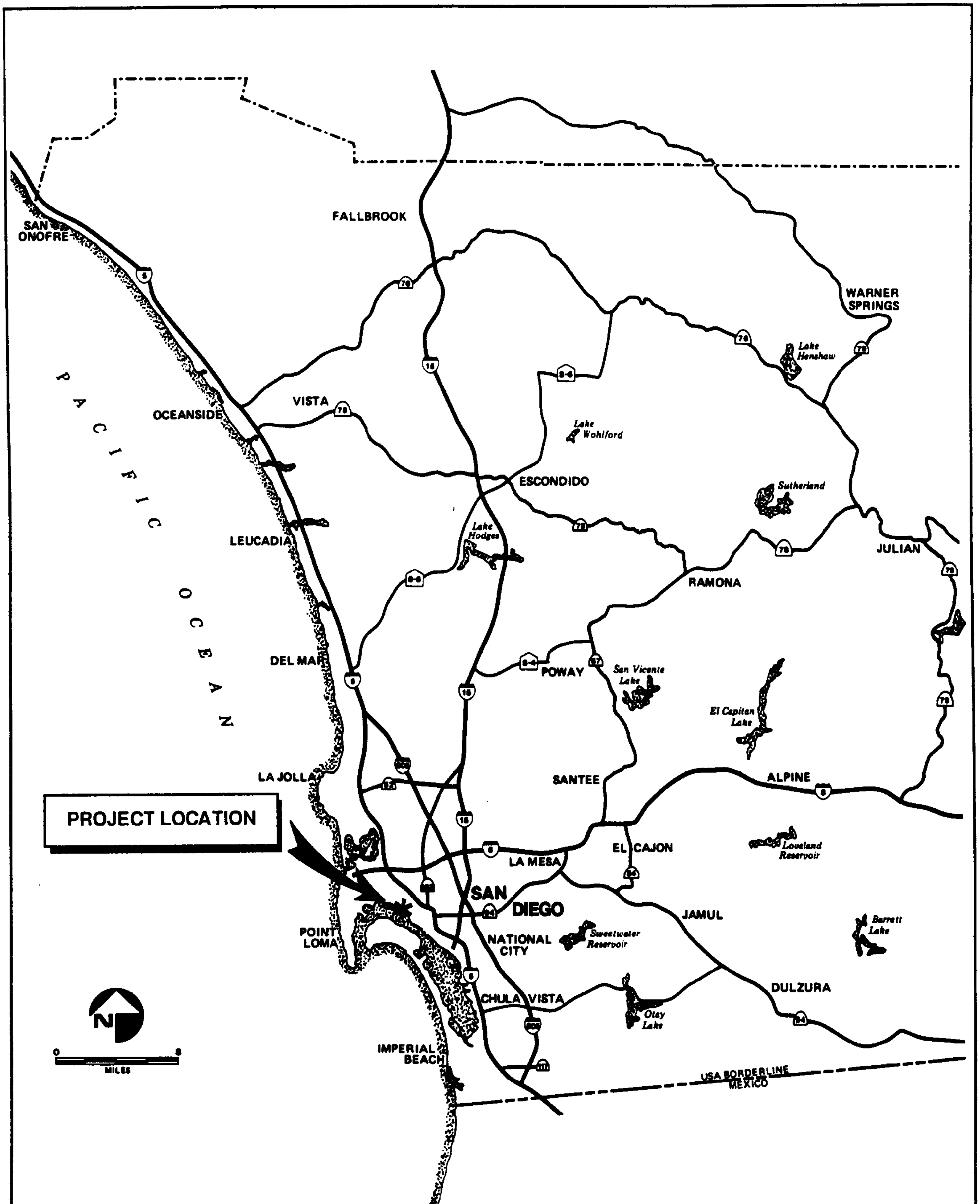
The purpose of the project is to isolate PCBs from the environment. On October 17, 1986, the Regional Water Quality Control Board (RWCQB) Executive Officer issued "Cleanup and Abatement Order No. 86-92 for Teledyne Ryan Aeronautical Near Lindbergh Field, San Diego County" for alleged violations of the "Comprehensive Water Quality Control Plan for the San Diego Basin," and for allegedly contributing to the condition of pollution in the Convair Lagoon portion of San Diego Bay. Cleanup and Abatement Order no. 86-92 required cleanup and sampling of certain storm drain lines and sumps located on the Teledyne Ryan Aeronautical leasehold, sampling in Convair Lagoon, and full characterization of contaminated sediments in Convair Lagoon. On December 9, 1991, the RWQCB issued a final order to Teledyne to clean up the Lagoon below 10 ppm by June 1, 1994.

3.2 LOCATION

The proposed Convair Lagoon Remediation Project is located within the eastern portion of Convair Lagoon, San Diego Bay, in the City of San Diego, in San Diego County (Figures 3-1 and 3-2). The proposed project is located immediately west of the U.S. Coast Guard facility and immediately south of Harbor Drive.

3.3 PROJECT DESCRIPTION

The proposed remediation project for Convair Lagoon consists of a combination of dredging and containment to isolate PCBs from the environment. Approximately 13,300 cubic yards of sediment would be hydraulically dredged from the Lagoon and pumped directly into a Nearshore Containment Facility (NCF). A detailed "Basis of Design Report" was prepared for the NCF in Convair Lagoon and is included as Appendix A. The NCF would consist of a sheet-pile bulkhead with a riprap base which would accommodate the volume of dredge material, provide sufficient volume for the settlement of dredge material, and effectively isolate PCBs from the environment by construction of impermeable walls and the installation of an impermeable surface liner (Figure 3-3).

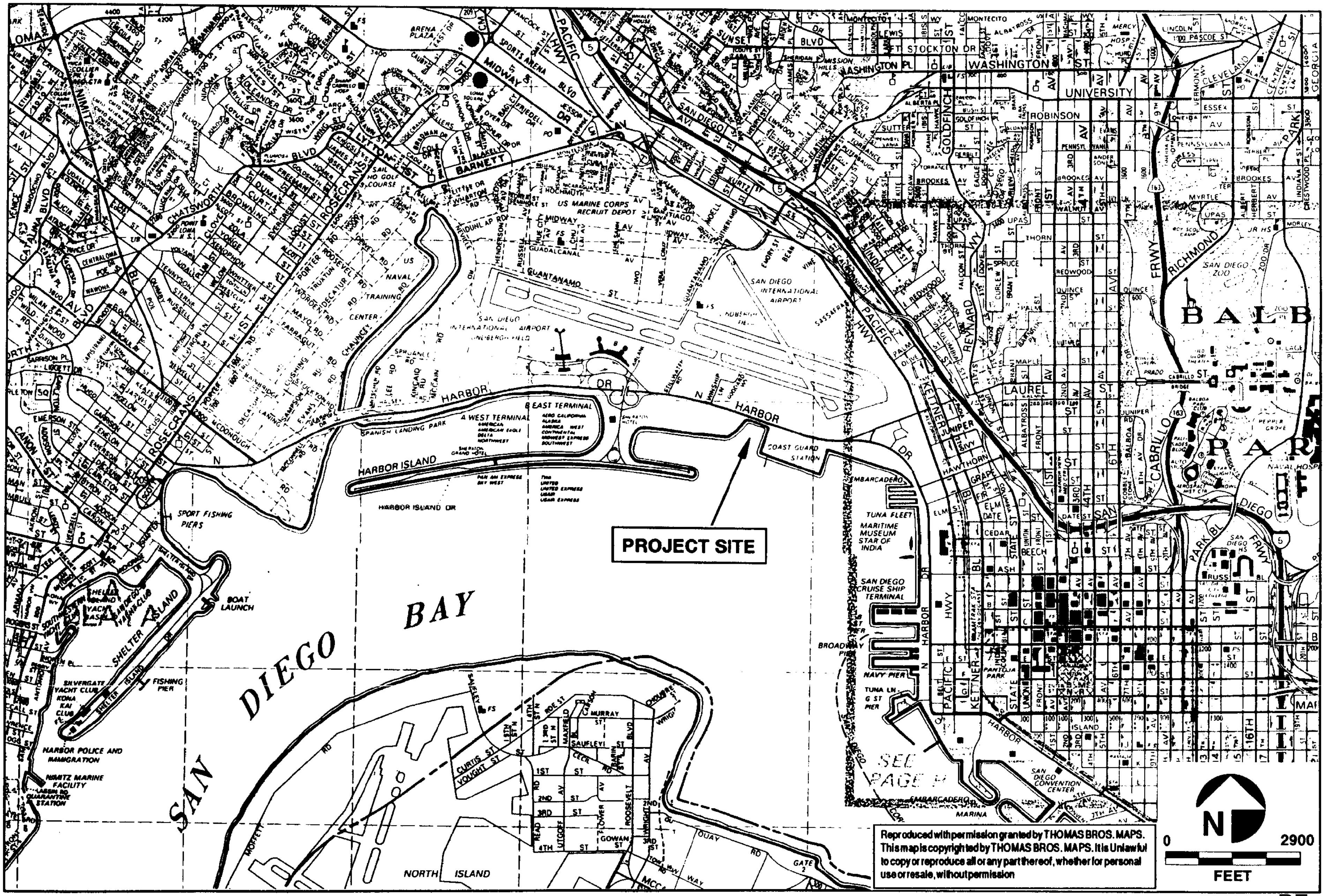


FIGURE

3-1

OGDEN

Regional Location of Project Site

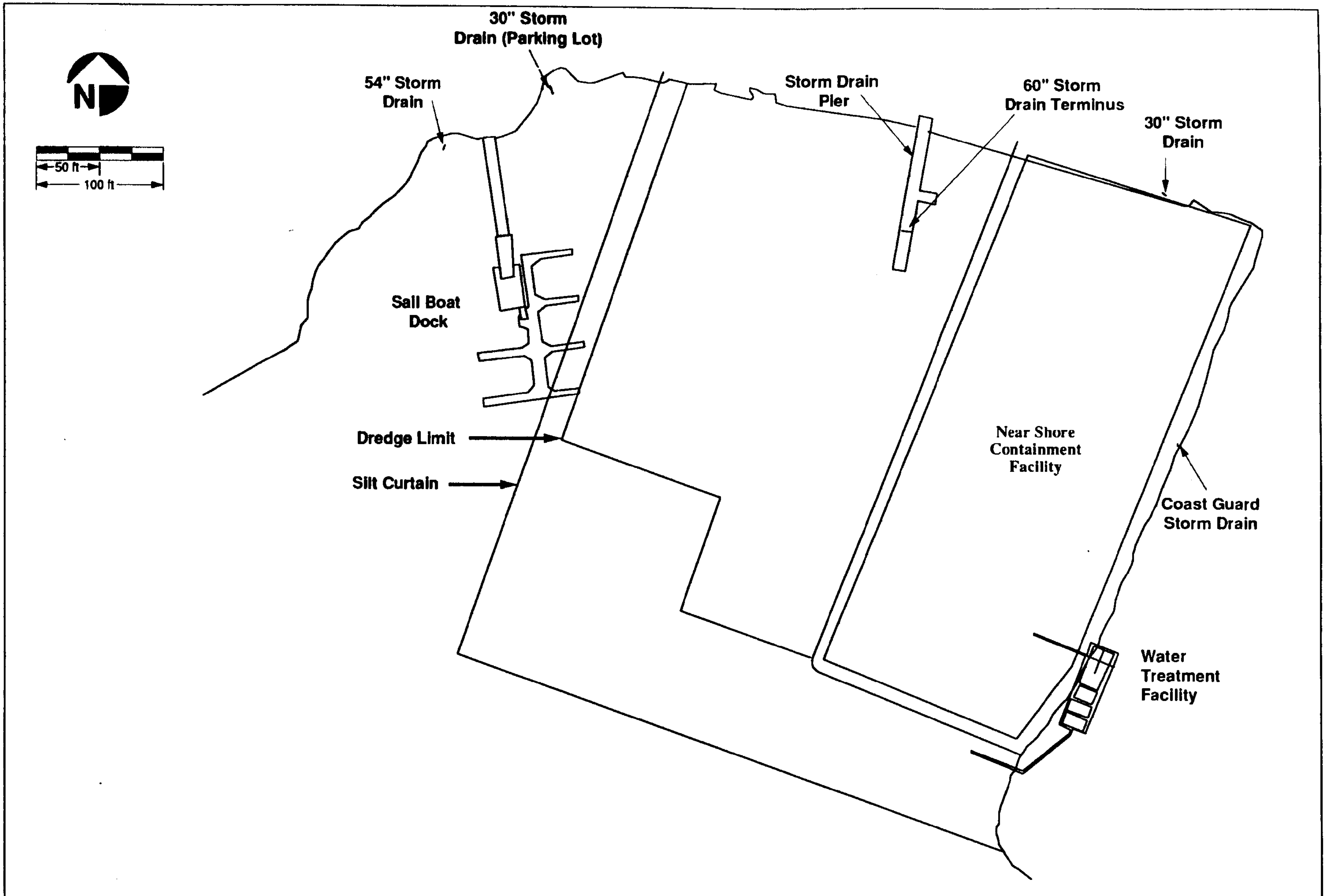


OGDEN

Site Vicinity Map

FIGURE

3-2



OGDEN

Proposed Nearshore Containment Facility

FIGURE 3-3

The NCF would occupy an area approximately 430 feet x 177 feet along the north side of the U.S. Coast Guard facility. The facility would accommodate approximately 34,000 cubic yards of dredge material and the steel sheet piling would be constructed to an elevation of 12 feet to provide 2 feet of freeboard dredging. The riprap toe protection blanket would be installed on the Lagoon floor outside the steel sheet wall to minimize erosion due to wave action. Construction of the inner facility would include placement of an impermeable inner liner of bentonite or similar material to prevent leaching of PCBs into the Lagoon.

Settling of dredged material within the NCF will generate water which must be treated in a treatment facility; a temporary water treatment facility (WTF) is proposed adjacent to the NCF on U.S. Coast Guard property. Treatment would occur at a rate compatible with the dredging and settling schedule, and three treatment processes in series would be used to remove PCBs and other contaminants from the water which would then be pumped back into the Lagoon. Monitoring would be conducted in the sediment and in the water column during and immediately following the remediation to document the success of the dredging and to ensure continuing water quality. In addition, piezometers would also be installed to monitor the long-term performance of the NCF.

After a period of several months, the dredged sediment would consolidate and dry out, at which time approximately 14,000 cubic yards of imported clean fill would be placed on top of the sediments to bring the facility to an elevation level with shoreside topography. Prior to placement of this fill material, a high density polyurethane membrane would be laid over the top of the facility to prevent infiltration of rain or runoff.

The proposed location of the NCF in the northeast corner of the Lagoon would not cover the 54-inch, the western 30-inch, or the 60-inch drain outlets. However, the proposed NCF would cover the present location of the eastern 30-inch drain outlet and the smaller Coast Guard Station drains.

Based upon an onsite investigation, two alternatives for the 30 east drain were identified. In the first alternative, the 30 east drain would be extended southwest through the NCF to a new outfall location behind the NCF bulkhead wall. The extension would continue in the same direction as the existing pipe (no bends), would be larger than the existing pipe to reduce backpressure effects due to its greater length, and would be pile-supported across the NCF to avoid settlement damage to the pipe extension. In the second alternative, the

30 east drain pipe would be terminated in a manhole at a point landward of the beach and rerouted to the west beyond the NCF and then south to the Lagoon next to the 60-inch outfall. Two new manholes would be required and two changes in direction would be introduced. Hydraulic analysis indicates that the second alternative is the best option for the 30 east pipe.

Estimated cost for constructing and monitoring the NCF, excluding the mitigation cost for filling in the bay, is about $10,000,000.

3.4 Alternative Forms of Remediation

CEQA requires that an EIR "(d)escribe a range of reasonable alternatives to the project, or to the location of the project, which could feasibly attain the basic objectives of the project, and evaluate the comparative merits of the alternatives." For the purpose of this EIR, four alternatives have been identified which could eliminate or reduce the impact resulting from the presence of PCBs in Convair Lagoon. These alternatives are subsurface bioremediation, chemical fixation, incineration, and capping of contaminated bottom sediment. CEQA also requires that the specific alternative of "no project" be evaluated. This EIR evaluates all viable alternatives at the same level of specificity as the proposed project to allow the Board of Port Commissioners and other decision-making bodies to reach consensus on a reasonable approach to remediating the impacts.

Because the purpose of this project is to remediate the impacts of PCBs in Convair Lagoon, alternative sites will not be considered.

3.4.1 No Action

The No Project or No Action alternative would retain the project site in its current condition including the presence of PCB contaminated sediments. This alternative would be contrary to the RWQCB's "Cleanup and Abatement Order No. 86-92 for Teledyne Ryan Aeronautical Near Lindbergh Field, San Diego County." "Where short term risks and effects can be tolerated and statutes do not require remediation or establish other preferences . . ., the preferred remedy is to implement pollution prevention measures and source controls and to allow natural cleanup processes such as biodegradation and the deposition of clean sediments to restore the site (EPA 1992)."

3.4.2 Incineration

This alternative first involves the removal of contaminated sediments by dredging in increments to the desired depth. The removed sediment slurry would then be pumped to a barge for dewatering. Recovered water would be treated as necessary and returned to Convair Lagoon. The dewatered sediment would be transported by truck to an incinerator specially permitted to burn PCBs in accordance with TSCA (Toxic Substances Control Act) standards.

Incineration is a demonstrated technique for effectively destroying PCBs. For materials containing high concentrations of PCBs, incineration is the preferred method of treatment. However, in this application to the remediation of Convair Lagoon, the option of dredging and incineration creates a number of negative impacts. Dredging of the sediment creates the potential to resuspend and redistribute contamination within the Lagoon and possibly into San Diego Harbor if silt curtains are not completely effective. Dewatering would require treatment of the resulting water prior to discharge into the Lagoon.

Approximately 22,000 cubic yards of sediment would have to be dredged out of the Lagoon in this alternative. Loading of the sediment into trucks, and transportation to a licensed PCB incineration facility would involve considerable logistics. The closest incinerators capable of treating the quantity of sediment that must be dredged from Convair Lagoon are in Texas and Arkansas. Transportation of 22,000 cubic yards of sediment would involve over 2,000 truckloads of sediment.

Shipment of the sediments would have to be done in leakproof covered containers (such as roll-off bins) or truck trailers. Liquids cannot be allowed to drain out of the bottom of the container. The shipment of the sediment would create the potential for a release of PCBs as a result of a traffic accident. Although a release would not create an immediate acute hazard (such as a release of toxic vapor), there would be the potential for skin contact. Also, extensive cleanup would have to be done to meet PCB spill cleanup requirements mandated by the Environmental Protection Agency. For example, a spill of PCBs onto the ground or onto pavement would require thorough cleaning of the soil or pavement, or removal, followed by the collection and analysis of samples to confirm that the cleanup or removal was effective. The handling and conveyance of the sediment from the dredging equipment through dewatering and into the trucks would also create the opportunity for an accidental spill of PCB-contaminated sediment in the staging area adjacent to the Lagoon.

Although incineration is a demonstrated technique for destroying PCBs, the cost of the process is high. The estimated cost depends upon the amount of sediment to be removed, the dredging and dewatering systems, transportation fees, and incineration fees. The combined cost could likely range from $40 to $100 million. Factoring in the cost of the alternative, and the potential for impacts on human health through accidental releases during handling and transportation, this alternative is not considered to be viable.

3.4.3 Subsurface Bioremediation

Bioremediation is a process by which organic chemicals are literally consumed as a food or energy source by microorganisms (typically bacteria). Bioremediation has been applied extensively to the cleanup of hydrocarbon fuels, such as gasoline and diesel fuel, in soil on land. Although PCBs are known to be very resistant to microbial degradation, research has shown that under the right conditions, they may be degraded. However, the rate of degradation of PCBs is considerably slower than for hydrocarbon fuels.

This alternative proposes to use an experimental system consisting of a hollow caisson, such as a vertical concrete storm drain pipe section, with a rotating impeller suspended through the axis of the pipe. This technology is believed to be adaptable from similar applications. Remediation occurs as the caisson is advanced into the PCB-contaminated sediments. The impeller mixes the sediment as nutrients are added. With the addition of nutrients, the native PCB-degrading microorganisms are stimulated to degrade the PCBs.

Although this alternative is theoretically possible, a number of problems prevent this alternative from being successful during the time frame necessary to complete this project. Bioremediation is not effective in completely removing contaminants, but rather accomplishes only bulk removal. Theoretically 90% degradation of PCBs may be achievable with bioremediation; however, this level of removal would not meet the cleanup criteria of 10 ppm in the more heavily contaminated areas of the Lagoon.

Compared to other common remediation processes for contaminated soil, bioremediation is a relatively slow process, even for readily biodegradable materials, such as gasoline. PCBs are slower to degrade than fuel hydrocarbons. Current research indicates that the microbiological degradation of PCBs is a two-stage process. The first stage is anaerobic in which specific microorganisms essentially remove chlorine atoms from the PCB molecules.

The second stage is aerobic in which a different group of microorganisms degrade the biphenyl foundation to relatively harmless by-products. The two stages require significantly different conditions and cannot be done simultaneously.

Even with multiple caissons, mixing sediment and nutrients in one area, and then moving on to another area, this process is expected to require years, and still not reach the necessary cleanup levels. The effects of the elevated levels of heavy metals on the microorganisms are unknown, and would require treatability testing to determine their viability. Also, bioremediation is not an effective technique for destroying or removing heavy metal contaminants.

This technique would homogenize the sediment, causing some of the more heavily contaminated areas to be brought up to the water-sediment interface. This could potentially create impacts on water quality, and ultimately, marine resources.

Bioremediation has not been demonstrated on a large scale in a marine environment, such as would be required in Convair Lagoon. A series of bench- and pilot-scale treatability tests would be necessary to demonstrate the viability of this alternative, and to develop full-scale design criteria.

With the lack of definition of this alternative and the lack of comparable demonstrated experience on the scale of this project, it is difficult to accurately estimate the cost of this alternative. However, with the considerable processing and handling necessary, this alternative is anticipated to cost at least $40 million.

Considering that the likelihood of success of this alternative is uncertain at best, and considering the long time necessary to accomplish the cleanup (and the shortfall in attaining the mandated cleanup level), this alternative is not considered viable.

3.4.4 Chemical Fixation

Chemical fixation is performed in a specially designed processing unit by adding a predetermined reagent formulation to the waste material. Through a series of chemical reactions, the contaminated soils or sediments become encapsulated, rendering them safe, non-polluting, non-leachable, and chemically and physically stable. Following stabilization, the material may be placed back into the site or sent to a municipal landfill.

Chemical fixation involves a chemical bonding of the contaminants to the binding agent. It is unlikely that a single binder will fix both the PCBs and the heavy metal contaminants in the sediment. However, other processes (including stabilization, solidification, and encapsulation) are available that create a solid matrix that immobilizes and isolates the contaminants from the environment. Binders for stabilization, solidification, and encapsulation typically include cement, pozzolanic agents (similar to cement), silicaceous compounds, and polymers. For the purposes of this discussion, all of these related processes are included. It is important to recognized that some areas of PCB contamination in the Lagoon exceed the maximum limits of 200 parts per million established by some of the particular processes.

For this application, it is anticipated that 22,000 cubic yards of contaminated sediment would be dredged from the Lagoon and pumped to a processing unit on the shore adjacent to the Lagoon. In this unit, the sediment would be dewatered as necessary, followed by mixing with the binding agent and other chemicals as necessary. The slurry of sediment, water, and binding agent would then be pumped to a location where it would be allowed to set or cure. Once cured, the resulting solid matrix would be broken or ground up and returned to the Lagoon or transported to a landfill.

This alternative has been identified as potentially applicable to Convair Lagoon, but has not been well defined. In addition to the uncertainty of the technical feasibility, a number of factors have been identified that jeopardize the viability of this alternative. These factors are described below.

The long-term viability of the process depends on the ability of the matrix to remain intact. Should the matrix break down, the PCBs and/or metals could be released into the environment. The marine environment is particularly aggressive, and as such, the matrix would be more susceptible to degradation. The processes that use cement or pozzolanic materials may be complicated by the fact that PCBs and oil in the sediments, and halides, such as the chloride, in seawater retard the setting process. This would lengthen the setting time, and could reduce the strength of the solid matrix which, in turn, would jeopardize the ability of the matrix to retain the contaminants. Halides also tend to be easily leached from the solid matrix, potentially compromising the stability of the matrix.

Adding a binder to the sediment would increase the volume of material that is either returned to the Lagoon or sent to a landfill. If the material is returned to the Lagoon, the additional volume could reduce the amount of intertidal habitat available or create new uplands. Also, since the solid would be in the form of rock-like chunks or gravel, the nature of the matrix may not be compatible with the desired flora and fauna in the Lagoon. Even though the stabilized material would immobilize and isolate the PCBs and metals, it is likely to be difficult to find a municipal landfill that would accept the resulting solid since it would still contain PCBs.

Polymers may also be used to stabilize the sediment. Polymers that have been used for stabilizing contaminated soils include thermoplastics and urea-formaldehyde resins. Both of these processes introduce hazardous materials into the process, either through the use of the original monomers or through plasticizers that participate in the reactions. PCBs and oils may retard the set of urea-formaldehyde polymers.

Dewatering is likely to be required for any of the processes. As such, wastewater treatment, similar to the requirements for the nearshore containment facility, would be necessary. The processing equipment and space to set or cure the solid will require area that is limited in the vicinity north of the Lagoon.

The processes required for chemical fixation would require considerable handling and processing. The ability of these processes to effectively treat the PCB and metal contamination is best characterized as uncertain. A series of treatability tests would be necessary to determine the effectiveness of the process, as well as to develop the data necessary to design the process. The long-term viability of the solid matrix is also unknown. Although the PCBs and metals would be better isolated under this alternative than under the No Action alternative, long-term monitoring would be necessary to ensure that the contaminants continue to remain out of the environment.

This alterative is not well defined and an accurate estimate is not possible without additional testing and design. However, with the considerable processing and handling necessary, this alternative is expected to cost at least $30 million. Combining this with the uncertainty of the technical feasibility and other issues, this alternative is not considered viable.

3.4.5 Capping of Contaminated Bottom Sediment

The Sand Capping alternative would cover the existing contaminated sediment in Convair Lagoon with a layer of uncontaminated "clean" material. Based upon similar capping projects, the feasibility level costs for this alternative may range from $1-2 million. The following discussion provides an overview of the capping technology, the physical and biological constraints to capping in Convair Lagoon, and a conceptual capping plan.

3.4.5.1 Overview of the Capping Technology

Capping Concept

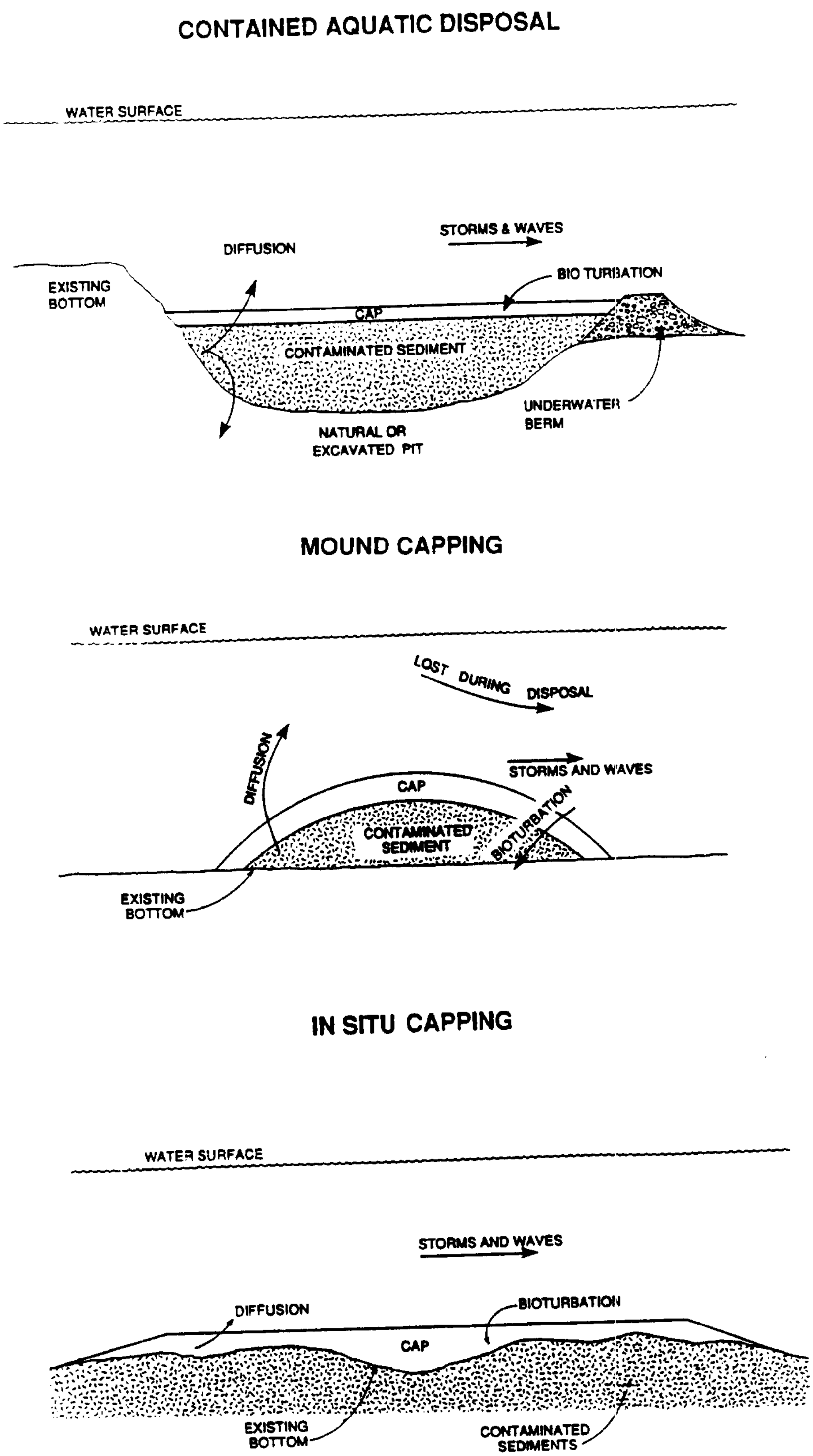
Capping is used as a containment technology for contaminated sediments in rivers, baysestuaries, and oceans, both nationally and internationally. As defined in this context, capping is the controlled and accurate placement of a clean isolating layer of material over clean or contaminated subaqueous material (sediment). Capping has been used for isolating contaminants in material that has been removed or "dredged" and placed in a subaqueous environment, and for containing sediments that remain in place. The following provides a definition of the capping methodologies used:

- Contained aquatic disposal (CAD): removal of sediments and placement of the sediments into an existing depression or pre-excavated disposal pit followed by capping with clean dredge sediment or sand.

- Mounding: level bottom dumping of materials in a discrete mound, followed by capping. Mounding is often used in subtidal areas where is it impractical to excavate a pit for containment. Material is dumped in a cohesive mass that forms a mound and is then capped with clean sediments.

- *In situ* capping: emplacement of clean material over in-place contaminated material. *In situ* capping is used when it is preferable to contain the sediment in place rather than to remove it. The majority of the materials used in *in situ* capping are clean dredge material and processed sand. Liners have not been routinely used and are experimental.

Figure 3-4 illustrates the three forms of capping defined above.



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Three Forms of Capping

FIGURE 3-4

Development Status and Overall History of Application

One of the first documented projects to apply the capping technology was conducted in 1977 by the Army Corps of Engineers, New England Division (O'Connor 1983). Discussions with the Army Corps of Engineers (Dr. Fredette 1991), indicate that capping of contaminated sediments to protect the environment has also been conducted by de facto (not mandated by regulatory agencies) as early as 1967. The concept of containing sediment contamination by placing a clean layer of isolating media has been used in government dredge disposal projects (New York Mud Dump), Superfund remediation (Simpson Kraft), and for privately funded remediation projects (Portland General Electric) (see Appendix B). Capping has also been used for bottom stabilization of sediments (Lofgren 1990) as well as contaminant isolation.

Appendix B lists selected capping projects both nationally and internationally. All of these projects involve capping of contaminated sediment with inert material (most frequently dredge sand). *In situ* capping projects include:

- Denny Combined Sewer Overflow (CSO) constructed in 1990, Seattle, WA.
- Pier 53 in Elliott Bay constructed in 1992, Seattle, WA
- Simpson-Kraft constructed in 1988, Tacoma, WA
- Several Japanese projects (Kure Bay, Lake Biwa, and Hiroshima Bay) constructed in the 1980s

Examples of contained aquatic disposal (CAD), level bottom dumping (LBD), as well as *in situ* capping are also described in Appendix B. The Duwamish Waterway project is a CAD project constructed in 1984 that has been monitored since construction to determine the effectiveness of the capping in containing polychlorinated biphenyls (PCB) contamination. Other projects in New England involving mound capping also provide insight into the long-term application and effectiveness of capping.

Principles and Objectives

The principle of the capping technology is to contain the sediment contamination in the nearshore and aquatic environment, and prevent exposure to the biota and physical surroundings by placing an isolating media over the contaminated sediments. The cap material may also be required to provide a suitable biological habitat.

The objective in applying capping is to confine the contaminated sediment and prevent chemical and biological exposure. Cap integrity should be maintained given physical factors such as wave action and boating impacts. These cap design objectives should be met given the following considerations:

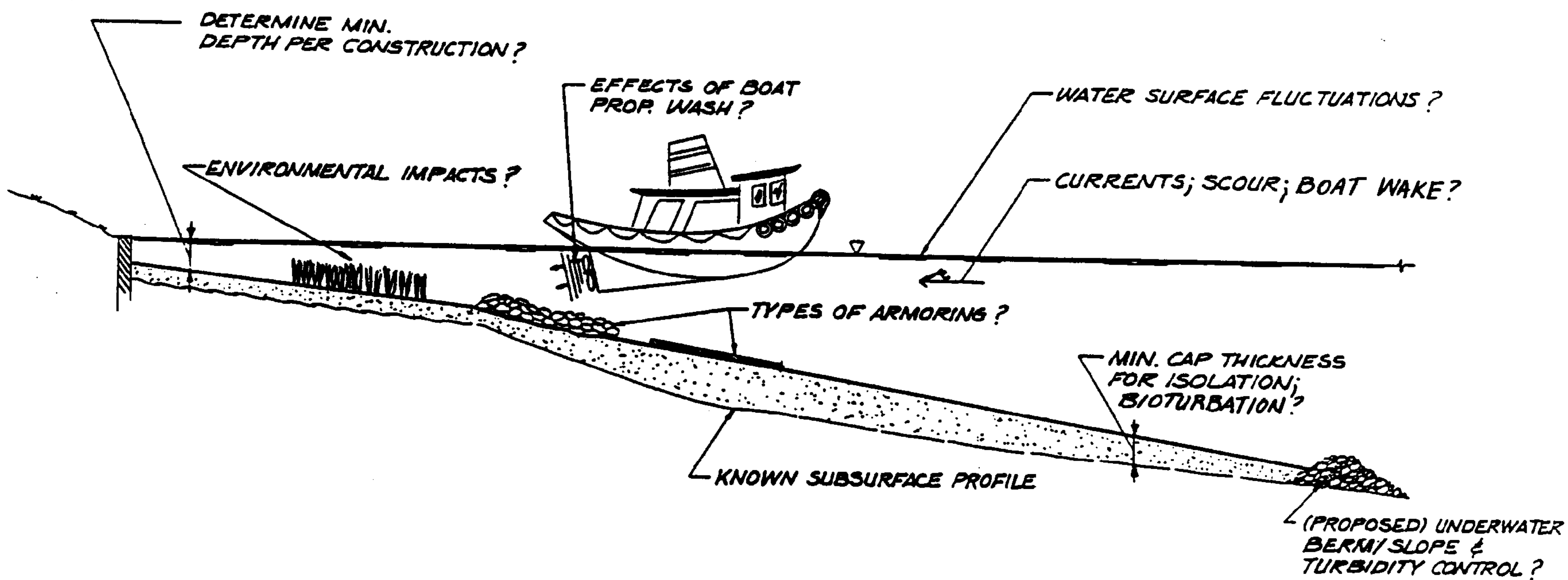
- the characteristics of the sediment to be capped
- cap material characteristics
- site characteristics: physical and biological
- cap placement and construction
- short and long-term monitoring

Factors that Impact the Effectiveness of Capping

A cap is effective if it isolates the contaminants given the physical and biological influences at the site. A cap must be designed to account for potential failure due to chemical diffusion, bioturbation (the action of biota burrowing and tube building in the sediment), and physical effects such as currents and boat propwash. Figure 3-5 illustrates the issues impacting a capping project. The type of material, thickness, and placement all impact the effectiveness of the cap. The impacts of diffusion, bioturbation, and physical constraints are briefly reviewed as follows.

<u>Cap Thickness and Chemical Diffusion</u>

Both laboratory and field studies have been conducted on the effectiveness of varying types of capping material (O'Connor, Brannon, Sumeri, Stanton studies). The effectiveness of capping contaminated sediments using various materials of differing thickness has been researched in laboratory studies (Brannon 1987). These laboratory studies attempted to simulate the water column in determining the required cap thickness for chemical isolation.



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Capping Issues

FIGURE 3-5

Brannon's study (1985) used laboratory reactor cells to test sand and silt caps for chemical isolation. In all cases, a 50-centimeter (cm) cap provided adequate isolation when non-burrowing clams and burrowing polychaete were added. It should be noted that some chemical isolation was found with as little as 5 cm (2 inches) of cap, with the greatest chemical isolation found with a 50 cm (20 inches) cap thickness.

Similar laboratory studies were conducted (Gunnison, et al. 1987) to determine the minimum thickness of cap to prevent chemical diffusion and bioturbation. Small reactor cells were used to assess the cap thickness. The study showed that a 30 cm (12 inches) cap effectively isolated the contaminated sediment (polycyclic aromatic hydrocarbons (PAHs), PCBs, and heavy metals) from the overlying water and biota. To protect against burrowing biota an additional 20 cm (8 inches) of cap was recommended for a total cap thickness of 20 inches.

Various types of capping material (sand, silt, clay) have been tested to determine their ability to control chemical diffusion and limit bioturbation (Bosworth 1990). In the study by Wang et al. (1991) four different types of capping material were tested that varied in composition, bulk density, and organic carbon. The capping material was tested in a reactor cell that mimicked the aquatic environment. The goal was to determine the "break through time" of the cap, or the time when contaminants are not contained by the cap. This data provides valuable information on the impacts of varying material characteristics (such as organic carbon and grain size) on the effectiveness of the cap.

In summary, chemical isolation varied with differing cap materials and thickness. In general, a minimum of 20 cm (8 inches) and up to 50 cm (20 inches) was found to maintain chemical isolation.

<u>Cap Stability and Physical Impacts</u>

Field studies and long-term monitoring also provide valuable data on the effectiveness of capping. Both sand and silt were used to cap contaminated sediment at the Central Long Island Sound site. Fine, silty material was capped with sand in one location and silt at another location. The two sites were then monitored to determine the effectiveness of the different cap material in isolating the contaminated sediments (O'Connor 1983).

Both materials were found to successfully contain the sediments; however, since the sand cap was not cohesive, it was placed more uniformly than the cohesive silt. This even coverage resulted in a more stable cap design. Subsequent investigations have shown that the sand cap remained in place during major hurricane events, while the silt cap experienced some erosion (Stanton undated).

Cap material selection must consider the hydraulic conditions at a site. The capping project at Portland General Electric was a high-energy intertidal site that required special design to prevent erosion of the cap (Sanders 1990). The cap design accounted for the impact of wave action and boat wakes as well as storm events on the cap. The cap was composed of a sand layer and a layer of "armor" material. The armor material prevented the erosion of the protective sand layer.

Capping for Biological Isolation

Of key interest in the *in situ* isolation of contaminants is the potential of disruption of the clean sediment layer. The clean sediment layer should isolate both chemically and biologically; therefore, the impacts from benthic organisms redistributing sediment by burrowing, ingestion/excretion, tube building, and other activities (called bioturbation) are a key concern. The depth of bioturbation is very site dependent. The cap must be of adequate thickness to prevent the majority of burrowing aquatic organisms from reaching the contaminated sediment and should provide a suitable media for their recolonization. The activities of these benthic organisms should be well known prior to proposing any action at any contaminated sediment site. More detailed discussions of bioturbation at Convair Lagoon are presented in Section 5.2.

Previous studies and projects indicate that capping has been used to effectively isolate contaminated sediments. Capping has been applied to both subtidal and nearshore environments (see Appendix B).

For a cap to be effective it must be designed and constructed to maintain physical, chemical, and biological isolation. Suitable capping material should be selected to insure effectiveness of the cap given the site conditions. The cap should be designed and constructed to resist erosion and bioturbation.

To determine if capping can be applied effectively at a given site, physical and biological characteristics or constraints of the site must be identified.

Case Studies for Capping Contaminated Sediment

The long-term monitoring of past capping projects presents information on the effectiveness of capping in isolating contaminated sediment. Observations of capping projects over several years (over 11 years in New England and over 7 years in Puget Sound) indicate that the cap has effectively isolated the contaminants (Sumeri, et al. 1991).

Contaminated dredge sediment was capped in Central Long Island Sound in 1979. Results from the 1990 sediment coring project of the cap indicate that chemical diffusion had not occurred. The cap isolated the PCBs, PAHs, and metals in the sediment. With cap thickness ranging from 54 to 140 cm, only the lower 10 cm (4 inches) was considered the transition zone where some mixing of the cap and sediment occurred.

Similar results were obtained at the Mud dump site in New York. In a cap with an average thickness of 1.1 meters, there was a sharp chemical interface between the cap and the contaminated material. The cap continues to effectively isolate the contaminants (PCBs, pesticides).

In Seattle, Washington, the capping project on the Duwamish Waterway was carefully monitored over a five-year period (monitoring is ongoing to date). Sediment cores were taken to determine if the cap was effectively isolating the PCB contaminated sediment. The sediment profiles showed that there had been no diffusion between the contaminated sediment and the cap. Similar results have been found in a recent Seattle capping project. Monitoring of the Denny CSO capping project has found no observable movement of the contaminated sediment into the sand cap.

A short-term monitoring plan to mitigate the impacts of construction and insure accurate cap placement is also proposed. A long-term monitoring plan is also presented to ensure that the cap integrity is maintained.

3.4.5.2 Physical and Biological Constraints to Capping in Convair Lagoon

The primary physical and biological characteristics constraints of Convair Lagoon and how they impact capping are discussed in this section. Descriptions of the existing conditions were taken from existing reports and studies. The majority of the site information was taken from the "Convair Lagoon Basis of Design Report" by Ebasco Environmental for Teledyne Ryan Aeronautical (1992) and Sections 3.2, 4.0, 5.1.1, 5.2.1, 5.3.1, 5.4.1, and 5.5.1 of this EIR/RAP.

Site Description

Convair Lagoon is not an actual lagoon but rather a small (less than 10 acres), shallow (depths to -11.0 MLLW) embayment within San Diego Bay. The lagoon is located northeast of Harbor Island and west of the U.S. Coast Guard. The adjacent shore is used primarily for industrial purposes with General Dynamics, Teledyne Ryan Aeronautical, the Port of San Diego, and the Coast Guard maintaining facilities in the area. A six-lane thoroughfare, Harbor Drive, is located adjacent to the shoreline.

The shoreline access is restricted (fenced) and not available to the public. Some recreational use of the western portion of the lagoon is available as a sailing club maintains a dock in that area.

Storm drains from adjacent properties and upland drainage basins (Lindbergh Field) terminate at the lagoon. Several large storm drains (60-inch storm drain from the pier, 54-inch to the west and several small lines) outfall into the lagoon. Maintaining these drains is a priority for this site as they drain a significant area shoreward of the site.

Convair Lagoon has been used as a storage, retrieval, and dumping area for derelict vessels. Noticeable amounts of debris can be observed along the shoreline. Additional field investigations using sidescan sonar were used to more precisely locate the debris. Two sunken vessels, piping, and miscellaneous debris were documented. The approximate location and type of debris was mapped. This information will be valuable in developing the conceptual capping plan.

The sidescan sonar also located eel grass beds in the nearshore area. Approximately 1 acre of area appears to have eel grass or macroalgae. Figure 3-6 shows the location of the storm drains, bathymetry, and approximate location of eel grass beds.

Physical Characteristics

Prior site investigations used to develop the "Basis of Design Report" for the Nearshore Containment Facility provide information on the physical characteristics of the site (refer to Appendix A). Knowledge of these physical characteristics is important in the development of the conceptual capping plan. The following information is necessary to determine an appropriate capping approach:

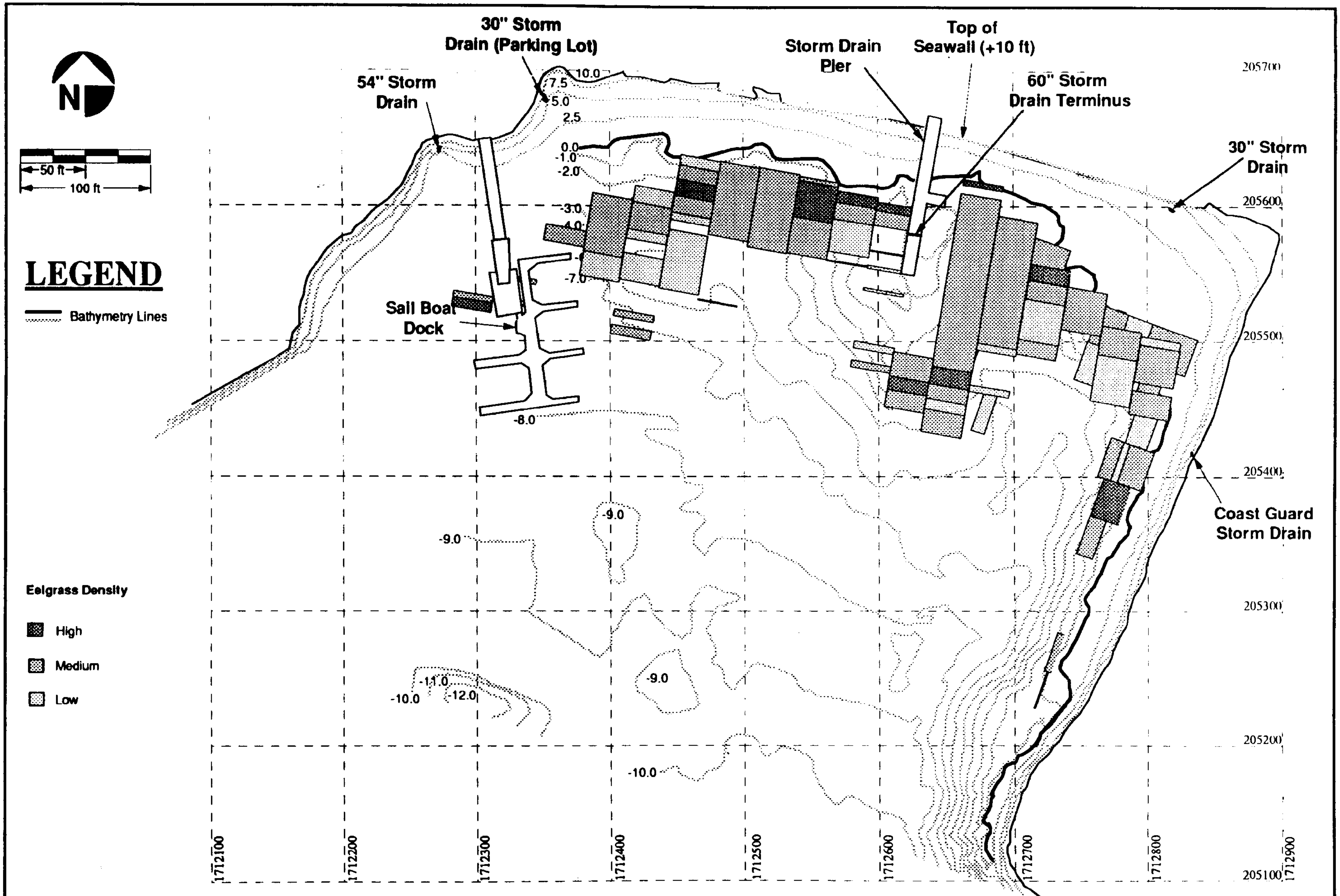
- water depths and hydrodynamic conditions
- sediment characteristics and stability issues
- extent of contamination
- subsurface obstructions and debris
- potential utilities impacted by cap
- recreational uses and boating impacts

Presently, there is limited information on the hydrodynamics of the site. A description of the circulation, bottom velocities, and other hydrodynamic data is lacking. Information does exist for tidal data and 50-year occurrence wave height. While this information should be verified, it currently provides the only information on the site's hydrodynamics.

A bathymetric survey was conducted for the site in conjunction with sediment sampling. In general, the lagoon is a shallow nearshore embayment with water depths from 0 to 11 feet. Shallow areas offshore occur at the 60-inch storm drain pier where there is a mounded area.

From these water depths the slope of the sediment can be determined. The lagoon has a shallow gentle slope seaward. At the eastern side adjacent to the Coast Guard area, the slopes steepen; however, the steepest slope is no greater than 6 feet horizontal to 1 foot vertical. Given these slopes, a cap should not greatly impact the stability of the sediments.

Although the sediment characteristics vary throughout the site, sub-bottom profiling indicates that the seabed is covered with fine-grained sediments of silt or clayey silt. Cores of the sediment confirm these results. The upper 4 feet of sediment is fine-grained and



Eelgrass, Storm Drains, and Bathymetry

FIGURE 3-6

unconsolidated. From 4 to 7 feet, the sediment becomes coarser-grained and more compact.

The contamination is mostly contained in the upper 7 feet of sediment. The highest concentration of PCBs was located at 3 to 5 feet in depth. Moreover, the highest contamination is found in the northeast quadrant of the lagoon near the 60-inch storm drain pier.

The location of subsurface debris has been mapped and is presented in the Basis of Design Report. Much of the debris at the site appears to be relatively large objects such as derelict boats, piling, and other objects. While small objects can be readily capped (and in some cases larger objects), the presence of large debris will require modifications to the capping plan.

The primary utilities that would be impacted by capping are the existing storm drain lines. Several large storm drain pipes discharge into Convair Lagoon. The 60-inch storm drain pier, a 54-inch concrete storm drain near the sail boat dock, and two smaller (30-inch) storm drain pipes. Presently, the 54-inch pipe appears to be out of the area that would be impacted by a cap. The 60-inch storm drain pier is the primary pipe that would be impacted by the cap. The conceptual capping plan must account for modification of this discharge.

The site is also used by recreational boating. The impacts from boat wakes and anchoring need to be considered in the conceptual capping plan. In some areas, recreational boating may have to be restricted. Anchorage at Convair Lagoon would be prohibited in the areas that are capped.

Biological Characteristics

Convair Lagoon is a biologically sensitive area that provides habitat for the California least tern, eelgrass, and a wide range of biota. A complete description of the biological characteristics of the site is provided in Sections 5.2 and 5.3.

The intertidal habitat and foraging areas of Convair Lagoon are considered in the conceptual capping plan. The cap should maintain or improve the present biological habitat at the site. Cap material selection should consider the habitat requirements of the site. Enhancement for the loss of eelgrass by planting new eelgrass is assumed in the conceptual capping plan.

The addition of a cap over the contaminated sediment will increase the elevation of the site while reducing the subtidal area. This increase in intertidal habitat is a beneficial impact. Capping has been used to increase the intertidal area and provide additional habitat in several projects. Monitoring of the Simpson Kraft capping project in Tacoma, Washington, where *in situ* contaminated sediment was capped with clean dredge sand, has shown that the biological community increased and diversified after capping (Parametrix 1989).

Of key interest in the *in situ* isolation of contaminants, is the potential of disruption of the clean sediment cap. The clean sediment cap should isolate the contaminated sediment both chemically and biologically. Therefore, the impacts from benthic organisms redistributing sediment by burrowing, ingestion/excretion, tube building, and other activities (bioturbation) is a key concern. Preliminary studies of the benthic organisms at Convair Lagoon are discussed in Section 5.2.

These investigations indicate that deep burrowers, particularly "ghost shrimp," may be present in portions of Convair Lagoon (Section 5.2). In studies by Suchanek (1986), ghost shrimp were found to burrow to depths from 1 to 2 meters. Maintaining the integrity of the cap, given this burrowing depth, is a key concern in the development of a conceptual capping plan.

3.4.5.3 Conceptual Capping Plan

The information used for the development of the following conceptual capping plan (CCP) was taken from the Basis of Design Report and gathered from field observations and sediment sampling. Engineering judgment was used to develop the capping concept in the absence of more detailed information.

The capping plan was developed to address the physical and biological constraints of Convair Lagoon. In addition, the capping plan was developed to be readily constructed given known materials and construction techniques. Efforts were made to develop alternatives that reduced the overall environmental impacts to the site.

Short- and long-term monitoring programs are recommended. Short-term monitoring involves reducing the environmental impacts during construction by implementing controls.

Long-term monitoring will monitor the effectiveness of the cap over time. The proposed monitoring plans are outlined in this conceptual plan. Plan specifics should be developed after final capping plans are approved.

Proposed Cap Configurations

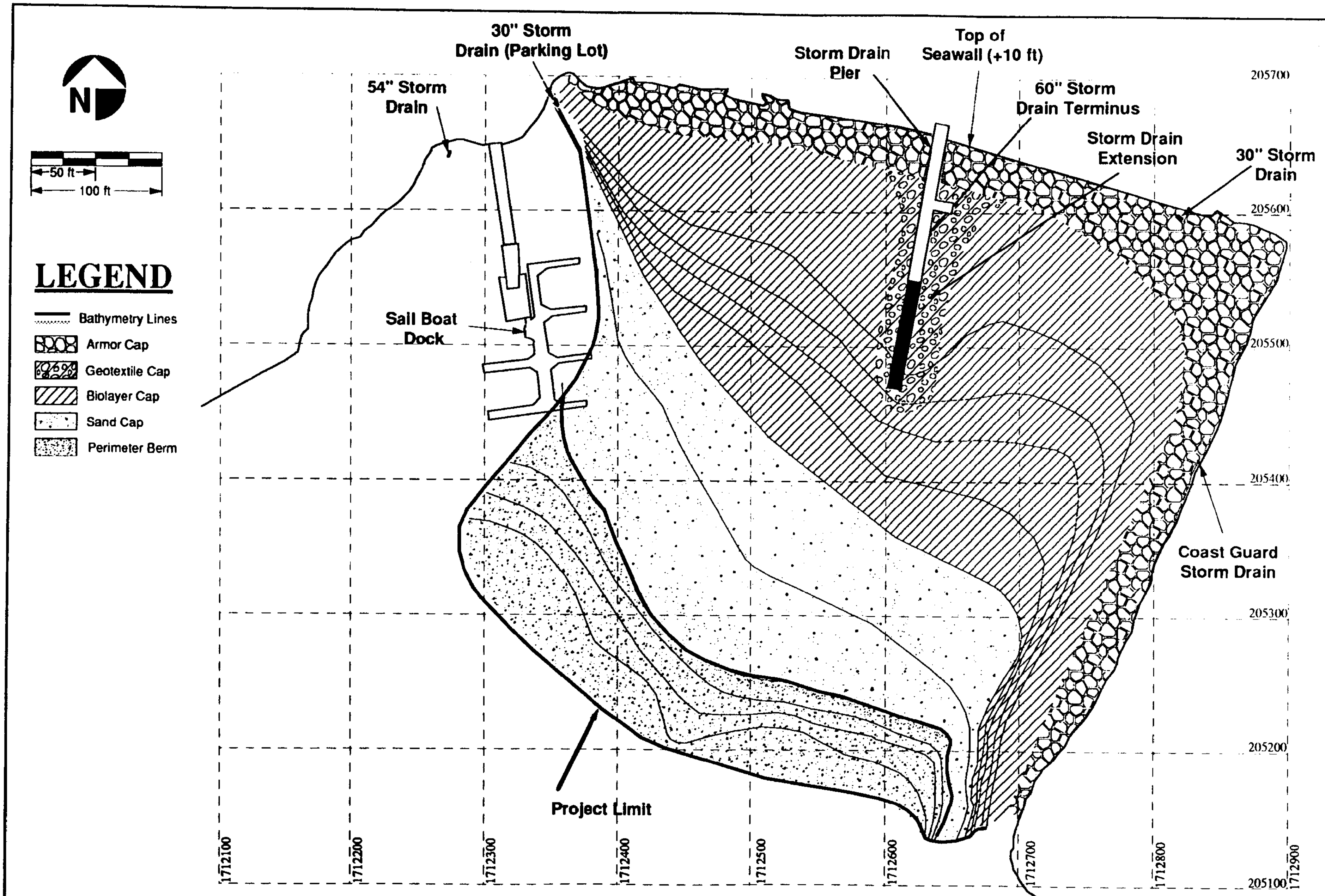
Several capping configurations are recommended for Convair Lagoon. These different configurations account for the varying site conditions observed in Convair Lagoon. The cap configurations account for high-energy conditions, biological disturbances, and quiescent site conditions. Different cap configurations were developed given the site constraints and will be used as warranted within the lagoon.

High-Energy Cap Configuration

Although there is limited hydrodynamic data for the lagoon, the site appears to be relatively quiescent with limited erosion. The Basis of Design Report indicates that fine grain sediment exists throughout the embayment area, which indicates limited erosive conditions.

Areas of shallow shoreline contamination may be exposed to wave action and boat wakes. The wave action may cause erosion of the cap. These areas are referred to as "high-energy" areas; therefore, a shallow energy area (such as the embayment) may also have a higher energy area "nearshore" that would be impacted by boat wakes and waves. The importance of distinguishing these areas is that the cap material must be protected from erosion in these locations. Suitable armoring material must be placed over the cap to ensure the long-term cap integrity.

A high-energy cap is a thick-section cap consisting of sand, gravel filter material, and riprap (or smaller quarry rock). The sand provides the chemical isolation, and the gravel filter and riprap are used to protect the cap from erosion. This type of high-energy (armor) cap design was used in capping the PGE Station L site on the Willamette in 1990. This cap configuration was designed to withstand boat wakes and waves in excess of 3 feet. It is anticipated that a similar cap should meet Convair Lagoon's 50-year-occurrence wave of 2.8 feet. Figure 3-7 shows the proposed location of the high-energy cap. Figure 3-8 provides further detail of the high-energy cap configuration.



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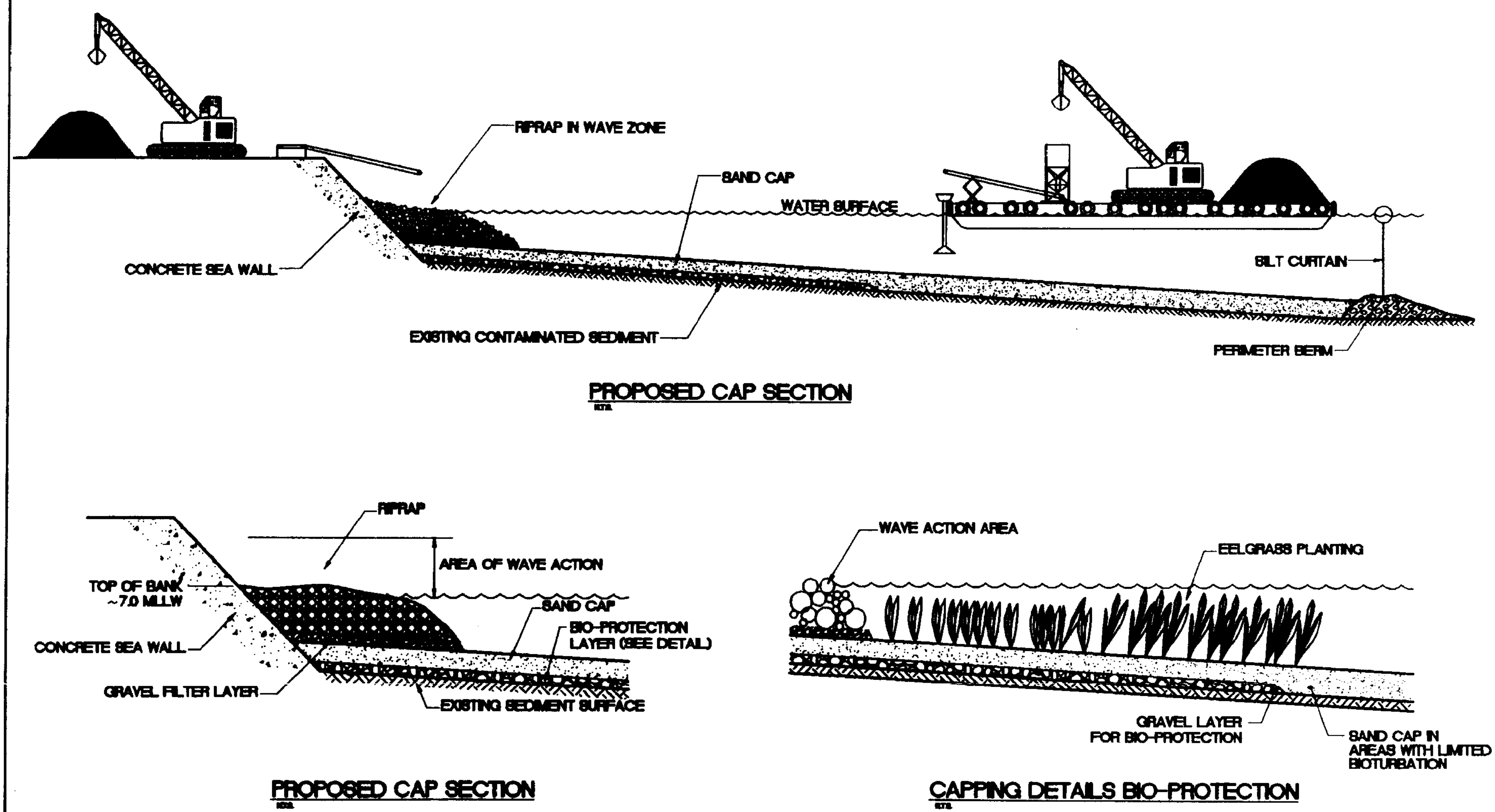
Conceptual Capping Plan

FIGURE 3-7



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Capping Details

FIGURE 3-8

Geotextile/Cap Configuration

Capping in the area of the 60-inch storm drain pier presents a challenge. While the smaller storm drains would require little or no modification to accommodate a cap, the 60-inch storm drain system would require modification to cap the contamination in this area. Since the sediments in the vicinity of the storm drain pier contain higher levels of contamination, capping in this area is a primary concern. Therefore, prior to any modification to the storm drain pier the following measures should be implemented:

- Prepare the surface by removing debris.

- Place a geotextile liner in the area where construction will occur. A thin layer of sand should be placed on the liner to reduce the buoyancy. The geotextile should prevent disruption of the contaminated sediment.

- A high-energy cap section or similar should be placed along both sides of the pier to isolate the contaminated sediment and provide equipment access for pier extension.

- The new discharge of the storm drain pier should contain energy dissipators (concrete or rock blocks) to slow the discharge and prevent erosion of the cap.

Modification of the 60-inch Storm Drain Pier

The Basis of Design Report indicates that the 60-inch storm drain system is significantly underdesigned for its current capacity (461 cubic feet/sec). This storm drain system drains a significant area north of the lagoon including Lindbergh Field. Modifications to the storm drain should not further restrict the capacity of this line.

Since capping would raise the bottom in the area of the drain terminus, the drain should be extended to deeper water. The capacity of the line would not be significantly affected given its present use. The drain should be modified in the following manner:

- Enclose the two end piling with precast "L" sections to further extend the existing structure. Place a concrete slab or concrete liner on grade. The concrete slab would cause some settlement in the sediment to provide a shallow slope for drainage. No dredging is anticipated.

- Use precast-concrete, inverted "T" sections to extend the channel. The storm drain should be extended approximately 80 feet.

- Cap and armor on both sides of the channel and at the discharge point.

These modifications provide several advantages. First, they can readily be made using existing material and technology. Second, they limit exposure of contaminated sediment to humans or the environment since there is no removal of the sediment. Furthermore the highly contaminated material is isolated under a liner, the new concrete pier, and armoring. The capacity of the line is not decreased and in cases of high flow the channel can overflow.

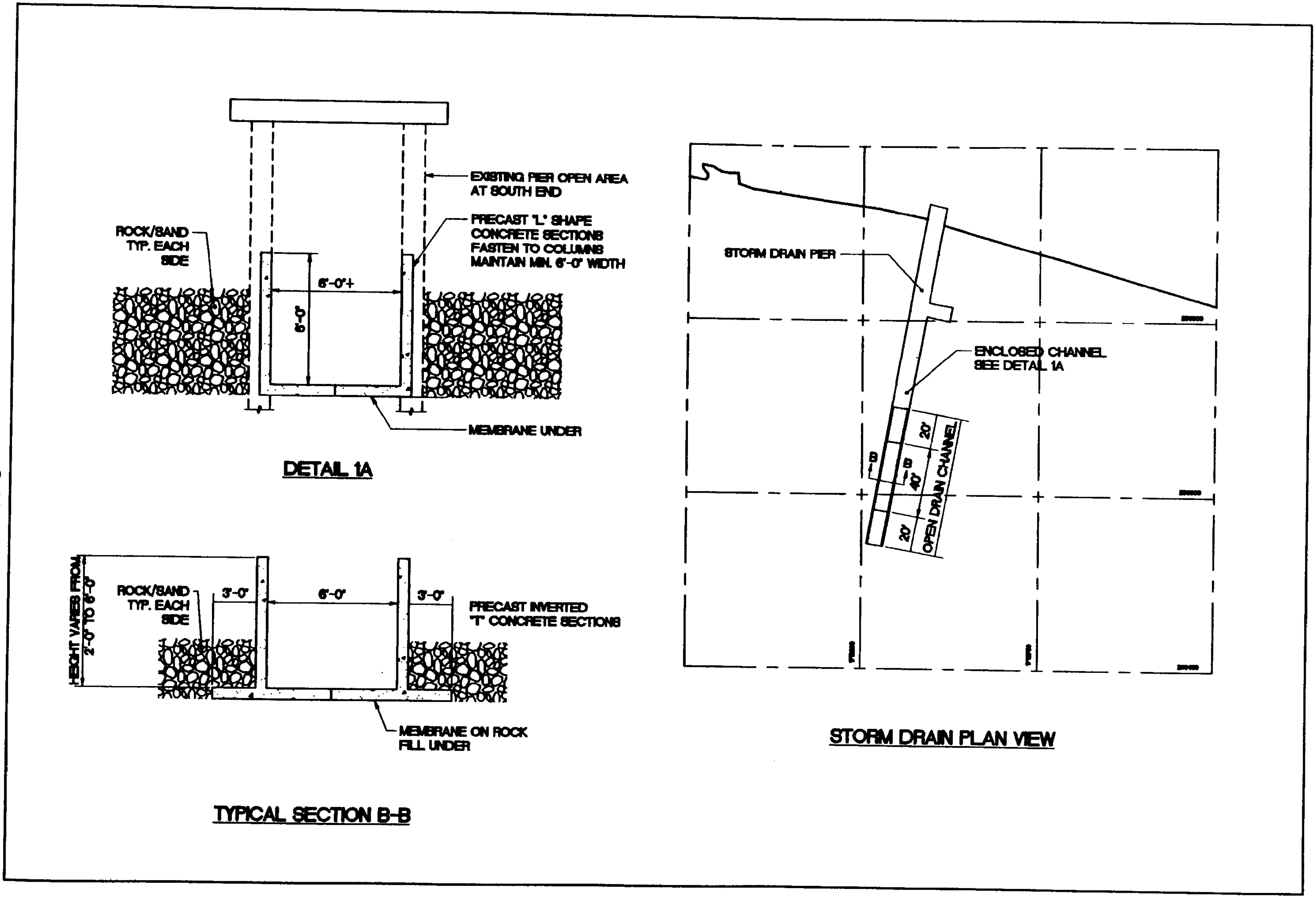
Figure 3-9 provides the details for the proposed 60-inch storm drain modifications. Smaller storm drains discharging at the seawall (30-inch line) and at the Coast Guard (12-inch drain) would not be significantly impacted by the cap (refer to Section 5.4). These drains could be modified by adding a flair section at the discharge end and/or extending the pipe.

Bio-Protection Cap Configuration

Sand or dredge sediments have been used for the majority of *in situ* capping projects. Sand is easy to place, readily available, enhances the stability of underlying fine grain sediment, (Bokuniewicz 1988), and provides suitable habitat for biota.

The thickness of the cap material directly influences its ability to chemically and biologically isolate the contaminated sediment. Studies by Wang (1991) and Brannon (1985, 1986) provide valuable information concerning the ability of a cap to chemically and biologically isolate the contaminated sediment. While chemical isolation can be achieved with a 20 cm cap (Brannon, Gunnison et al.), the cap must also protect against bioturbation.

The impact of bioturbation is very site dependent. Section 5.2 describes the presence of deep burrowers such as ghost shrimp and other organisms that may impact the integrity of the cap over time.



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Proposed Storm Drain Modifications

FIGURE 3-9

A bio-protection cap configuration is proposed to limit burrowing into the contaminated sediment. Several options were considered. A thin layer (6 inches) of precast concrete liner could be placed over the sediment followed by several feet of sand. This liner would prevent bioturbation into the contaminated sediment while the overlying sand would establish a suitable media for biota. The liner would allow gases from the sediment to escape as organic material erodes. The disadvantages of using this type of liner is that it requires preparation of the subsurface prior to placement (extensive debris removal) and is more costly than using rock.

A layer of coarse rock (minimum 1 foot) should provide isolation of the contaminated sediment and inhibit deep burrowers from penetrating into the contaminated sediment and distributing contamination into the sand cap. A rock layer is also much less costly than a concrete liner and easier to install. However, this should be confirmed using field and laboratory experiments with the organism responsible for burrows in Convair Lagoon.

Figure 3-8 shows the proposed bio-protection cap. The locations are assumed (Figure 3-7) until the distribution and density of the deep burrowers are further defined. A bio-protection cap would be placed in areas known to have deep burrows and in areas where significant contamination could be disturbed if no bio-protection layer was in place.

<u>Eelgrass Habitat and Cap Stability</u>

The sand cap conceptual design includes planting approximately two acres of eelgrass on the sand cap after installation to reduce wave energy from boat wake and natural waves, enhance the stability of cap sediments, and reduce shoreline erosion. Recent studies by Fonseca and Cahalan (1992) indicate that when seagrasses occur in broad shallow meadows and occupy most of the water column they substantially reduce wave energy, enhance sediment stability, and reduce turbidity in the water column. In addition, the eelgrass meadow will increase the overall biological productivity of the Lagoon.

<u>Sand Cap Configuration</u>

A standard sand cap should be suitable for the areas of Convair Lagoon that are not exposed to excessive bioturbation. Generally, the sand cap would be covering areas with lower levels of surface contamination. In these areas, the high levels of contamination occur at depths greater than 2 feet below the surface. (See Section 5.2). A sand cap would provide additional isolation of the surface contaminated sediment.

The sand cap thickness should be a minimum of several feet. This conservatively accounts for chemical, biological, and operational characteristics of the site. Shields (1984) suggests a minimum of a 3-foot (1 meter) cap to assure accurate installation. Given the operational constraints, a thicker cap would allow for irregularity in thickness and would be more consistent with the resolution and accuracy of monitoring and placement equipment (Palermo et al. 1989). However, capping thickness should be minimized to reduce the filling of the lagoon. Approximately 3 feet of sand and rock could be placed in the lagoon without significant shoreline alteration, aside from the area around the 60-inch storm drain pier.

Cap Constructability

The following describes the material and construction techniques considered in capping Convair Lagoon.

Materials

Imported material or clean dredge material would be suitable material for a sand cap. Dredge material is often less expensive and provides a "beneficial use" when used for capping projects. Dredging projects in the vicinity of San Diego Bay may provide a sufficient volume of capping material for the entire site. The composition of the material including the grain-size, total organic carbon, porosity, and bulk density should be known before use.

Additional capping material including gravel, riprap, geotextile liners, and concrete revetment mats can be supplied by local vendors.

Construction

Various construction techniques may be required for placement of the different cap configurations. Construction constraints for cap placement include water depth, slope, subsurface material type, debris, and material being placed. Placement methods would be highly dependent on water depth and access for the equipment. Although the construction contractor may determine other methods that meet the design requirements, the following approach should meet the construction constraints for Convair Lagoon:

> The clean sand cap material should be delivered to the site by barge and/or stockpiled on shore for later placement. In shallower areas, capping material may be offloaded from a barge by a conveyor and placed with or without the aid of a diffuser. A diffuser is a mechanical device that is placed on the submerged discharge to allow the gradual, controlled placement of material. In other areas, the cap may be have to be placed directly from shore by a clam shell dredge, standard excavation equipment, or conveyor. Figure 3-10 shows methods of onshore and offshore placement.

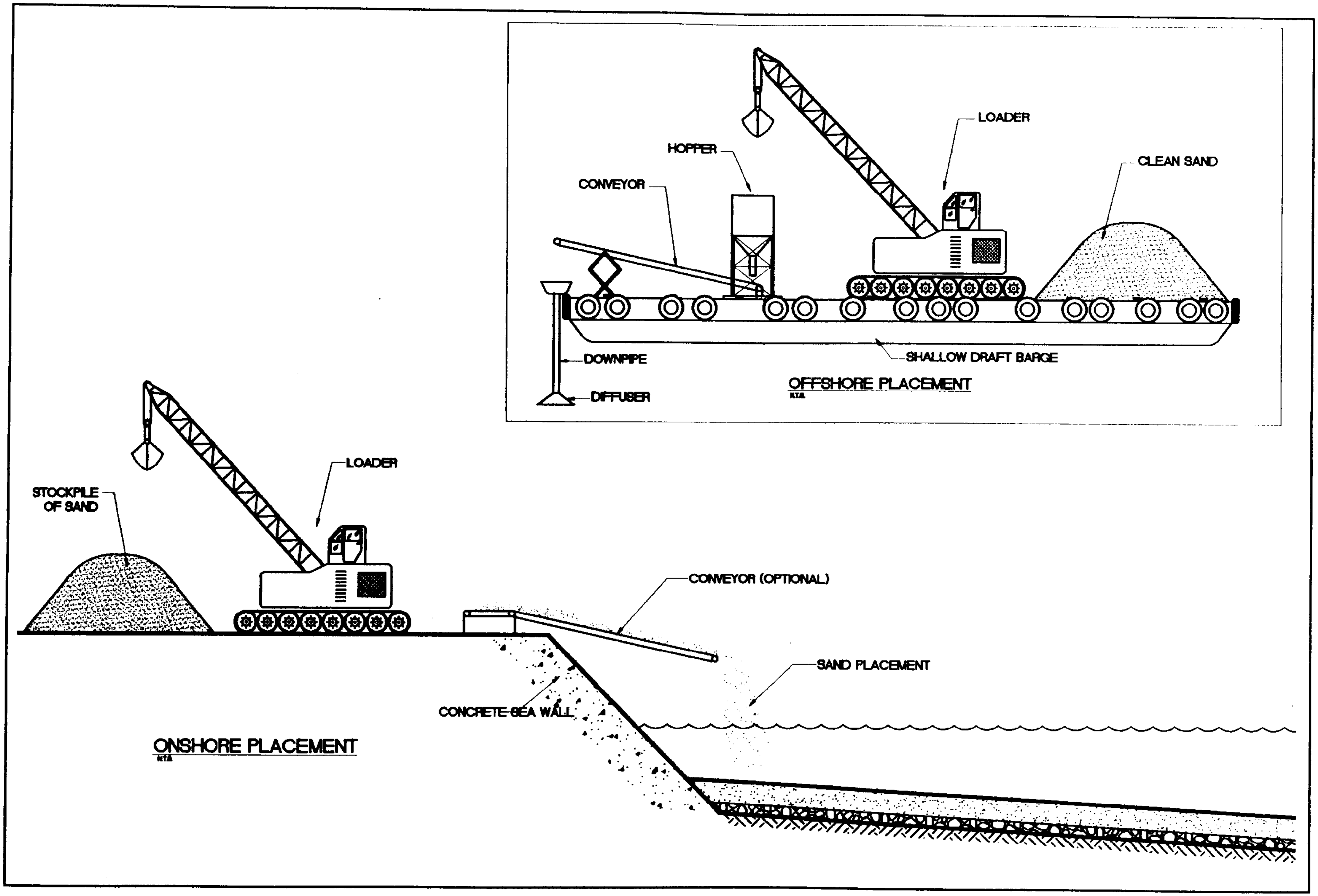
The submerged diffuser placement of sand over naturally deposited silt-clay was successfully used on the Terminal 1 project for the Port of Portland, Oregon (Hardin et al. 1988). Submerged diffusers allow accurate and controlled placement of material in the aquatic environment. Field and laboratory analysis support their effectiveness in reducing sediment resuspension (Neal et al. 1978).

The thick-section high energy cap (gravel and riprap) would be placed with a clam shell dredge or standard excavation equipment from the shoreline. Placement of geotextile and gravel along the 60-inch storm drain pier would be required to provide access for construction equipment from the shoreline.

To avoid impacts to the endangered California least tern in the spring and summer months, construction should be limited to the period from late September through early March, if possible.

Perimeter Berm

A perimeter berm would be constructed of large rock and smaller graded rock prior to cap placement. The berm would serve to reduce movement of the sediment during capping (mud waves), provide a turbidity barrier, and act as an artificial reef following construction. A perimeter berm was used effectively in the capping of the PGE site on the Willamette River (Sanders 1990). In addition, a silt curtain would surround the site during capping. Figures 3-7 and 3-8 show the details and location of the perimeter berm.



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Placement Techniques

FIGURE 3-10

Turbidity Barriers

Turbidity barriers may be effective in reducing the turbidity in the water column outside of the barrier. Turbidity barriers such as silt curtains are restricted to conditions where the currents are less than 1 ft/sec and the tidal flux is minimal (American Marine vendor data). Silt curtains can reduce the turbidity by 80 to 90 percent (Palermo 1988); however, frequent movement of the curtain and storm events can impair the curtain's effectiveness. In the New Bedford pilot study, the highest levels of sediment resuspension were observed during initial deployment, periodic movement, and final removal of the curtain (Otis 1990).

The prolonged use of the curtain should be effective. Movement and redeployment of the curtain should be kept to a minimum. The silt curtain would be anchored to the perimeter berm throughout the construction (see Figure 3-8) Moreover, in many cases the curtains are not necessary to keep turbidity below the requirements implemented by regulatory agencies. During capping, the majority of suspended material in the water column would be the clean capping material.

Monitoring

A monitoring program is recommended to ensure the effectiveness of the capping. Although the specific monitoring plan is dependent on regulatory guidance and recommendations, the purpose of the monitoring plan presented is to verify that the objectives of the conceptual capping plan are achieved.

Two types of monitoring programs are identified: short-term monitoring or construction monitoring, and long-term performance monitoring. Construction monitoring would assure adequate controls to limit the impact to the environment during cap construction. Long-term monitoring would evaluate the effectiveness of the cap over time.

Short-term Monitoring

Short-term monitoring should be conducted during the construction process including the following components:

- Capping should be accompanied by in-field real time turbidity measurement to ensure permit objectives are met and to track the sediment plume.

- Water quality should be monitored at designated reference (background) stations and near the point of cap placement during construction. Water samples should be collected for analysis of PCBs and other contaminants to verify that dissolved and resuspended material meets regulatory requirements.

- At the end of each day, soundings should be made of the area capped and mapped. Weekly reports summarizing the soundings of the site should be prepared for review.

The health and safety of the workers should be assured by adherence to a health and safety plan and by the use of trained onsite personnel. The workers that may come in contact with the contaminated sediment should be required to participate in proper training prior to participating in any construction activities.

Long-term (Post-Implementation) Monitoring

The three components of long-term monitoring are physical, chemical and biological monitoring. A brief description of these components follow.

Physical Monitoring

Physical monitoring serves to show changes in surface conditions by consistently monitoring the bathymetry at the site. Over time, the stability of the sediment and/or cap can be assessed.

Bathymetric surveys determine the underwater topography of the site. The depth relative to a known datum allows one to determine the contours of the site and how stable they are over time. The impacts of sediment transport at the site is of key concern. The stability of the site can be evaluated by recording the bathymetry of the area of interest over time, and the impacts of erosion and shoaling assessed.

Subbottom profiling and sidescan sonar surveys also provide valuable data. Subbottom profiling gives some idea of the Lagoon's stratigraphy. This may be valuable in determining consolidation of the cap. Sidescan sonar surveys provide a underwater picture of the Lagoon bottom. Rock outcrops, bedforms, and capping material can be noted. Both of these forms of physical monitoring are helpful in the initial stages of the project and can be conducted intermittently over the life of the project. (Initial subbottom and sidescan surveys were conducted by Ebasco for the Basis of Design Report.)

A sediment profile camera profiles *in situ* sediment. These photos allow one to see the depth of bioturbation, the sediment cap interface, sediment grain size, and specific benthic/infaunal information. The sediment profiling camera is used before capping and as part of the long-term monitoring to establish the impacts of dredging and/or capping on benthic recolonization of the cap.

Chemical Monitoring

Sediment cores and chemical monitoring allow one to determine if the cap is working and serve to provide an "early warning" system. The primary components of long-term chemical monitoring are sediment coring and chemical analysis.

Sediment cores would be analyzed for the constituents of concern to analyze the rate of vertical migration of the contaminated sediment through the cap and to predict the movement of contaminants (sediment transport). The core should penetrate through the cap to a minimum of 2 feet into the contaminated sediment.

Biological Monitoring

Biological monitoring would be necessary to show the impacts of the alternative on the organisms inhabiting the sediment or exposed to the sediment. A variety of techniques could be used including bioassay and bioaccumulation studies and field characteristics of biota inhabiting the cap.

Biological monitoring will be necessary to characterize the biological assemblages that colonized the sand cap and riprap perimeter berm after construction is complete and determine the success of the eelgrass planting. The type of burrowing organisms and the depth of their burrows should also be evaluated to determine if chemicals are escaping into the cap and or the water above the cap and if they are biologically detrimental. This could include measurement of PCBs in sediments expelled from burrows, the toxicity of this sediment, and bioaccumulation of chemical contaminants by biota inhabiting the sediment and overlying water column.

Monitoring Frequency

The first year should include two sampling events: one post-construction and one at 6 months. Through year 5, there should be one sampling event per year. From year 6 through year 10, sampling should be done every other year. At the end of 10 years, the sampling plan should be reviewed to see if monitoring procedures and frequencies are adequate. At that time, sampling could be conducted once every 5 years for a total sampling period of 30 years. Physical monitoring would be required after significant storm (25-year storm) or other natural events that could impact the cap integrity.

The nature and frequency of the Convair Lagoon monitoring program would impact the project costs; however, frequent monitoring in the first 5 years is essential to verify cap effectiveness.

Contingency Plan

Monitoring would provide information on the effectiveness of the cap in isolating the contaminated sediment from the clean cap sediment and the water column the upper layer of sediment where most biological activity occurs. A contingency plan could be developed to address extraordinary events that might impact the cap integrity such as:

- Continuing sources of contamination
- Major storm events eroding the cap
- Excessive bioturbation

Identifying potential ongoing sources such as storm drains and adjacent contamination, and eliminating these sources, is necessary prior to cap construction to assure that the cap is not recontaminated. Continuing sources of contamination, if not eliminated prior to capping, will contaminate the cap.

If erosion of the cap occurs during a storm event, the cap should be sampled to determine thickness and sediment quality of the cap. If there is risk that contaminated sediment could be exposed, than additional capping material could be placed; however, the initial cap design should account for the majority of storm conditions.

Excessive bioturbation is a potential concern at the Convair Lagoon site. A protective rock or concrete liner should limit penetration of burrowing organisms into the contaminated sediment and redistribution of contaminated material. The activities of burrowing in the overlying sand cap should not impact its integrity; however, frequent monitoring in the first few years is recommended.

A pilot study using a variety of capping materials to inhibit bioturbation by ghost shrimp or other species is recommended. Field and laboratory studies would produce valuable information on the nature of these burrowers. This information would greatly aid cap design.

4.0 ENVIRONMENTAL SETTING

The Convair Lagoon Remediation project site encompasses approximately 4.8 acres within the eastern portion of Convair Lagoon, northern San Diego Bay, in the City of San Diego. The project site is currently fenced from public access and contaminated water warning signs are posted around the Lagoon. A small pier approximately 45 feet in length extends into the water from the asphalt pavement along the northeast boundary of the Lagoon area.

Surrounding land uses in the immediate project vicinity are primarily industrial and include Teledyne Ryan Aeronautical to the north, General Dynamics to the northwest, and the United States (U.S.) Coast Guard facility to the southeast. Harbor Drive, a six-lane thoroughfare, is located directly north of the project site. In addition, San Diego International Airport (Lindbergh Field) is located within the adjacent uplands. A 1.3-mile pedestrian walkway/bicycle path which follows the bayside alignment of Harbor Drive passes the project site to the north.

Within the Lagoon to the west of the project site, the Convair Sailing Club, which is associated with General Dynamics, maintains a pier and floating dock for small sailboats. Approximately 12 sailboats are currently docked at the pier. Harbor Island, a commercial recreation area which is developed with uses such as hotels, restaurants, marinas, and marine-related commercial businesses, is located to the southwest of the Lagoon.

Several drains and pipes terminate in the Lagoon, including four large storm drains (a 54-inch drain to the west, a 60-inch drain off a center pier, and two 30-inch drains from Teledyne Ryan Aeronautical property). Smaller drains also originate from the Coast Guard Station and the General Dynamics facility.

The configuration of the Lagoon dates to the mid 1930s. It was created as part of an expansive dredge-and-fill project to develop the upland area which currently encompasses Lindbergh Field, the U.S. Marine Corps Recruit Depot, the U.S. Naval Training Center, and the railroad spur. The adjoining U.S. Coast Guard Station, which predates that project, is also constructed on fill material.

The San Diego Unified Port District has jurisdiction over waterfront property along the bay excluding federal, private, and ungranted lands. Under the San Diego Unified Port District Master Plan, the present uses of Convair Lagoon are designated as commercial recreation, and harbor services on the land, and recreational boat berthing and boat navigation in the water.

5.0 ENVIRONMENTAL ANALYSIS OF POTENTIALLY SIGNIFICANT EFFECTS

The environmental analysis of potentially significant effects focuses on the impacts that would result from implementation of the nearshore containment facility (proposed project), the sand capping alternative (preferred alternative), and the no action alternative. Alternatives involving incineration, bioremediation, and chemical fixation as described in Section 3.0 were not considered sufficiently viable to warrant an analysis of their impacts.

5.1 WATER QUALITY

5.1.1 Existing Conditions

At the present time, the primary hazards associated with the contamination of Convair Lagoon are believed to be associated with the sediment, rather than the water column above the sediment. PCBs are relatively insoluble in water and have a high affinity for soil and sediments, and hydrocarbons.

Ogden and Ebasco Environmental collected and analyzed water samples for a variety of chemical and physical properties during August of 1992. The samples were collected from three locations within the Lagoon. Each sample was split in two so that one subsample was filtered before analysis, and the other sample was analyzed without being filtered. Filtration was performed to help in assessing whether the PCBs were present in suspended solids in the water and whether they were dissolved in the water. The results of the three water samples are shown in Table 5.1-1.

Table 5.1-1

RESULTS OF PREVIOUS WATER SAMPLES IN CONVAIR LAGOON

Sample ID		Sample location	Aroclor compound (in parts per trillion) 1248	1254
A8	unfiltered	approximately 50' NW of the end of the 60-inch storm drain pier	<20	52
	filtered		<20	<20
A10	unfiltered	approximately 70' E of the end of the 60-inch storm drain pier	65*	51
	filtered		<20	<20
A21	unfiltered	approximately 100' SSW of the end of the 60-inch storm drain pier	<20	<20
	filtered		<20	<20

* Sample analyzed after standard holding time had expired
Note: <20 means that the Aroclor compounds were not detected at a detection limit of 20 parts per trillion
Source: Ogden and Ebasco Environmental 1992.

The results of the water samples indicate that low, but detectable, levels of PCBs are found in the water above areas of the Lagoon where the sediments are known to be contaminated with high levels of PCBs. The fact that the PCBs are detected only in unfiltered samples suggests that the PCBs are attached to suspended solids in the water, rather than being dissolved. Even at the relatively low concentrations revealed in these analyses, PCBs are available to the marine organisms in the contaminated sediment and the water column above the sediment.

The EPA has established chronic toxicity criteria for PCBs of 0.030 micrograms per liter (μg/L), which is approximately equal to 30 parts per trillion. This criteria represents the concentration of PCB in seawater that will result in adverse effects in the most sensitive marine life over an extended period of exposure. The sampling results indicate that the PCB concentrations detected in two of the three seawater samples exceed the criteria established by the EPA.

5.1.2 Impacts

5.1.2.1 Proposed Project – Nearshore Containment Facility

The NCF would result in two potential impacts to the water quality in San Diego Bay. The first impact pertains to resuspension and redistribution of the contaminants during construction of the NCF and dredging operations. The construction of the NCF is expected to disturb the sediment where the containment walls are constructed, resulting in the suspension of PCB-contaminated sediment. Also, the hydraulic dredging process for removing contaminated sediment from the Lagoon and placing it into the NCF would unavoidably result in a small fraction of the sediment being suspended in the surrounding water. The resuspended sediment would eventually settle out; however, it is expected to be distributed in the Lagoon. The proposed silt curtain is expected to prevent significant migration of contaminants out of dredging area; however, it is strongly suspected that as dredging takes place the contaminants would be spread over the entire bottom surface within the silt curtain.

A small fraction of the resuspended contaminated sediment is expected to pass through the silt curtain and eventually settle to the bottom of the Bay beyond the project area. The amount of sediment resuspended from a particular dredging location that eventually passes through the silt curtain depends on the size of the sediment particles and the distance from the dredging location to the silt curtain. The amount of PCB contamination carried through the silt curtain depends on the factors and the concentrations of contaminants in the sediment. The area outside of the silt curtain is not free of contamination, with PCB concentrations in the sediment as high as 2.4 parts per million in some sample locations.

According to the dredging plan proposed by Ebasco in the Basis of Design Report (Ebasco 1992), the closest dredging to the silt curtain would be located approximately 20 feet away from the silt curtain, along the west side of the remediation area. However, the levels of contamination in this area are relatively low, and the potential for recontamination of sediment outside of the silt curtain is not considered to be significant. The locations with the highest known levels of PCB contamination are located no closer than 150 feet from the silt curtain. The likelihood that significant quantities of contaminants would be resuspended and carried at least 150 feet through the silt curtain before settling out is considered to be very low. Therefore, contamination of the Bay outside of the project area through the redistribution of PCBs is not considered to be a significant impact.

The second impact relates to the long-term stability of the NCF. Although the NCF is considered as a "permanent" solution to the contamination in Convair Lagoon, the design lifetime of structures such as this typically is in the order of several decades. The marine conditions and the nature of the contaminated sediment is expected to contribute to corrosion of the structure. As the structure deteriorates, the leakage of contaminant-bearing water into the Lagoon may occur. This is considered to be a significant long-term impact of the proposed project. Alternative construction techniques should be considered to prevent or mitigate these potential impacts.

5.1.2.2 No Action

The No Action alternative would result in continuing release of PCBs from the sediments to the water above the sediment, and ultimately into the rest of San Diego Bay. Sampling of the water in the Lagoon (see Table 5.1-1) has revealed the presence of PCBs at concentrations of 0.052 to 0.16 μg/L in the unfiltered water samples (52 to 160 parts per trillion), which are above the EPA's chronic criteria for marine water quality of 0.03 μg/L (30 parts per trillion). Therefore, the presence of PCBs may result in adverse effects on sensitive marine organisms through long-term exposure (refer to Section 5.2). Under the No Action alternative, these levels would most likely continue for the considerable future. Although the concentrations are low, they are above the levels that can result in chronic impacts on marine life.

5.1.2.3 Sand Capping - Preferred Alternative

As designed, the sand cap would isolate the contaminants in place with a minimum of disruption, and would prevent the migration of contaminants into the water column of Convair Lagoon. The only potential impacts that could occur under this alternative are associated with the potential for contaminants to migrate to the surface of the cap through chemical diffusion or bioturbation. A monitoring and repair program has been defined for this alternative that, if properly instituted and maintained, would prevent this from resulting in significant long-term impacts.

The primary water quality impact resulting from the Sand Capping alternative is the suspension of sediment during the capping operations. Since the contaminated sediment will remain in place with the capping material placed over it, the sediment that is suspended will consist primarily of the capping material, rather than the contaminated sediment. Prior to the installation of the cap, large debris would be removed from the area to be capped. Although this may lead to resuspension of contaminated sediment, the installation of a silt curtain would prevent the migration of sediment contamination outside of the remediation area.

The sand cap is expected to promote conditions that may enhance the natural anaerobic dechlorination of the PCBs (in which microorganisms biochemically degrade the PCB molecules in an environment that is free of oxygen). In comparison with the Proposed Project and the No Action alternative, implementation of the Sand Capping alternative would result in a net positive benefit in terms of water quality within both Convair Lagoon and San Diego Bay.

5.1.3 Mitigation Measures

5.1.3.1 Proposed Project - Nearshore Containment Facility

Implementation of the following mitigation measures would reduce impacts under the proposed project to below a level of significance:

- To minimize the impacts of recontamination of surface sediment following resuspension of contaminated sediments during the dredging operations, the dredging should begin in those areas of the Lagoon with the highest levels of contamination. The dredging should then move from cell to cell in order of the level of contamination. Finally, the entire surface of the sediment in the project area should be dredged to remove contaminated sediment that has settled in areas that originally did not require dredging.

- Extensive sampling should be conducted during the dredging operations to confirm that the PCB-contaminated sediment has been removed in accordance with the Cleanup and Abatement Order. Sampling should also be conducted to determine where final dredging should be performed to remove recontamination from settled sediments.

- Since the NCF cannot be designed and constructed as a truly permanent facility, measures must be included in the proposed project to identify leakage of contaminants out of the NCF. Ultimately, repairs will be necessary. A continual monitoring plan must be in place to verify that leakage of contaminants does not take place out of the NCF.

5.1.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.1.3.3 Sand Capping - Preferred Alternative

The Sand Capping alternative includes a post-capping monitoring plan that is designed to verify that contaminants are contained, and are not migrating to the surface through bioturbation or chemical diffusion. If contaminants are detected in the clean capping material, the placement of additional capping material or other repairs should return the cap to full integrity. With monitoring of the cap, and repair when conditions that could lead to potential breakthrough are detected, the impacts to water quality will be mitigated to below a level of significance.

5.2 MARINE RESOURCES

5.2.1 Existing Conditions

Convair Lagoon is a shallow embayment on the north shore of San Diego Bay (Figure 5.2-1). Its intertidal shoreline comprises a narrow beach abutting a seawall along the north shore paralleling Harbor Drive and a riprap revetment along the east shore adjacent to the U.S. Coast Guard Station. The narrow beach ranges from about 2.0 feet below mean lower low water [(MLLW), which equals 0.0 feet for most topographic maps and hydrographic charts)] to elevations ranging from approximately 3 to 7.5 feet above MLLW. The subtidal portion of the lagoon extends down to a depth of about 10 feet below MLLW. The project site, encompassing the proposed nearshore containment facility (NCF), the proposed dredge footprint, and a narrow area outside the proposed dredge footprint contained within the dredge silt curtain, is basically a rectangle measuring approximately 450 feet by 475 feet (approximately 4.8 acres).

The following description of existing marine environmental conditions is divided into sections on sediment quality, marine biology, and bioavailability (the availability of a chemical to be accumulated by an organism). The sediment quality section describes the chemical composition and grain size distribution of lagoon sediments. The marine biology section describes the marine invertebrate and fish assemblages inhabiting the intertidal and subtidal habitats of the lagoon and defines the distribution and density of eelgrass (*Zostera marina*) in the area. Because of their relevance to this project, an expanded discussion of burrowing organisms is included in this section. This group of organisms is addressed further under impact analysis. The bioavailability section summarizes data from reports describing concentrations of a variety of contaminants in lagoon biota.

Sediment Quality

<u>Distribution of Sediment Types in Convair Lagoon</u>

The natural sediments in Convair Lagoon are a mixture of sand and silt or mud. Sand predominates on a narrow beach that ranges from about MLLW to elevations ranging from approximately 3 to 7.5 feet above MLLW, where it meets either concrete or a rock revetment composed of a variety of sizes of rock and broken concrete. Most of the lower portion of the intertidal zone (the beach out to about 2 feet below MLLW) is fine sand

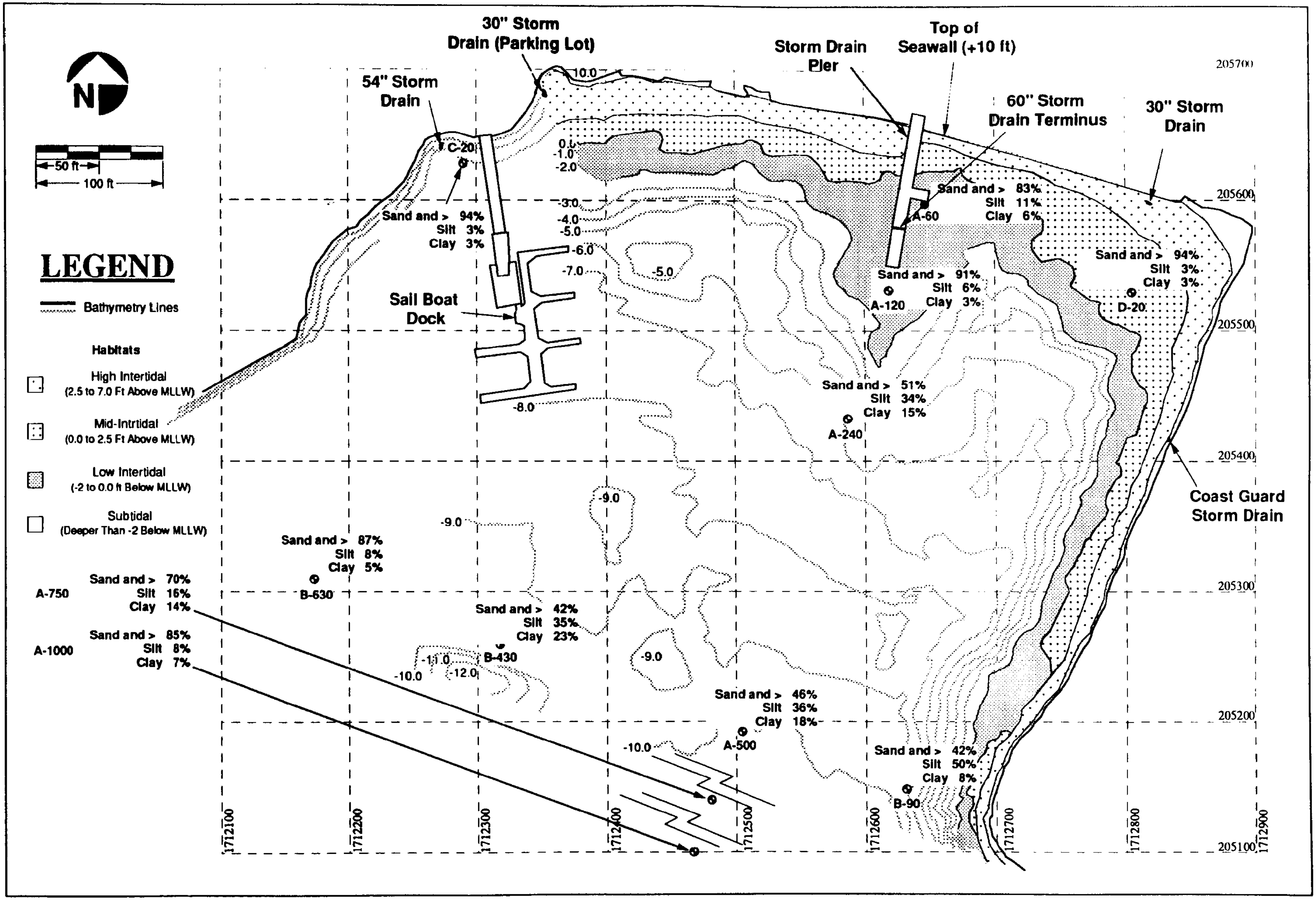

FIGURE 5.2-1

General Features of Convair Lagoon
Sand Grain Composition of Bottom Presented for Select Sites

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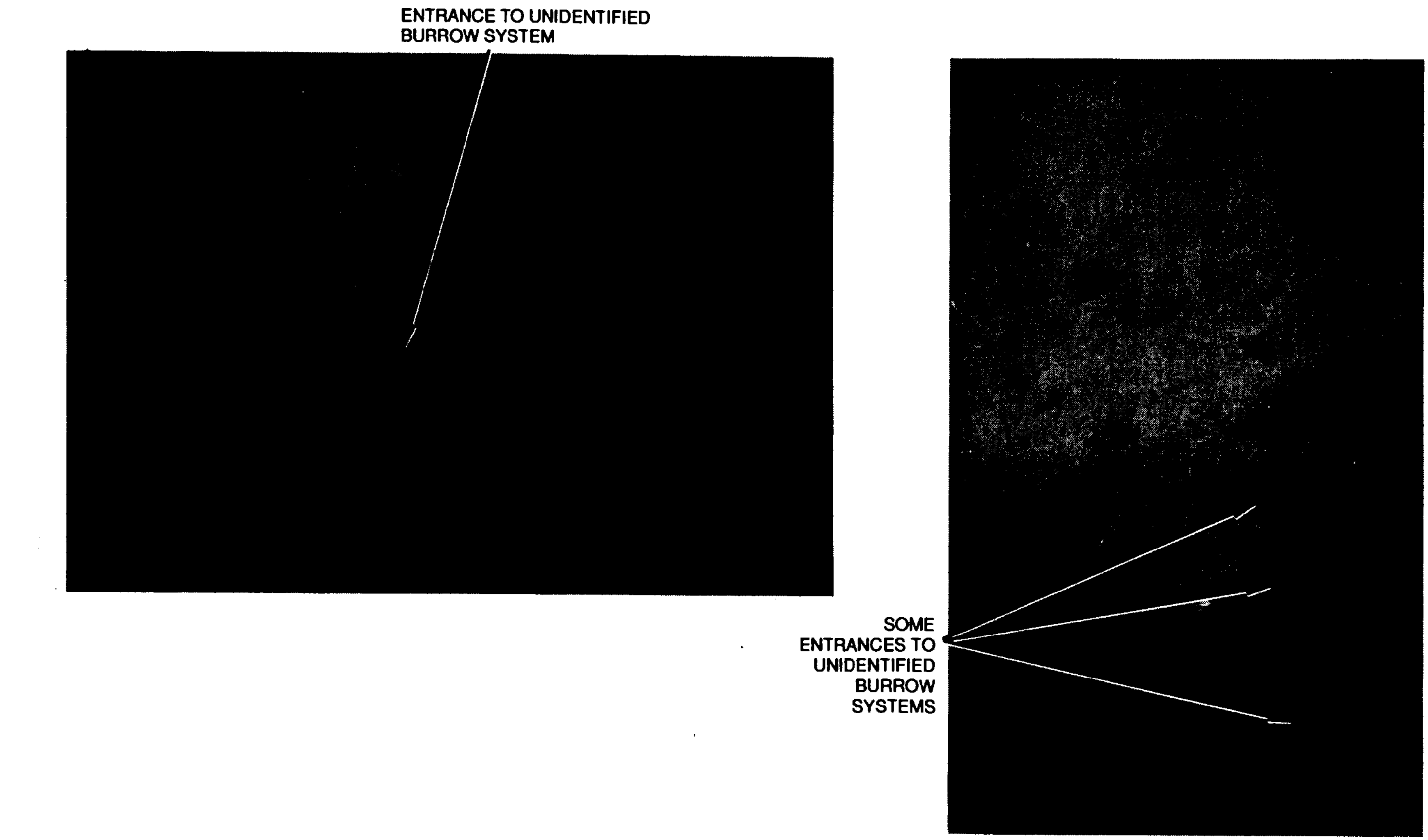
(Figure 5.2-1). Subtidally, the upper 1 foot of lagoon bottom is composed mainly of sandy silt with some clay. In both intertidal and subtidal areas surrounding the project area, sediments are predominantly sand. This pattern suggests that the project area is a depositional environment and that storm drains have contributed substantial quantities of fine-grain sediments to the lagoon.

In terms of appearance, the most conspicuous visible feature of the subtidal seafloor in Convair Lagoon is the extensive network of burrows penetrating the surface of the sediments (Figure 5.2-2). Below its surface, the sediment is honeycombed with burrows constructed by several species of animals.

Concentrations and Distribution of PCBs and Trace Metals in Lagoon Sediments

Investigations of sediment quality in Convair Lagoon were initiated by the Regional Water Quality Control Board (RWQCB) in 1985 (RWQCB 1986) to describe the concentration of PCBs and trace metals in the lagoon sediments. In 1988, Teledyne Ryan Aeronautical (TRA) initiated studies to document the vertical and horizontal distribution of PCBs and trace metals in the lagoon (ERCE 1988). More comprehensive studies were conducted by TRA in 1989 to better define the distribution of PCBs (ERCE 1989). Finally, Ebasco Services collected additional data on PCB distributions to support the design of an NCF proposed for remediation of lagoon contamination (Ebasco undated). The 53 locations sampled in the three studies are identified in Figure 5.2-3. Figure 5.2-4 shows the estimated distribution of Total PCBs (the arithmetic total concentration of all seven PCB species detected) in the upper foot of sediment, based on combined data from all studies. The combined data sets for Total PCBs from all studies are summarized by sampling location and depth below the bay bottom in Appendix B-1. PCB values below the level of detection were assumed to be zero. The estimated location of the 10 ppm dry weight cleanup level is highlighted. All Total PCB concentrations exceeding 10 ppm are also highlighted in Appendix B-1.

Trace metals data from RWQCB (1986) and ERCE (1988) are summarized in Appendix B-2 and Appendix B-3, respectively, and compared with some regulatory guidelines often used to evaluate the potential for biological effects. The guidelines are discussed in Appendix B-4. While the highest values for trace metals fall within the area to be remediated, concentrations of several trace metals exceeding the more rigorous National Oceanic and Atmospheric Administration (NOAA) ER-L guideline (cadmium, chromium,



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Appearance of Sea Floor in Convair Lagoon Demonstrating Entrances for Unidentified Burrow Systems

FIGURE 5.2-2

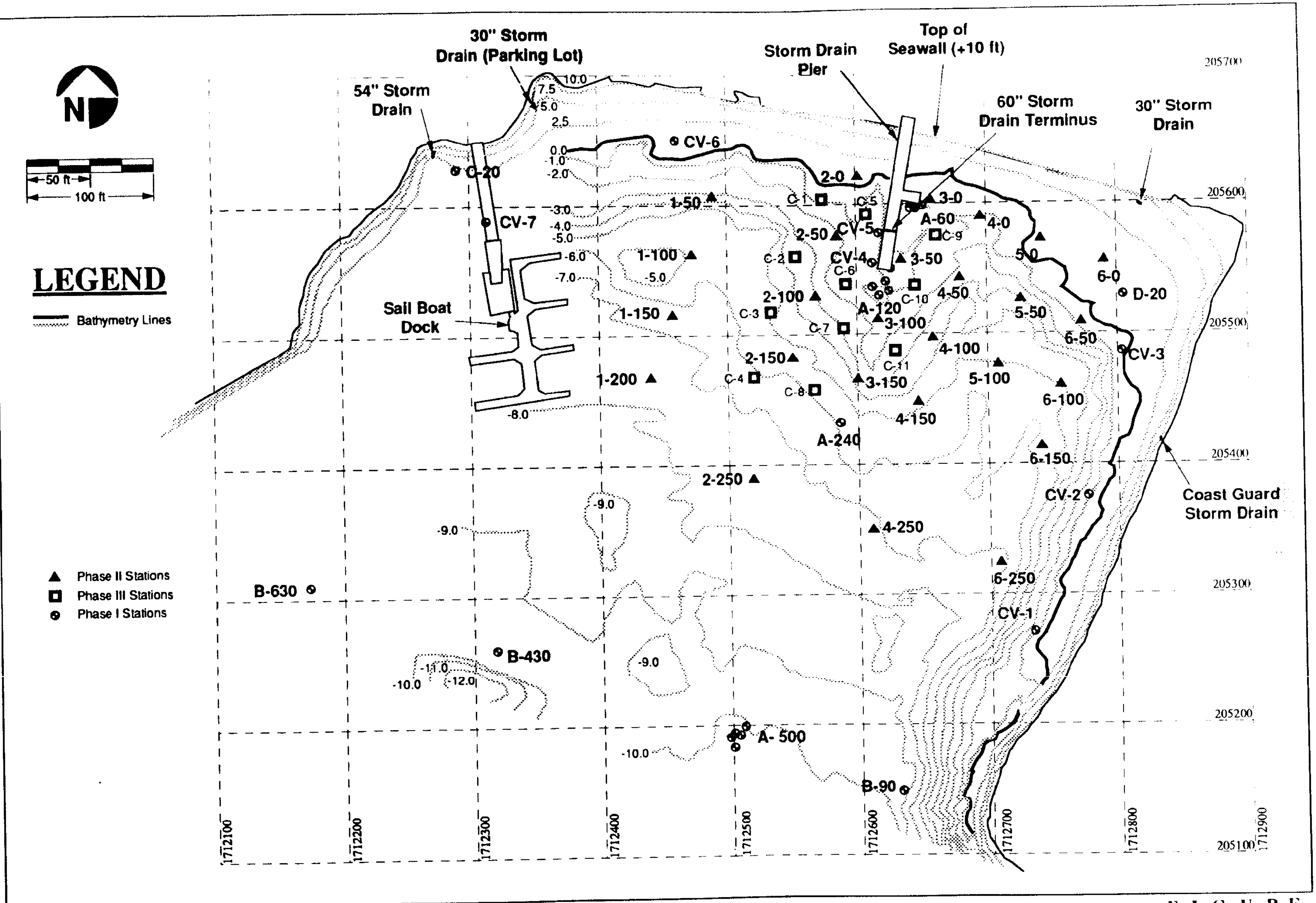

FIGURE 5.2-3

Sediment Sampling Locations In Convair Lagoon

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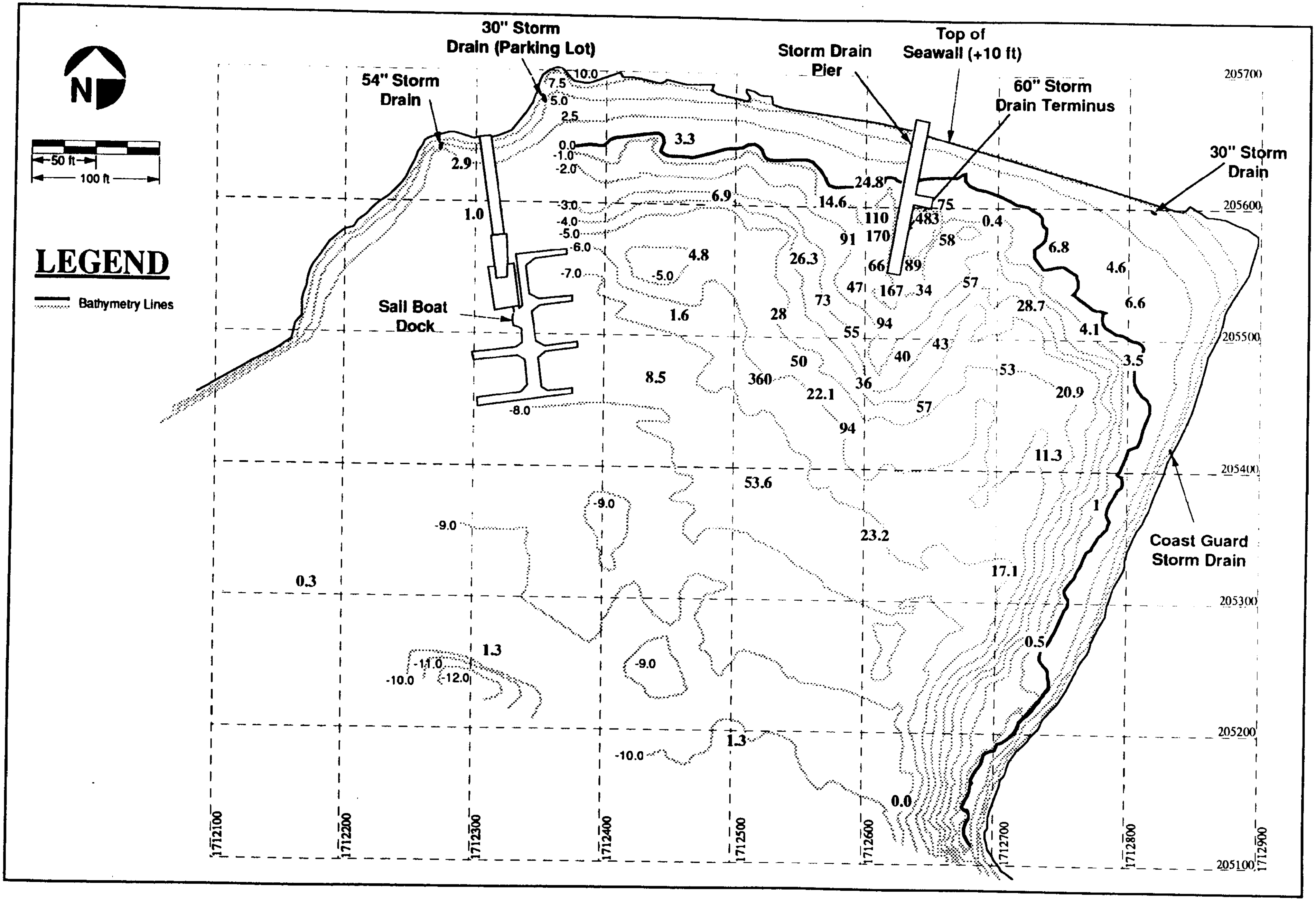

Distribution of Total PCBs (mg/kg dry weight) in the Upper Foot of Sediments in Convair Lagoon

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FIGURE 5.2-4

copper, lead, nickel, and zinc) are reported from sediments outside the remediation area (Figure 5.2-5). None of the metals concentrations exceed the NOAA ER-M Levels and only mercury exceeds the State of Washington Sediment Management Criteria. Copper or mercury concentrations do not exceed the cleanup levels established for Commercial Basin, San Diego Bay (copper - 530 mg/kg dry weight, mercury - 4.8 mg/kg dry weight; RWQCB 1990).

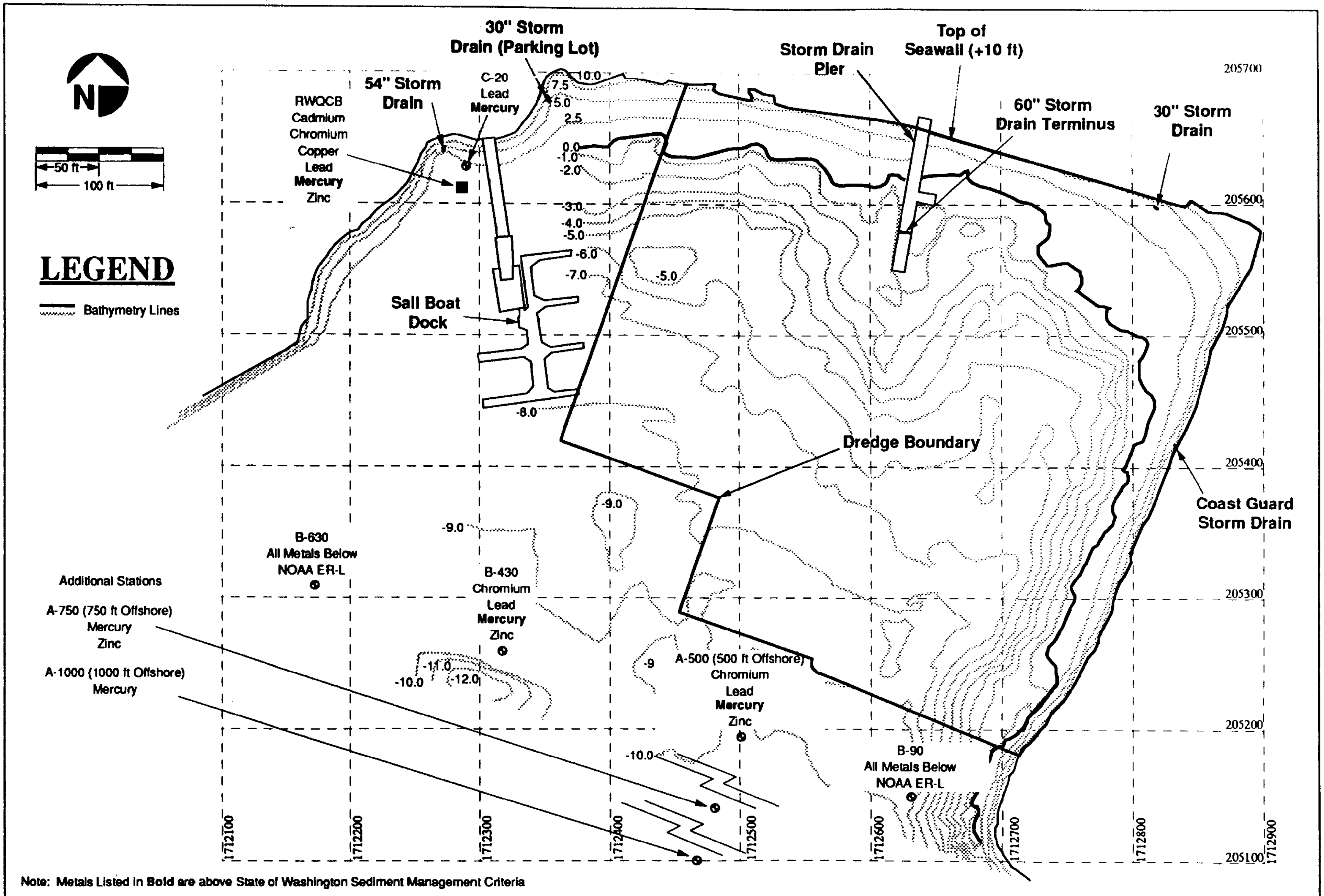
Although these regulatory guidelines have no status for San Diego Bay, they are used by many regulatory agencies to interpret sediment chemistry results. Values exceeding the guideline(s) have a statistical potential for association with adverse biological effect; however, the mere presence of a contaminant does not indicate biological effects. A large body of literature has developed in the last several years describing conditions that neutralize potential effects of trace metals (e.g., acid-volatile sulfides and organic carbons) (Ankley et al. 1993).

Marine Biology

Information from Previous Studies

The study of the biological resources in Convair Lagoon includes 1) a review of literature available from the vicinity of the project site, 2) a previous cursory site reconnaissance, and 3) results of field studies conducted in April 1993 as part of this EIR. Previous site-specific information on marine biological resources is limited to one, 1-day field reconnaissances from shore (Macdonald 1985) and ancillary observations recorded during the remediation design program for the Lagoon (Ebasco 1992). Information on fishes in the area is derived from studies done for the nearby Sunroad Marina on Harbor Island (approximately 1,000-2,000 feet west of the project area; Ford and Macdonald 1986).

Macdonald (1985) stated, "While site-specific biological data are lacking, the area does not appear to be prime habitat, nor have high biological productivity, nor to harbor rare, threatened, or endangered species." A subsequent intertidal field reconnaissance of the area conducted by Macdonald on March 4, 1985, seemed to support that statement. Findings showed that the limited hard substrate areas supported mussels and barnacles at higher elevations and a sparse biota of red algae, sea anemones, and tunicates below the water line. In the lower intertidal zone, burrows of infaunal organisms were evident in soft-



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Distribution of Trace Metals Exceeding NOAA ER-L Levels Outside the Project Area in Sediment in Convair Lagoon

FIGURE 5.2-5

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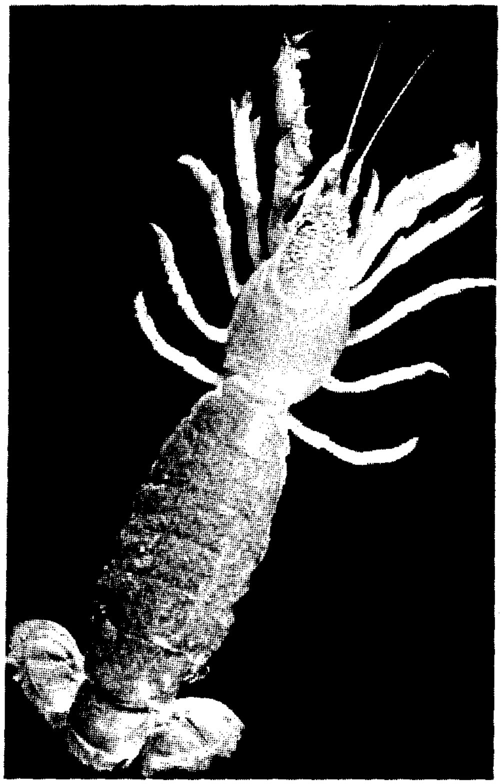
bottom areas and molluscs including an introduced Japanese nestling mussel (*Musculista senhousia*), bubble snails (*Bulla gouldiana* and *Haminoea* spp.), and a predatory sea slug (*Chelidonura inermis*) were present.

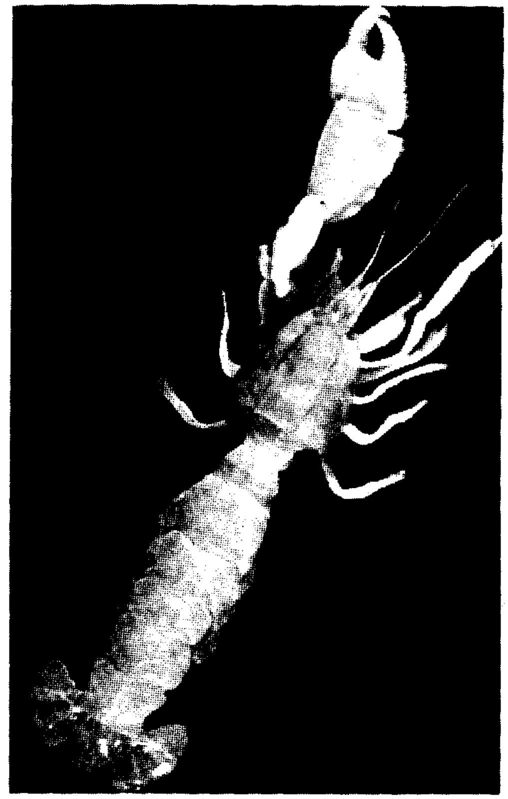
Fish and epifaunal invertebrate populations were assessed in the nearby East Harbor Island basin prior to construction of Sunroad Marina using trawls and beach seines (Ford and Macdonald 1986). Since these organisms are mobile and the opening to Convair Lagoon is contiguous with the mouth of East Harbor Island basin, it is reasonable to assume that this group of organisms at least visit the project site. The species found were typical of central and northern San Diego Bay, as well as other larger southern California embayments (Ford and Macdonald 1986). Abundance of small fish just below the water line of the basin was assessed with beach seines. The most abundant fish were the queenfish (*Seriphus politus*) and the topsmelt (*Atherinops affinis*). Cheekspot and arrow gobies (*Clevelandia ios*) were also fairly abundant. Fishes at greater depths and more distant from the shoreline were assessed using trawls. Round stingray (*Urolophus halleri*), California halibut (*Paralichthys californicus*), northern anchovy (*Engraulis mordax*), and queenfish were most common. Also common were barred sand bass (*Paralabrax nebulifer*), spotted sand bass (*Paralabrax maculatofasciatus*), and diamond turbot (*Hypsopsetta guttulata*). Common epifaunal invertebrates included the California bubble (*Bulla gouldiana*) and the mud snail. Invertebrates of commercial or recreational importance included ghost shrimp (*Callianassa affinis*), spiny lobster (*Panulirus interruptus*), and a shrimp (*Penaeus californiensis*) (Figure 5.2-6). The most abundant species of bivalves were the egg cockle (*Laevicardium substriatum*) and the introduced Japanese nestling mussel, both usually associated with the infauna. These species and others encountered in the East Harbor Island Basin would be expected in Convair Lagoon based on the proximity of the sites and similarity of habitat types in each.

<u>April 1993 Field Reconnaissance Surveys</u>

To augment the limited biological information for the lagoon described above, a three-day field survey of intertidal, subtidal, and eelgrass habitats was conducted as part of the EIR program. Intertidal and subtidal surveys to identify the macrofaunal organisms present in the lagoon and provide qualitative estimates of their abundance were conducted on April 9. The distribution and density of eelgrass in the lagoon were mapped on April 13. A subtidal survey was conducted on April 16 to identify macrofaunal organisms in the lagoon and provide quantitative estimates of the density of unidentified burrow systems.



Upogebia pugettensis (Dana). Blue Mud Shrimp. 95 mm long (overall, including appendages).



Callianassa californiensis Dana. Bay Ghost Shrimp. 100 mm long (overall).

SOURCE: Morris, Abbott, and Haderlie, Plate 166, 1980

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Photo of the Mud Shrimp and Ghost Shrimp

FIGURE 5.2-6

The site-specific field study was designed to 1) map the density of eelgrass and the areal extent of eelgrass meadows; and 2) describe the benthic biota in the intertidal and shallow subtidal habitats of the project site (Figure 5.2-7). Eelgrass was mapped on the basis of density categories (i.e., low [<8 shoots/m^2], moderate [8 to 17 shoots/m^2], and high [>17 shoots/m^2]) along transects located on 30-foot centers and originating from either the sea wall or the riprap boundaries of the project area. Observations on benthic biota and fish were recorded along each transect and in other areas. Densities of burrows were sampled both in intertidal and subtidal areas.

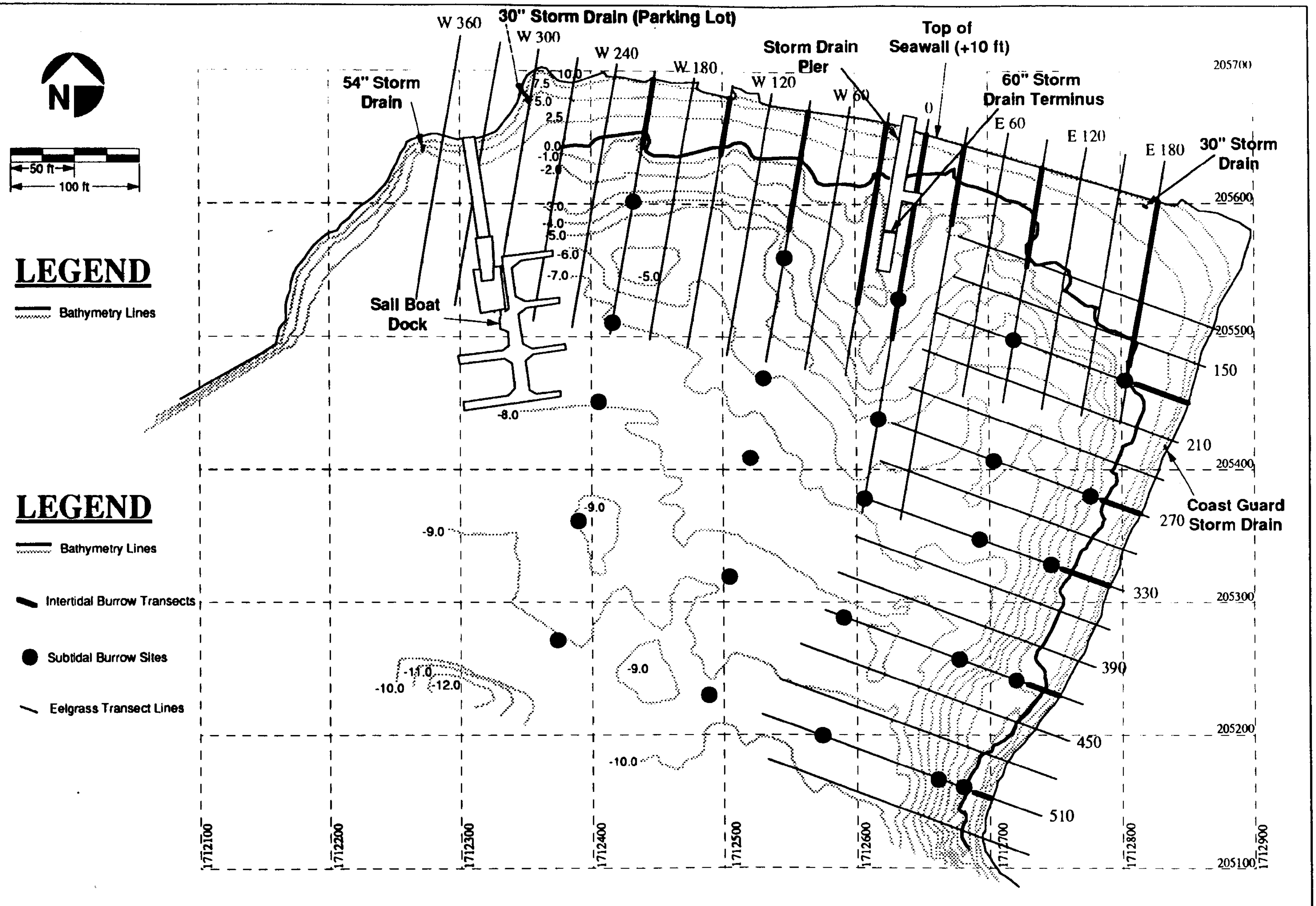
Eelgrass. Total estimated eelgrass coverage on the 4.8-acre project site is 0.82 acres (Table 5.2-1). Eelgrass distribution and density within the project site are illustrated in Figure 5.2-8. Low-density growth covers approximately 25 percent of the eelgrass bed, moderate-density growth covers about 64 percent of the bed, and high-density growth covers about 11 percent of the bed.

Table 5.2-1

ESTIMATED AREA OF EELGRASS MEADOWS IN CONVAIR LAGOON

	Low Density	Moderate Density	High Density	Total
Estimated Area in Sq Feet	8,940	22,860	3,950	35,750
Estimated Area in Acres	0.21	0.52	0.09	0.82
Percent of Eelgrass Meadow	25%	64%	11%	100%
Percent of Project Site	4.4%	10.8%	1.9%	17.1%

Generally, eelgrass was more abundant along the northern shore than along the eastern shore, adjacent to the Coast Guard facility. Except for an apparent gap in the bed in the vicinity of the 60-inch storm drain, the general distribution of eelgrass appears to reflect the bathymetry of the lagoon. The low-density areas were located mainly at the outer edge of the eelgrass meadows and probably indicate a response to reduced light levels. High-density patches occurred mainly at depths between -1 and -2 feet MLLW.



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Approximate Areas Sampled During Intertidal, Subtidal, and Eelgrass Sampling in Convair Lagoon

FIGURE 5.2-7

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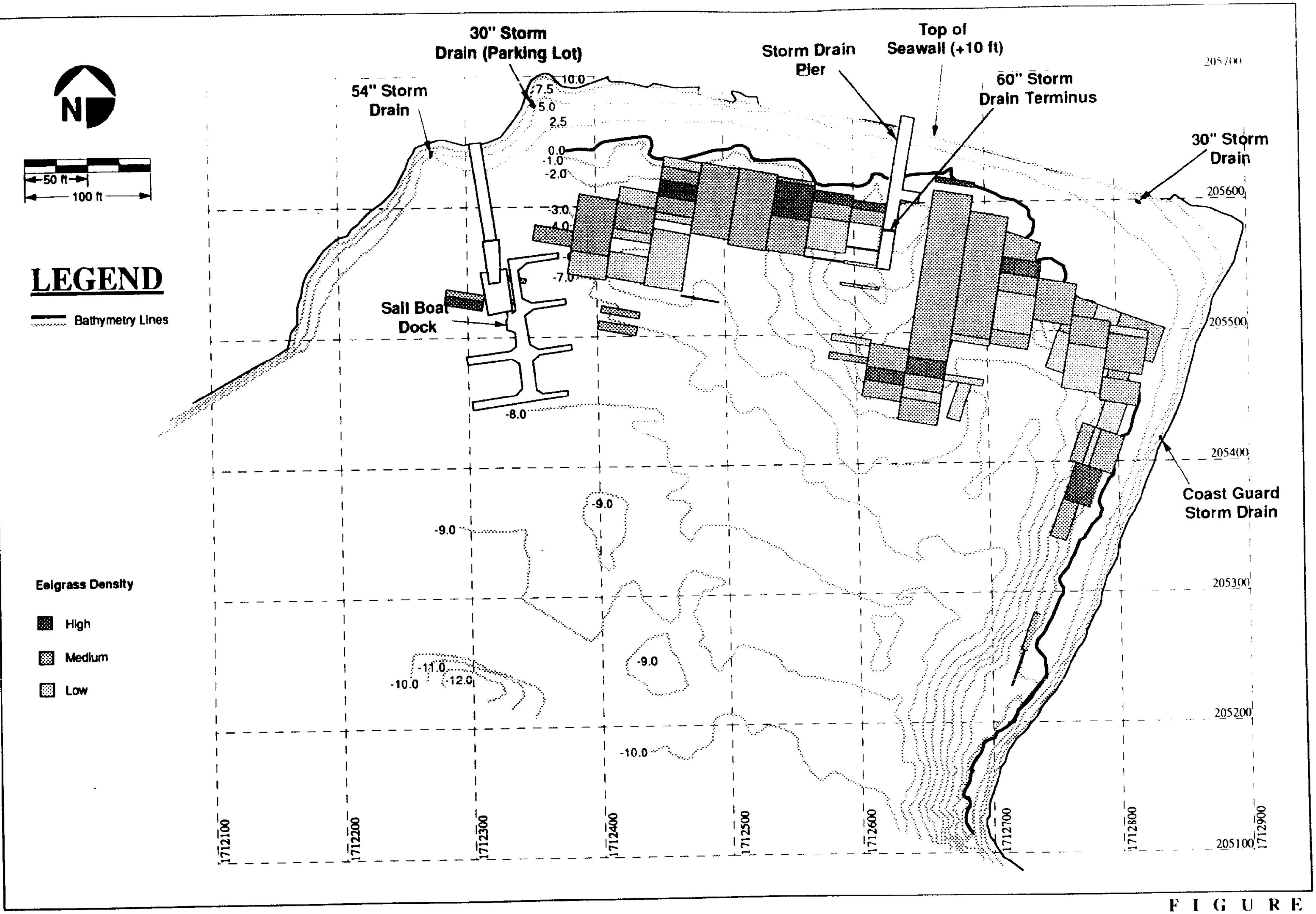

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Distribution and General Density Patterns of Eelgrass in Convair Lagoon

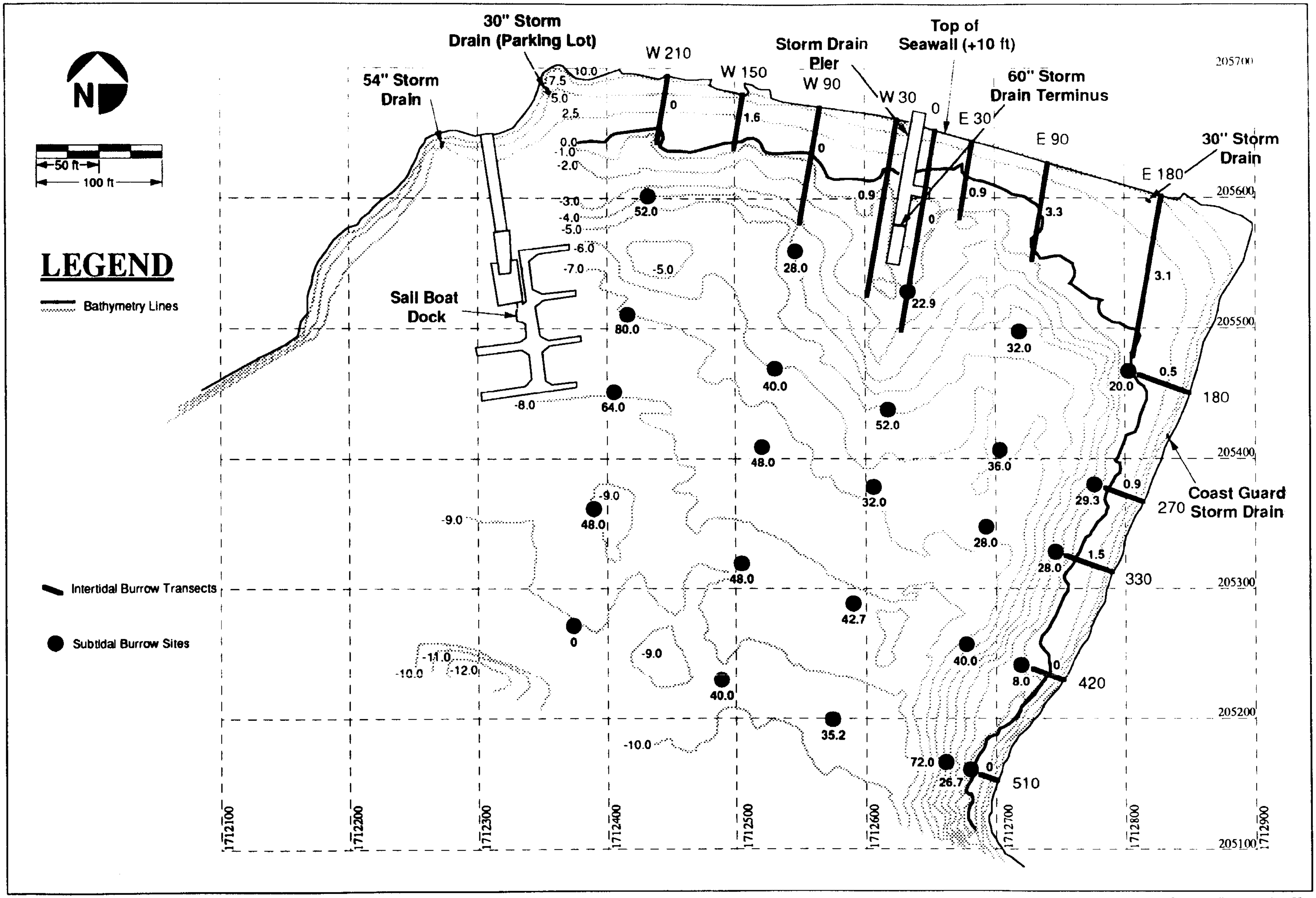
FIGURE 5.2-8

The gap in the eelgrass bed around the 60-inch storm drain was noted during this survey and the 1992 survey (Ebasco 1992).

Intertidal Invertebrates. Intertidal organisms observed included burrowing species such as ghost or mud shrimp (Figure 5.2-6), species living on or only partially buried in the sediment, and species associated with hard substrate (i.e., riprap and concrete pier of the 60-inch storm drain). Species associated with hard substrate included limpets (*Collisella scabra* and an unidentified limpet), barnacles (*Chthamalus dalli* and *Balanus* spp.), the lined shore crab (*Pachygrapsus crassipes*), a sedentary tubicolous snail (*Serpulorbis squamigerus*), a fleshy brown alga (*Colpomenia sinuosa*), and a branched brown alga (*Sargassum* sp.)

Burrow density in the intertidal areas differed among transects from the three main sampling areas: the west side of the 60-inch storm drain (WEST), the east side of the drain (EAST), and transects along the riprap adjacent to the Coast Guard facility. Highest mean densities of intertidal burrows were present along two transects east of the 60-inch storm drain with densities >3/m^2 (Figure 5.2-9). Mean densities were lower from 30 feet east to 210 feet west of the 60-inch storm drain. Mean densities were depressed in the area around the 60-inch storm drain as there were several areas with a higher elevation compared to the surrounding area (and to the EAST 180 feet transect). These elevated areas had few if any burrows, thus decreasing the mean density because of the elevation, different grain size, and different compaction of the sediment (these areas easily supported the weight of a person while much of the lower area did not). In general, densities of burrows were considerably lower than observed subtidally.

Subtidal Invertebrates and Fish. Descriptions of epibenthic macroinvertebrate and fish assemblages at the project site are based on qualitative observations and counts of burrows and organisms during the 1993 eelgrass and benthic surveys in the subtidal zones. The most abundant macroinvertebrate species in the soft-bottom habitat in the project area was probably a tubicolous polychaete (*Pseudopolydora paucibranchiata*). Small upright mud-impregnated tubes characteristic of this species were abundant from the mid-intertidal throughout the subtidal zone (Figures 5.2-10 and 5.2-11). An introduced nestling mussel was quite common in the area (Figure 5.2-10) and probably dominates the biota in terms of biomass (weight of organisms). This mussel is a common inhabitant of soft



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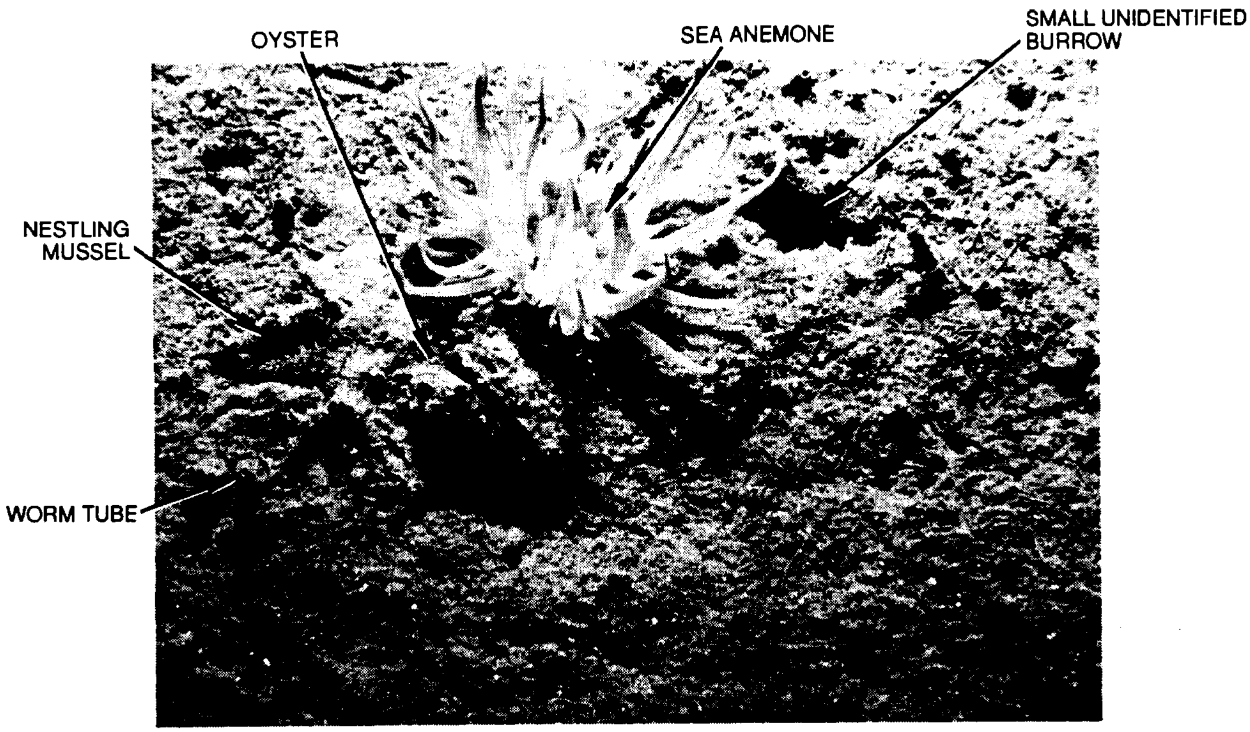
Distribution and Density of Intertidal and Subtidal Burrows in Sediments in Convair Lagoon

FIGURE 5.2-9



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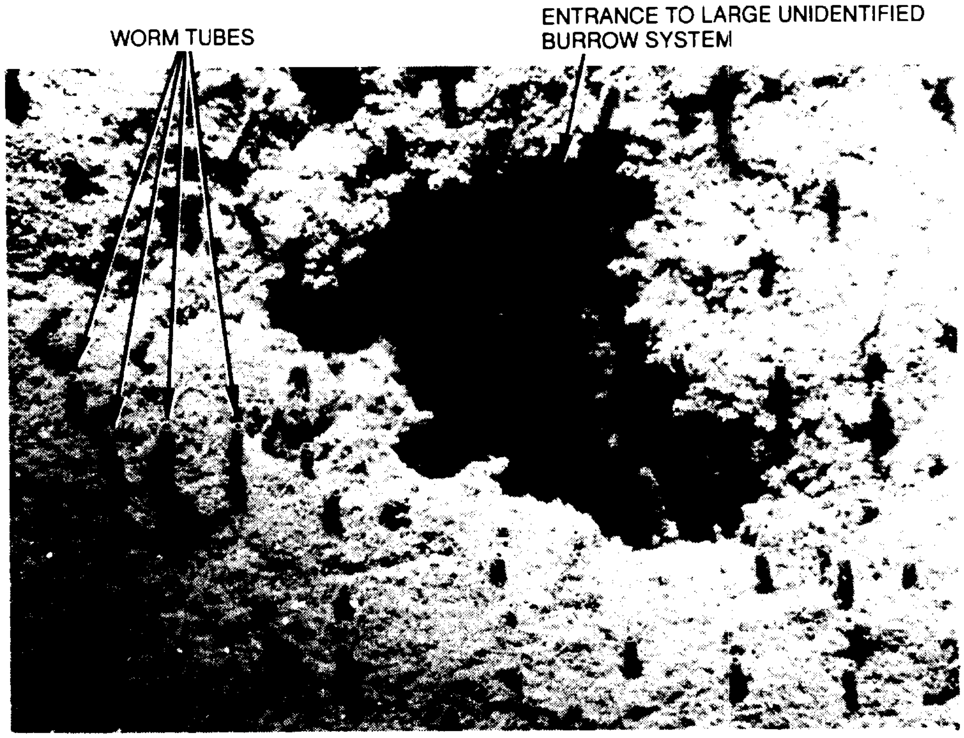
Appearance of Tubicolous Polychaete Tubes, Nestling Mussel, Oyster, and Sea Anemone in Sediments in Convair Lagoon

FIGURE
5.2-10



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Appearance of Tubicolous Polychaete Tubes and Entrance to Unidentified Burrow System in Sediments in Convair Lagoon

FIGURE 5.2-11

subtidal sediments offshore of eelgrass meadows throughout San Diego Bay. Densities in Convair Lagoon appear similar to those observed in other parts of the bay. Based on food habits of diving ducks and flatfish in other areas, different sizes of the mussel are probably important components of the food web for several demersal fishes and diving ducks throughout the bay (Deleeuw et al. 1992).

Several other macroinvertebrate species occurred at moderate to high densities. The mud snail was common generally throughout the area. The bubble snail and its major predator, the large sea slug *Chelidonura inermis*, were most common in the vicinity of eelgrass but occurred throughout the project area.

Several types of burrowing organisms were common to abundant in various parts of the project area. Burrows of ghost shrimp were observed primarily between the mid-intertidal area and approximately -2 feet MLLW. Large and small extensively branched burrows of unidentified organisms were common throughout the subtidal area (Figure 5.2-11); based on the characteristic crackling sounds heard commonly during the dives in the area and observation of juveniles during the surveys, it is suspected that pistol shrimp (Alpheidae) are the animals building these burrow systems. Small gobies also occupy these burrows but do not appear to maintain them. A red alga (*Gracilaria verrucosa*), a brown alga (*Sargassum* spp.), a solitary hydroid (*Corymorpha* sp.), an unidentified sea anemone, a moon snail (*Polinices* sp.), an oyster (*Ostrea lurida*), the spiny lobster a polychaete (*Nephtys caecoides*), and solitary tunicates (*Styela clava*, *S. montereyensis*, *S. plicata*) were also encountered. These species are commonly found elsewhere in areas with similar depths and sediment types in San Diego Bay, particularly in the north part of the bay.

Burrowing organisms are generally common in soft substrates, including Convair Lagoon, and are structurally and functionally important ecologically. Nevertheless, they are not commonly observed directly, are difficult to sample, and their identity and abundance are frequently unaccounted for, primarily because of their extensive burrows. These organisms either construct burrows or tubes for residence and feeding, or move through the sediment. Experiments using pressurized water, rhodamine dye, and brine indicate that extensive burrow systems were common in the project area (Figure 5.2-11). In the process of movement, burrowing, tube construction, or feeding, sediment is displaced from one location to another. This phenomenon, called bioturbation, has been shown to have a major effect on the distribution of sediments (Bosworth and Thibodeaux 1990;

De Vaugelas 1985; Myers 1979; Pemberton et al. 1976; Suchanek and Colin 1986; and Suchanek et al. 1986).

Burrowing organisms are important to the remediation of Convair Lagoon because they generally move considerable amounts of sediment both vertically and horizontally. Despite attempts to capture some of the burrowing organisms, only one small cheekspot goby was captured and several small alpheid shrimps were observed; thus, the organisms responsible for a large proportion of the subtidal burrows in the lagoon sediment were not identified during this survey. The density of burrows was measured at several intertidal and subtidal locations to provide a relative estimate of the abundance of burrowing organisms in different areas of the lagoon (Figure 5.2-9). Mean density of burrow openings for all areas counted was $38.1/m^2$. The transect nearest the Coast Guard Station (East 180) had the lowest mean density of burrows. The site with the lowest burrow density (none observed) was located at the farthest point from shore on the West 210 transect. Density of burrows at nearly all other sites was at least $20/m^2$, indicating the presence of large numbers of burrowing organisms throughout the lagoon. Based on observations from one transect, fewer burrows were present inside the eelgrass meadows than in areas without eelgrass. Diver observations using dilute dye and brine solutions or pressurized water showed that many of the burrow systems have multiple entrances, suggesting that the actual density of burrowing animals is probably somewhat lower.

Numerous fish were observed during all three surveys. Schools of unidentified juvenile fish were most abundant. They were present in the depression at the end of the 60-inch storm drain, in the eelgrass meadows, and in the depression at the end of the 54-inch storm drain. A school of juvenile opaleye (*Girella nigricans*) was observed near the mouth of the lagoon along the riprap revetment. Recreationally and commercially important fish species observed included California halibut, barred and spotted sand bass, and kelp bass (*Paralabrax. clathratus*). Also observed were round stingray, black perch (*Embiotoca jacksoni*), opaleye, rock wrasse (*Halichoeres semicinctus*), diamond turbot, and at least one unidentified species of goby. Most of these species were reported from the fish studies conducted in the adjacent East Harbor Island basin (PBR 1986).

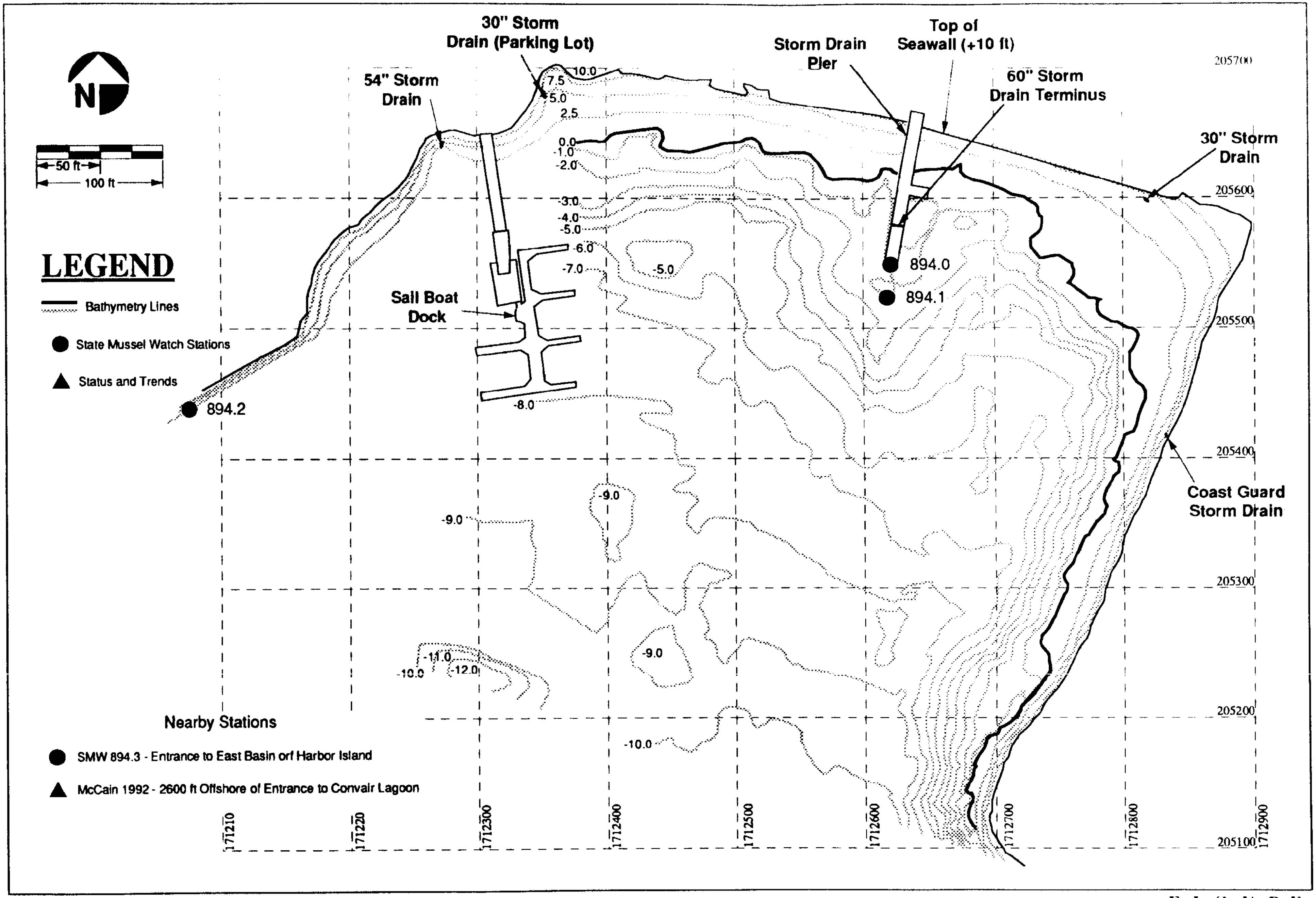
Bioavailability

California State Mussel Watch Program

The California State Mussel Watch Program uses the California mussel (*Mytilus californianus*) as a tool to monitor the bioavailability of sediment-borne contaminants throughout the state. This is accomplished by transplanting uncontaminated mussels to various areas of interest, leaving the mussels in-place for 2 to 6 months, then measuring the concentration of contaminants in the mussels. A major assumption of this program is that the presence of contaminants indicates bioaccumulation in mussel tissue; however, transient sediment passing through the digestive tract of mussels could also be measured.

Between 1982 and 1991, the California State Mussel Watch Program sampled up to four locations in the vicinity of Convair Lagoon (Figure 5.2-12). Results of these studies are summarized in Appendices B-5 and B-6. Various PCB species (Aroclors) were found in almost all samples at all sample locations. Total PCB concentrations were recorded in mussel tissue during all sampling periods and exceeded State Mussel Watch Elevated Data Level (EDL_{95}) dry weight values for PCB at Station 894.0, the site nearest the 60-inch storm drain terminus for samples collected in 1988 and 1989. In 1988 the EDL_{95} was exceeded for Total PCB, PCB 1248, and PCB 1254 at Station 894.2 and 894.3 both near the entrance to east basin of Harbor Island. The EDL_{85} for Total PCB was exceeded at Station 894.1 in 1988. Thus, concentrations of PCBs at these stations equal or exceed 85 (EDL_{85}) or 95 percent (EDL_{95}) of all measurements of that analyte in similar samples at all other sites tested by the Mussel Watch Program (i.e., these samples fall into a group that represents the upper 15 or 5 percent of the samples throughout the state). Total PCB values in mussel tissue also exceed the Food and Drug Administration (FDA) action level for PCBs of 2 ppm wet weight in 1982, 1985, 1986, and 1988.

In 1989, when additional chemicals were measured, concentrations of gamma-HCH (Lindane), alpha chlordane, and chlorpyrifos also exceeded the EDL_{95} at Station 894 and O',P' DDE and P,P" DDMS exceeded the EDL_{85}. Cadmium, chromium, copper, lead, silver, and zinc exceeded the EDL_{85} or EDL_{95} in one or more of the nine samples collected. These elevated concentrations of chemicals in the mussels indicate the potential biological availability of trace metals and organics near the terminus of the 60-inch storm drain, the most contaminated area of Convair Lagoon.



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Approximate Locations of State Mussel Watch Sample Sites and National Status and Trends Sediment and Fish Site (McCain 1992)

FIGURE 5.2-12

National Status and Trends Program

NOAA assessed pollution in San Diego Bay as part of its National Benthic Surveillance Project, a component of the National Status and Trends Program. They sampled one site in the bay during 1984 and 1985. Because high concentrations of sediment and tissue contaminants were found, an additional site was added in 1986, and seven sites were sampled between 1987 and 1988. Fish and sediments from an East Harbor Island site (approximately 2,000 feet offshore from the entrance to Convair Lagoon) were sampled at least once per year from 1986 to 1988 (Figure 5.2-12).

In summarizing these studies, McCain et. al. (1992) concluded that mean concentrations of selected PCBs, trace metals (e.g., copper and lead), and aromatic hydrocarbons in sediments from sites in central (East Harbor Island) and southern (28th Street) San Diego Bay were significantly higher than other bay sites and nearby non-urban sites.

Analysis of fish tissues indicated that concentrations of various aromatic hydrocarbons and PCBs were lower in non-urban areas than in the bay but concentrations in tissues from study sites within the bay generally were not significantly different from each other. Between-site differences inside the bay were found only for PCB concentrations in black croaker liver tissue from the East Harbor Island (highest) and Shelter Island sites. This study also noted that, while DDT concentrations were high in bay sediments, concentrations in fish tissue were lower in San Diego Bay than at the control station at Dana Point. Metal concentrations in fish samples from the bay and control sites were not significantly different.

5.2.2 Impacts

5.2.2.1 Proposed Project - Nearshore Containment Facility (NCF)

Beneficial Impacts

Successful implementation of the proposed project should result in significant improvement to the sediment and water quality in Convair Lagoon and the contiguous areas of San Diego Bay. Specifically the removal of contaminants will reduce the potential for 1) resuspension or remobilization of contaminants and redistribution to other areas of north San Diego Bay, and 2) bioaccumulation in resident biota and the potential transferred to higher levels in the food chain including man.

Four marine environmental areas in the project area where impacts may result from this alternative are 1) the footprint of the nearshore containment facility; 2) the area in which dredging will occur (the dredge footprint); 3) the area between the dredge footprint and the silt curtain; and 4) the area outside of and adjacent to the silt curtain (Figure 5.2-13). Biological assemblages in all these areas will be affected, especially the epibenthic forms living on riprap and the benthic invertebrates and burrowing fish inhabiting sediments in the project area. Types of impacts may include 1) direct mortality associated with removal of or burial by Lagoon sediments or 2) acute toxicity resulting from exposure to remobilized sediment-sorbed contaminants; 3) increased sublethal or chronic impacts associated with exposure to remobilized sediment-sorbed chemicals; 4) bioaccumulation; and/or 5) magnification of contaminants. These issues are discussed in more detail in the following sections.

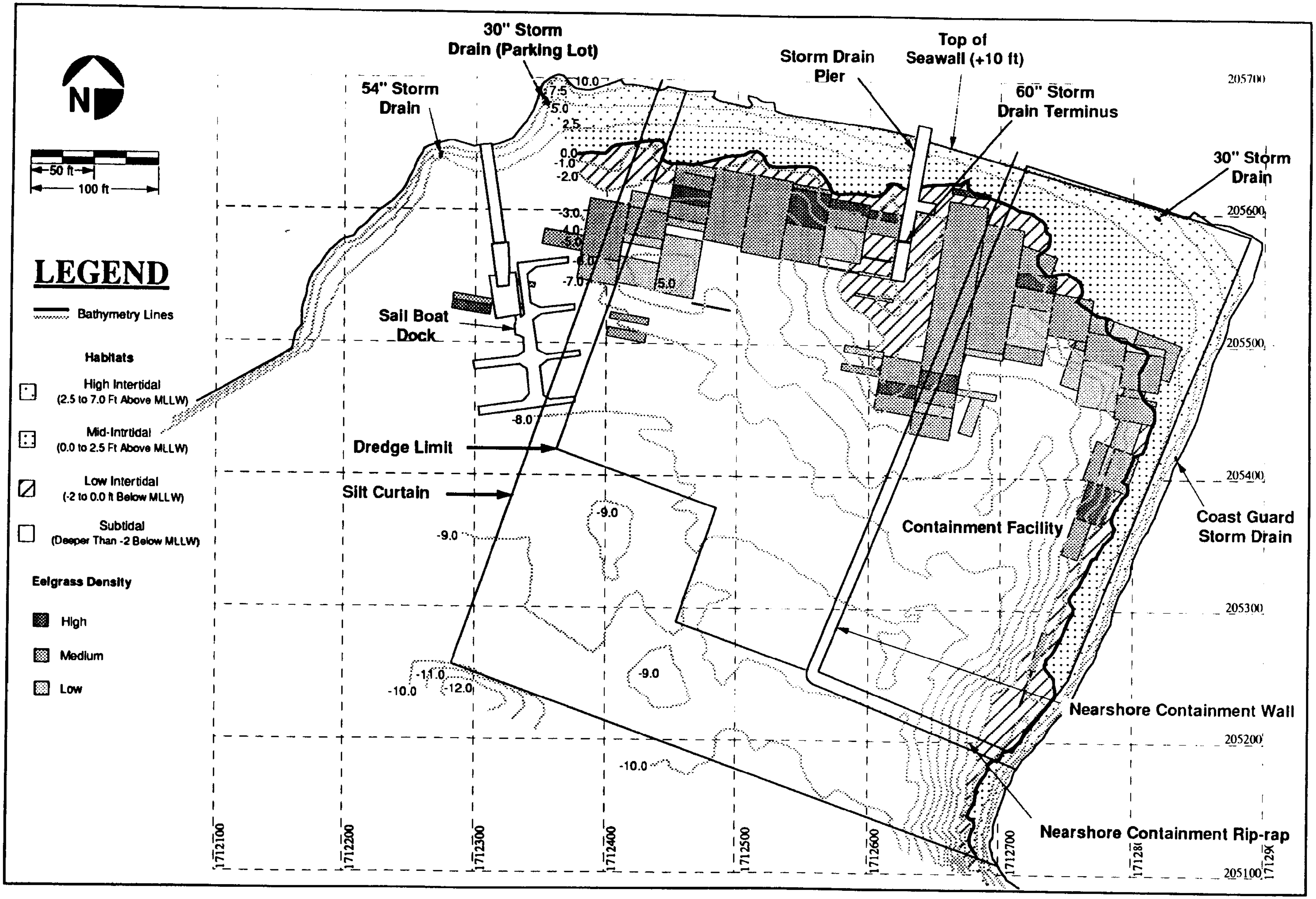
Short-Term Construction-Related Impacts

Nearshore Containment Facility Construction

Construction of the NCF would involve building a sheetpile wall and placing rip-rap adjacent to the wall (Figure 5.2-13). These activities would result in increased turbidity, noise, and above-average general human activity in the Lagoon. This is considered to be an insignificant impact assuming successful management of the construction operation.

Dredging to Relocate Contaminated Sediment Inside the Dredge Footprint Into the NCF

Project Footprint. The area within the dredge footprint would be enclosed within a silt curtain to improve containment of turbidity inside the project area. Lagoon sediments would then be hydraulically dredged and pumped into the NCF for dewatering and long-term containment. Dredging would result in 1) a considerable increase in turbidity above normal; 2) a somewhat unconfined turbidity plume of unknown size and shape; 3) substantial but largely contained remobilization of chemicals in the sediment; and 4) total eradication of eelgrass, macroinvertebrates living on and in the sediment, and burrowing fish within the dredge and NCF footprint. Mobile fish and some mobile macroinvertebrates may move to nearby suitable habitats when construction begins.



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Habitats Impacted by Nearshore Containment Facility

FIGURE 5.2-13

Dredging activities would eliminate approximately 0.39 acres of eelgrass in the combined dredge and silt curtain footprint (Figure 5.2-13). Benthic biota inhabiting the 1.42-acre dredge footprint would also be lost. Organisms inhabiting the 0.31 acres of intertidal habitat in the combined footprint would also be lost. The loss of intertidal habitat within the project area represents a small percentage of baywide totals; however, this is considered to be a significant cumulative impact.

Silt Curtain Footprint. The areas within the silt curtain but outside the dredge footprint would be affected by resuspension and potential remobilization of chemical contaminants, turbidity, and burial of benthic species, including eelgrass in the nearshore area. Benthic biota inhabiting the 1.24-acre silt curtain footprint would not be excavated but would probably be disturbed or buried by deposition of particulate material resuspended by dredging and retained within the silt curtain. These areas may also be physically disturbed (e.g., scouring and scarring of the bottom) by maneuvering of the dredge, deployment of anchors to position the dredge, and installation and maintenance of the silt curtain. This is considered to be an insignificant impact assuming successful management of the dredge operation.

Adjacent Area Outside Silt Curtain. Adjacent areas may be affected by resuspension and potential remobilization of chemical contaminants, turbidity, burial of benthic species, and physical disturbance from the dredge operations.

Resuspension and potential remobilization of chemical contaminants in the sediment into the water column and the redistribution of suspended particulate-sorbed contaminants to adjacent areas may result in short-term acute or chronic impacts to water column and benthic biota. Of particular concern are planktonic eggs and larvae of numerous invertebrate and fish species, especially during the spring when large numbers of species are spawning. Settlement of contaminants from the water column and incorporation into the sediments are discussed under long-term effects. Concentration of PCB 1248 in the elutriate tests (Ebasco 1992) designed to predict PCB levels in the dredge area water were 69 and 15 ug/l for unfiltered and filtered samples, respectively. Eisler (1986) conducted an extensive review of PCB hazards to fish and wildlife and reported that concentrations of PCBs from 0.1 to 10.0 ug/l were toxic to sensitive marine species. Consequently, containment of contaminants from the dredge operation is necessary to ensure that no significant impacts occur.

Turbidity resulting from the dredge operation may cause short-term sedimentation in the eelgrass meadows and shallow benthic habitat to the west and outside the dredge footprint. This sedimentation could affect the adjacent eelgrass meadows.

Adjacent areas may also be physically disturbed (e.g., scouring and scarring of the bottom) for a short time period by maneuvering of the dredge and deployment of anchors to position the dredge, and installation and maintenance of the silt curtain when working along the west and south boundaries of the project site. This is considered to be an insignificant impact.

Water Treatment Facility Discharge

Ebasco (1992) estimated that the hydraulic dredging operation would produce an approximately 10:1 water-sediment slurry. Consequently, the slurry entering the NCF would have to be dewatered. Ebasco evaluated the chemical composition of the untreated water generated by this operation using elutriate analysis. Both the filtered and unfiltered fractions of elutriate samples exceeded the National Ambient Water Quality Criteria (acute and chronic) and the California Bays and Estuaries Criteria for silver, copper, and PCB 1248 (Appendix Table B-6). Concentrations of PCB 1248 in elutriate analyses exceeded values reported by Eisler (1986) as toxic to sensitive marine species. Concentration of several other contaminants were below levels of detection that were high enough that an uncertainty of whether they exceeded one or more national or California water quality criteria remains. These contaminants include chromium, mercury, nickel, lead, and selenium. Consequently, this water may require additional treatment to obtain a permit for disposal into San Diego Bay. This is considered to be a significant impact.

Long-Term or Facility-Related Operational Impacts

Construction and Operation

Construction of the NCF would result in the loss of approximately 1.75 acres of tidally influenced habitat. This area comprises 0.21 acres of upper intertidal, 0.29 acres of middle intertidal, 0.24 acres of lower intertidal, and 1.0 acres of subtidal habitat, based on separation of the upper and middle intertidal at +2.5 feet MLLW, the middle and lower intertidal at 0.0 feet MLLW, and lower intertidal and subtidal at -2.0 feet MLLW. This includes approximately 0.39 acres of eelgrass meadows which is composed of 0.1 acre of low-, 0.25 acres of medium-, and 0.04 acres of high-density eelgrass. Approximately 1.75 acres of shallow open water habitat would also be lost. The loss of 1.75 acres of tidal habitat represents a small percentage of total tidal habitat of San Diego Bay; however, these habitat losses are considered cumulatively significant.

Modified Habitat. Construction of the riprap would result in the modification of approximately 0.13 acres of tidally influenced habitat. Based on the elevation criteria specified above, this area is composed of 0 acres of upper intertidal, 0.01 acres of middle intertidal, 0.02 acres of lower intertidal, and 0.10 acres of subtidal habitat. These habitats would be replaced with an equal amount of riprap habitat.

Deterioration of NCF. Long-term deterioration of the NCF may result in the release of contaminants into Convair Lagoon. This is considered to be an insignificant impact assuming successful management of the NCF.

Dredge Footprint. This area will be dredged and result in short-term losses previously described. Based on the condition that the dredged area is restored to existing bathymetry with clean sand after dredging and construction of the NCF are complete and the lost eelgrass meadow is revegetated, no long-term impacts are expected.

Silt Curtain Footprint. The area within this footprint could receive sufficient contaminants from suspended material from dredging to elevate the PCB and metals concentrations to levels of concern. This is considered to be an insignificant impact assuming successful management of the dredge operation.

Adjacent Area Outside the Silt Curtain. No long-term impacts are expected in this area if dredging operations meet regulatory criteria for controlling turbidity and chemical contaminants.

Residual PCBS. A substantial amount of PCBs would be removed from the lagoon and contained in the NCF after remediation is complete. Some residual sediment PCBs would remain in the lagoon. Ebasco (1991) estimated levels after remediation would be approximately 4.6 ppm for the dredge area and approximately 3.8 ppm for the total lagoon. Although both values are above the NOAA ER-M level (Appendix C-4) of 0.4 ppm, a concentration above which effects are frequently observed (NOAA 1990) and the California Action level of 1 ppm in soils, they are well below the cleanup level of 10 ppm ordered by the RWQCB.

Storm Drain Realignment

The operation of the 60-inch storm drain should not change following implementation of the project except the drain will carry runoff from the rerouted 30-inch storm drain. Because the contaminated sediments in the vicinity of the storm drain discharge would be removed under this alternative, there would be no disturbance and resuspension of contaminates expected. However, the catchment basins in the lower portion of the storm drain system should be routinely monitored to identify any new contaminants accumulating in the system. New contaminated sediment should be removed from the basins and appropriately disposed of before it recontaminates Convair Lagoon. No significant impacts are expected from storm drain modification.

5.2.2.2 No Action

The No-Action alternative would result in no remediation of Convair Lagoon. Consequently, chemical contaminants including PCBs and metals present in the sediment would continue to bioaccumulate in resident biota and potentially be transferred to higher levels in the food chain including man. Contaminants would also be resuspended by various physical factors (e.g., waves, currents, and the discharge of rainwater runoff), biological activity (e.g., bioturbation by the large number of burrowing organisms inhabiting the lagoon) and human activities (e.g., boating) where they could become biologically "availabile" to various marine organisms in the water column.

5.2.2.3 Sand Capping - Preferred Alternative

Beneficial Impacts

Successful implementation of this remediation alternative would result in significant improvement to the sediment and water quality in Convair Lagoon and the contiguous areas of San Diego Bay. Specifically the capping and containment of contaminants will reduce the potential for 1) resuspension or remobilization of contaminants and redistribution to other areas of north San Diego Bay, and 2) bioaccumulation in resident biota and the potential transferred to higher levels in the food chain including man.

Three marine environmental areas in the project area that may be impacted by this alternative are 1) the footprint of the sand cap; 2) the area between the sand cap footprint and the silt curtain; and 3) the area outside and adjacent to the silt curtain (Figure 5.2-14). Biological assemblages in all of these areas would be affected, especially the sessile epibenthic organisms living on riprap and the benthic invertebrates and burrowing fish inhabiting the project area. Impacts may involve direct mortality from burial or limited sublethal or chronic toxicity resulting from remobilization of sediment sorbed-chemicals and limited bioaccumulation and/or magnification of contaminants due to increased availability in the water column. These issues are discussed in more detail in the following sections.

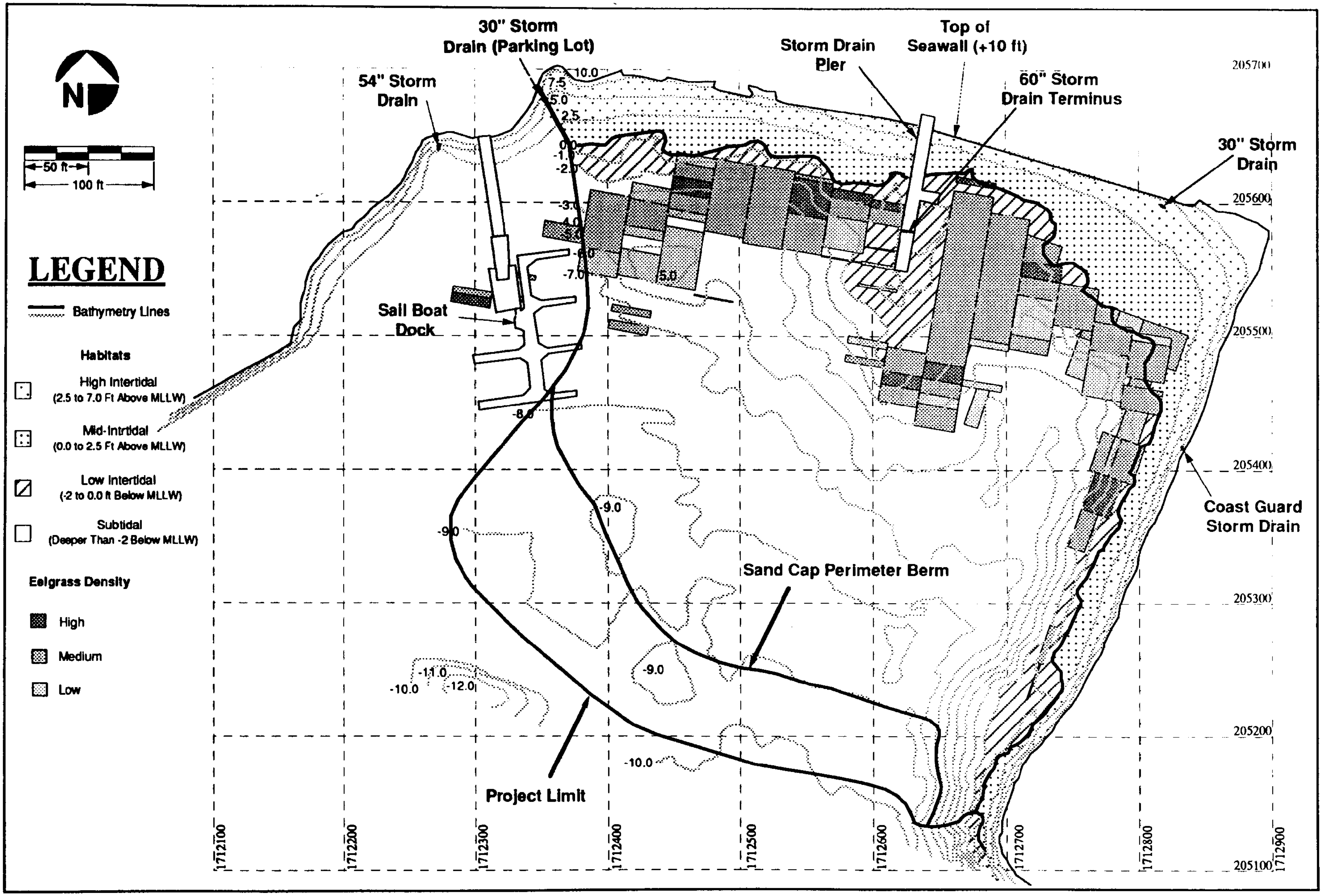
Short-Term Construction-Related Impacts

Sand Cap Construction

Construction of the sand cap would involve placement of a silt curtain to contain turbidity, the installation of various protective liners, a rock layer to inhibit bioturbation, riprap, and the sand cap (Figure 5.2-14). Since no sediment would be dredged, the deeper sediment layers containing the greatest concentrations of contaminants would not be disturbed. Sand capping activities would result in 1) an increase in turbidity above normal but substantially less than options employing dredging; 2) a turbidity plume of unknown size and shape; 3) slight but uncontained remobilization of chemicals in the surficial sediment; and 4) loss of eelgrass, macroinvertebrates living on and in the sediment, and burrowing fish within the sand cap footprint. Mobile fish and some mobile macroinvertebrates may move to nearby suitable habitats when construction begins. These short-term impacts are considered to be insignificant assuming careful management of the cap installation and successful operation of the silt curtain.

Adjacent Area Outside the Silt Curtain

Areas adjacent to and outside the silt curtain may be affected by resuspension and potential remobilization of chemical contaminants, turbidity, burial of benthic species, and physical disturbance from the capping operations. Most of the resuspended sediment will originate from clean materials used for capping but capping activities may cause a limited amount of resuspension and remobilization of contaminated sediments. Redistribution of suspended



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Habitats Impacted by Sand Cap

FIGURE 5.2-14

particulate-sorbed contaminants into adjacent areas may result in limited short-term acute or chronic impacts to biota in the water column and sediments. Of particular concern are planktonic eggs and larvae of numerous invertebrate and fish species, especially during the spring when large numbers of species are spawning. Settlement of contaminants from the water column and incorporation into the sediments are discussed under long-term effects.

Turbidity resulting from the capping operation may cause short-term reduction in primary productivity in the adjacent eelgrass meadows. Resulting sedimentation could affect these eelgrass meadows and the shallow benthic habitat to the west and outside the cap footprint.

Adjacent areas may also be physically disturbed (e.g., scouring and scarring of the bottom) by maneuvering of vessels and barges employed in capping activities, deployment of anchors used to position the barges, and installation and maintenance of the silt curtain when working along the west and south boundaries of the project site.

These impacts are considered to be insignificant assuming careful management of the cap installation and successful operation of the silt curtain.

Storm Drain Extension

The storm drain would be extended approximately 80 feet farther offshore to provide a new discharge point. Construction would be conducted by placing extensions in line with the existing pipe. All construction would be conducted within the silt curtain perimeter and no dredging would be required. Consequently, construction impacts are considered to be insignificant.

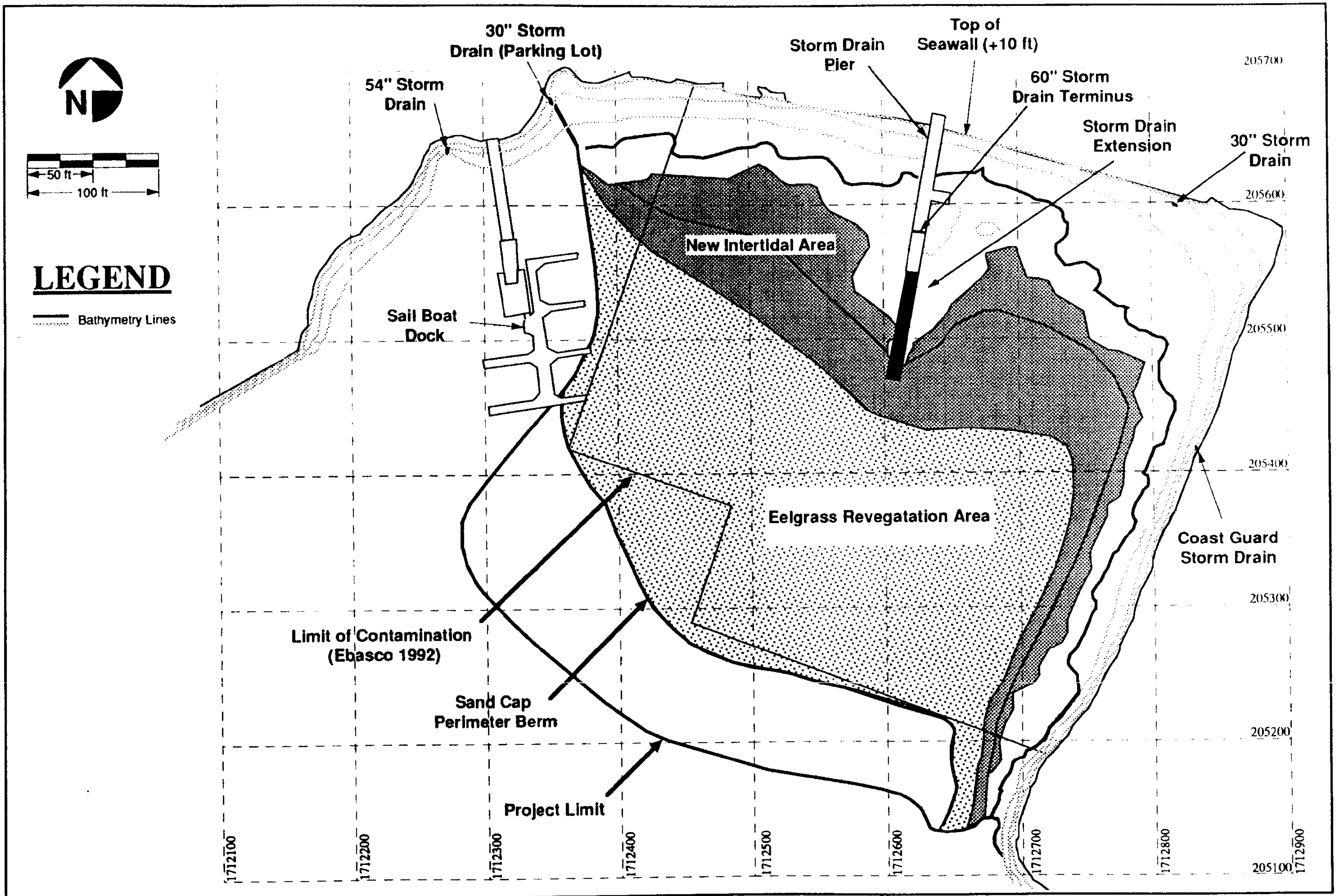
Long-Term or Facility-Related Operational Impacts

Operation

Lost Habitat. Construction of the cap would result in the modification of approximately 4.8 acres of tidally influenced habitat. This area is composed of 0.40 acres of upper intertidal, 0.47 acres of middle intertidal, 0.34 acres of lower intertidal, and 3.7 acres of subtidal habitat. This includes approximately 0.82 acres of eelgrass meadows. This meadow is composed of 0.21 acre of low-, 0.52 acres of medium-, and 0.09 acres of high-density eelgrass. The installation of a cap 3 feet thick would elevate the area presently at -3.0 feet MLLW to 0.0 feet MLLW or above. This action would result in the loss of approximately 0.98 acres of lower intertidal habitat based on the conceptual bathymetry presented in the capping plan. However, the area presently in the -3.0 to -5.0 feet MLLW range would be elevated 3 feet due to the cap and create approximately 0.98 acres of new lower intertidal habitat. This new intertidal habitat created by the cap would result in the loss of 0.98 acres of existing subtidal habitat. The increase in intertidal habitat is considered a beneficial impact since much of this habitat has been destroyed in San Diego Bay. It is anticipated that benthic and intertidal assemblages characterizing this area would rapidly recolonize within six to twelve months after cap completion. The conceptual capping plan includes the planting of eelgrass to provide cap stability and biological enhancement (Figure 5.2-15). Based on the conceptual capping plan approximately 2 acres of eelgrass would be planted. Root systems of eelgrass typically grow to depths of about 6 inches; consequently, they should not be influenced by the contaminants under the 3-foot thick cap. In addition, the perimeter berm would be constructed of large rock and smaller graded rock which will act as an artificial reef environment after construction of the cap is complete. As a result of the above biological enhancements in conjunction with containment of contaminants, habitat modifications are considered insignificant.

Long-term Deterioration of the Sand Cap. Long-term deterioration of the sand cap associated with normal erosion accompanying storms and boating activities or bioturbation may result in the release of contaminants to Convair Lagoon.

In view of moderate to high densities of burrowing organisms noted during field surveys and the proposed use of a sand cap to cover contaminated sediments in Convair Lagoon, the burrowing depth of organisms and the ability of local (or similar) species to redistribute buried sediments to the surface was investigated by review of published literature. This is one of the least understood, yet most likely, scenarios as populations of infaunal organisms (invertebrates that live and burrow in the sediment) develop in the new, clean sediments of a sand cap. These organisms either construct burrows or tubes for residence and feeding, or move through the sediment. In the process of movement, burrow or tube construction, or feeding, sediment is displaced from one location to another. This phenomenon, called bioturbation, has been shown to have a major effect on the distribution of sediments (Bosworth and Thibodeaux 1990; De Vaugelas 1985; Myers 1979; Pemberton et al. 1976; Suchanek and Colin 1986; and Suchanek et al. 1986).



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Habitat Enhancement for Conceptual Sand Cap

FIGURE 5.2-15

Infaunal recruitment occurs rapidly in shallow subtidal sediments, particularly in protected areas of bays. Reish (1961) found that colonization of newly available sediments by infauna peaked within a year and stabilized within three years. A study on dredge-and-fill operations in north San Diego Bay showed that infaunal populations re-established within six months of disturbance (Elliott, unpublished data). As populations of burrowing organisms develop, the upper layer of sediment becomes increasingly disturbed by biological activity. MacGinitie (1934) estimated that a population of ghost shrimp (*Callianassa californiensis*) can completely recycle (turn over) the upper 30 inches of sediment (the approximate depth of their burrows) in about 240 days. Other studies demonstrating the ability of callianassid shrimps to move large amounts of sediment are reported by Murphy and Kremer (1992), Aller and Dodge (up to 12 kg/m^2/day; 1974), Suchanek (1983), Suchanek and Colin (1986), Branch and Pringle (1987), and Riddle (1988). These studies have documented that burrowing activities cause sediment destabilization and resuspension but also release nutrients and increase community productivity. Exclusion experiments (Branch and Pringle 1987) and measurement of bioturbation rates (Suchanek and Colin 1986) have shown that callianassids are the most important cause of bioturbation in certain areas. Suchanek and Colin (1986) noted that some of the highest contaminant levels were associated with extremely fine-grained sediments and callianassids tend to pump these back to the surface (Suchanek 1983; Tudhope and Scoffin 1984; Riddle 1988). The situation in Convair Lagoon may be similar as organic contaminants and metals are often associated with the smaller sediment grain sizes.

If a species such as the ghost shrimp penetrates into the contaminated sediments beneath a sand cap, their burrowing and feeding activities would bring contaminants to the sediment surface where their activities and the activities of the other species restricted to the upper layer would cause further redistribution. This raises the question of how thick a permanent sand cap needs to be to ensure that it will not be penetrated by biological activity. This is separate from the physical and oceanographic questions that also should be answered relative to the sand cap including the effect of wave and storm induced water energy on the sand cap, the possibility of upward migration of contaminated sediments into the sand cap through time due to internal sediment processes, and the possibility of outside activities penetrating the cap (e.g., boating activities such as anchoring, sailboat keels getting stuck in the sand, swimmers, etc.). To address the bioturbation concern, a list of burrowing organisms that may occur at this site (based on species found in Convair Lagoon and San Diego Bay, or those that could inhabit the bay based on their reported distribution) is shown in Table 5.2-2 along with pertinent information on habitat and burrow depth. Further information on the reported locations of species most likely to inhabit a sand cap in Convair Lagoon is presented in Table 5.2-3.

The penetration depth by organisms likely to be present in Convair Lagoon following remediation is difficult to determine as few studies have been done in the southern California area to determine these depths. An early study (MacGinitie 1934) suggested that the ghost shrimp burrows extend to a depth of approximately 30 inches in southern California. More recently Griffis and Chavez (1988) found that burrow diameter, depth, volume, and number of holes differed depending on substrate composition and species in Bahia de San Quintin, Mexico (approximately 175 miles south of San Diego). Burrows in sand were deeper (16 inches [45 cm]) with less horizontal extension than in mud. Burrows in mud had a larger volume, more openings, and larger diameters. An additional factor is tidal elevation as intertidal individuals burrow deeper apparently to remain in contact with water. This is significant as the highest PCB values are at depths between 4 and 5 feet in intertidal sediments around the 60-inch storm drain (TRA 1989). This is also the area that is exposed to more wave action that could accelerate redistribution of PCBs returned to the sediment surface. Ghost shrimp in other locations have been shown to burrow deeper (~6.5 feet [~200 cm] in very fine sand, Suchanek et al. 1986; >24 inches [>60 cm] in fine to medium grade sand, Tudhope and Scoffin 1984). Related species are reported to burrow as deep or deeper (*Upogebia pugettensis* [mud shrimp] to ~35 inches (90 cm); Dworschak 1983; MacGinitie 1930) and (*Axius serratus* to >10 feet (>3 m), Pemberton et al. 1976). Species related to both of these shrimp are present in the San Diego area. Ghost shrimp and mud shrimp have been reported throughout northern San Diego Bay. A deep burrowing and usually deep water species similar to *Axius* has been reported once from a location near the bay entrance (D. Cadien personal communication). A closely related species, *Axius serratus*, disrupted the normal stratification at a relatively shallow contaminated site in Nova Scotia (Pemberton, et al. 1978). Consequently, the potential for burrowing organisms to compromise the integrity of the cap is significant.

Adjacent Area Outside Silt Curtain. No long-term impacts are expected in this area if capping operations meet regulatory criteria for controlling turbidity and chemical contaminants.

Table 5.2-2

ORGANISMS THAT MAY OCCUR IN THE PROJECT AREA AND DISTURB THE SEDIMENT SURFACE

PHLYA Species (Common Name)	Bay Habitat Type	Burrow Depth	Probability of Occurrence	Habitat Zone
MOLLUSCA - BIVALVA				
Chione spp. (chione clams)	Sandy & sandy mud	Close to surface[1]	High	Low Int
Laevicardium substriatum (egg cockle)	Sand or mud	Near surface[1]	High	Low Int
Macoma nasuta (bent-nosed clam)	Gravel, sand, mud	~.4 ft (20 cm)	High	Int to 150 ft
Nuttallia nuttallii (purple clam)	Sand and gravel	12 to 16 in[1,2]	Low	Low Int
Panopea generosa (geoduck)	Sandy mud	~4.3 ft (1.3 m)[1]	Low	Low Int, Sub
Protothaca spp. (littleneck clam)	Sandy & gravel areas	16 in (40 cm)[2]	Moderate	Mid-Low Int
Saxidomus nuttallii	Sandy	1 ft or more[1]	Low	Low Int
Solen rosaceus (rosy razor clam)	Sandy	~1 ft (30 cm)[2]	Likely	Low Int, Sub
Solen sicarius (sickle razor clam)	Sandy (w/ eelgrass)	~1.2 ft (35 cm)[2]	Likely	Low Int
Tagelus spp. (jackknife clam)	Sandy mudflats	4 to 20 in[1,2]	Likely	Low Int
Trachycardium quadragenarium (spiny cockle)	Sand flats	Close to surface[1]	Low	Low Int, Sub
Tresus nuttallii (gaper)	Sandy mud	3 ft+[1,2]	Low	Low Int
ARTHROPODA - CRUSTACEA				
Axius spp. typr (mud shrimp)		>10 ft (3 m)	Low	Subtidal
Callianassa spp. (ghost shrimp)	Mixed sand & mud	2.5 ft[2], 6.5 ft+[5]	High	Mid-Int
Hemisquilla ensigera californiensis (mantis shrimp)	Mud or sand-shell areas	3 to 6 ft (1 to 2 m)	High	Int to 90 ft
Upogebia macginitieorum (mud shrimp)	Mud or sandy mud flats	~3 ft (90 cm)	High	Low-InMud
ANNELIDA - POLYCHAETA				
Chaetopterus variopedatus (parchment-tube worm)	Sandy mud or mud	Near surface	Low	Int to Sub
Diopatra splendidissima	Sand & mud flats	3 ft (*D. cuprea*)[2]	Moderate	Int to 100 ft
Glycera americana (blood worm)	Muddy sand mud		High	Sub
Mesochaetopterus rickettsii[3]	Sand (w/ eelgrass)	~4 ft (1.2 m)[2]	High[3]	Shal Sub
Nepthys caecoides	Sandy mud	Near surface	High	Int to Sub
Pista pacifica	Sand a & mud flats	Deep	Low	Low Int
SIPUNCULA				
Siphonosoma ingens	Sandy mud (w/ eelgrass)		Moderate	Low Int
Themiste zostericola	Sand (w/ eelgrass)	Near surface	High	Low Int
ECHIURA				
Urechis caupo	Sand & Sandy mud	4in to 1.5 ft (10-45 cm)	Low	Low Int, Sub
VERTEBRATA - FISHES				
Myliobatis californica	Sand & Sandy mud	to 2 ft	Moderate	Low Int, Sub
PLANTS - ANGIOSPERMS				
Zostera marina (eelgrass)	Sandy mud	6 in+ (15cm+)[4]	High	Low Int

Int - Intertidal -2.0 to + 7.0 ft.
Sub - Subtidal ≤-2.0 ft.
Source:
1 McLean 1969
2 Morris et. al 1980
3 The depth of penetration into the sediment is for *M. taylori*, a species reported only as far south as Dillon Beach, CA (Marin County)[2]. It is likely that the southern species demonstrates similar characteristics.
4 Short 1983
5 Suchanek et al. 1986

Table 5.2-3

ORGANISMS REPORTED OR OBSERVED IN THE VICINITY OF THE PROJECT AREA THAT MAY PENETRATE BENEATH THE SEDIMENT SURFACE

PHLYA Species (Common Name)	Convair Lagoon	East Harbor Island	North San Diego Bay	General
MOLLUSC - BIVALVE				
Chione spp.		+[1]	+	+
Laevicardium substriatum	+[3]	+	+	+
Macoma nasuta		+	+	+
Nuttallia nuttallii				+
Panopea generosa				+
Protothaca spp.		+[1]	+	+
Saxidomus nuttallii				+
Solen rosaceus		+	+	+
Solen sicarius				+
Tagelus spp.			+	+
Trachycardium quadragenarium				+
Tresus nuttallii				+
ARTHROPODS - CRUSTACEANS				
Callianassa spp.	+	+	+	+
Hemisquilla ensigera californiensis			+[2]	+
Upogebia spp.	+		+	+
ANNELIDS - POLYCHAETES				
Chaetopterus variopedatus	+[3]		+	+
Diopatra splendidissima			+	+
Glycera americana			+	+
Mesochaetopterus spp.				+
Nepthys caecoides		+	+	+
Pista pacifica				+
SIPUNCULA				
Siphonosoma ingens				+
Themiste zostericola				+
URECHIDA				
Urechis caupo				+
VERTEBRATA - FISHES				
Myliobatis californica		+	+	+
PLANTS - ANGIOSPERMS				
Zostera marina	+	+	+	+

1 Personal unpublished observations
2 U. S. Navy 1987
3 Observations from field studies in Convair Lagoon

U.S. Navy, 1987. Biological Reconaissance Survey at the Electromagnetic Roll Garden Pier, North San Diego Bay. Prepared as an appendix to an EIS for the pier.

Residual PCBs. A substantial of PCBs would be capped and isolated from the lagoon after remediation is complete. Some residual PCBs would remain in the lagoon sediment. Ebasco (1991) estimated levels after remediation using the NCF approach would be approximately 3.8 ppm for the total lagoon. Although the Ebasco value is above the NOAA ER-M Level (Appendix C-4) of 0.4 ppm, a concentration above which effects are frequently observed (NOAA 1990) and the California Action level of 1 ppm in soils, it is well below the cleanup level of 10 ppm ordered by the RWQCB. Because the cap and perimeter berm will cover a larger area then the NCF alternative even more PCB contaminated sediment will be isolated from the lagoon, likely resulting in a still lower residual PCB level.

Storm Drain Modifications

The only change in operation of the 60-inch storm drain following implementation of this alternative is that the discharge point would be approximately 80 feet farther offshore but at the same elevation. The discharge would be positioned in a bed of large riprap to diffuse the force of the water as it exits the pipe. In combination with the cap, this design would reduce the potential for disturbance, resuspension, and redistribution of contaminants by storm water. The catchment basins in the lower portion of the storm drain system would be routinely monitored to identify any new contaminants accumulating in the system. New contaminated sediment would be removed from the catchment basins and appropriately disposed of before it recontaminates Convair Lagoon.

5.2.3 Mitigation

5.2.3.1 Proposed Project - Nearshore Containment Facility

Implementation of the recommended mitigation measures outlined below would reduce impacts to marine resources to below a level of significance.

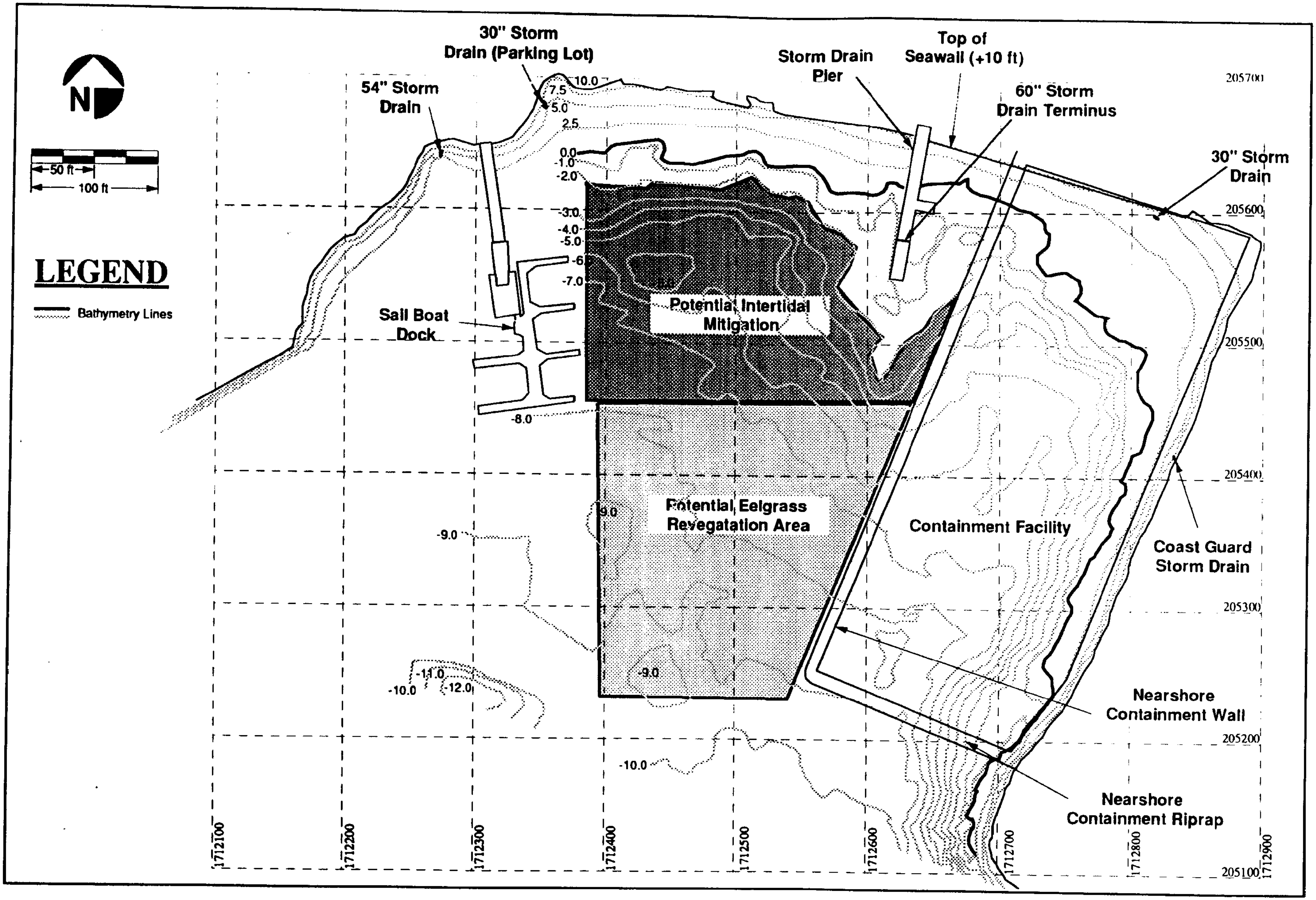
- Impacts associated with turbidity and redistribution of particulates can be minimized by enclosing the construction area within a silt curtain. This action will minimize the dispersion of fine particulate material disturbed during construction activities. Success of this measure should be monitored using real-time turbidity and water column chemical monitoring at designated sampling locations outside the silt curtain. If turbidity and water chemistry criteria are not met, construction operations can be interrupted and modified to attain compliance.

- Dredging impacts are likely to be significant within the dredge footprint but can be mitigated after dredging is complete, a situation not typical of usual dredge projects. Typical dredge project are undertaken to increase water depth. In this situation water depth does not need to be increased; consequently, the lagoon bottom can be returned to grade using clean sand after the contaminated material is removed. Benthic and intertidal assemblages characterizing this area are dominated by species that are usually able to rapidly recolonize areas following severe physical disruptions such as the proposed dredging within six to twelve months. Larger macroinvertebrates such as the ghost shrimp and other burrowers may require additional time to colonize the restored area. Consequently, it is expected that the area will recover from the dredge program naturally and within only a few years after restoration of the bottom to grade with biota typical of these habitats. Similar but more rapid recolonization of the silt curtain footprint is expected.

- Impacts in the area adjacent to but outside the silt curtain can be mitigated by careful operation of the silt curtain and dredge. The success of these mitigation measures can be monitored using real-time monitoring of turbidity and water chemistry in the water column. If turbidity and water chemistry criteria are not being met, dredge operations can be interrupted and modified to attain compliance.

- The potential toxicity of the discharge should be tested using appropriate EPA-approved bioassay tests. Moreover, the potential area influenced by the discharge plume should be estimated on the basis of physical oceanographic conditions and discharge water volume. These data and analyses will allow a better estimate of the impact of the proposed discharge.

- Potential mitigation for loss of 0.75 areas of intertidal habitat could involve construction of a new intertidal area of equal size west of riprap wall of the NCF (Figure 5.2-16) elevating the existing lagoon bottom to -0.2 feet MLLW. However, this action will result in the loss of an equal area of shallow subtidal habitat and the 0.39 acres of eelgrass from the dredge footprint. This loss of



OGDEN

Potential Mitigation for Nearshore Containment Facility

FIGURE 5.2-16

shallow subtidal habitat may be mitigated by filling a nearby deep water area (>18 feet MLLW) of the bay with clean sand to a depth of less than 18 feet to create new shallow subtidal habitat, thus using less valuable deep water habitat to create valuable shallow water habitat.

- The loss of eelgrass in the NCF and dredge footprints can be mitigated by implementation of a restoration program in the adjacent area west of the NCF in conjunction with the restoration of eelgrass for the dredge footprint (Figure 5.2-16). This option will result in a planting of 0.94 acres of eelgrass to mitigate the loss of 0.78 acres of eelgrass and monitoring its development to document mitigation success.

- Long-term deterioration of the NCF should be monitored by implementation of a routine inspection and maintenance program for the life of the facility. This plan should include a biological and water quality monitoring program including a mussel watch station and tissue analysis of burrowing organisms to allow detection of bioaccumulation in resident biota that may indicate a breach in the integrity of the facility.

- After dredging is complete, redeposited contaminants in the silt curtain footprint can be evaluated by testing for surficial sediments to determine if contaminant levels require further remediation. If contaminant levels are elevated, the upper layer of sediment can be removed with the dredge and placed in the NCF. The area potentially affected can be minimized by placing the silt curtain as near the dredge footprint boundary as possible.

5.2.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.2.3.3 Sand Capping - Preferred Alternative

Implementation of the recommended mitigation measures outlined below would reduce impacts to marine resources to below a level of significance.

- Placement of a 1-foot layer of crushed rock on the existing lagoon bottom may act as a deterrent to deep-burrowing organisms such as ghost shrimp. Additional field studies need to be conducted to determine what species created the burrows in Convair Lagoon and estimate the depth of those systems. Finally, additional field and lab investigations need to be conducted to determine the effectiveness of the proposed rock layer as a deterrent to burrowing for the organisms identified as responsible for the burrow systems since these are likely to colonize the sand cap after construction.

- A long-term monitoring program should be designed to evaluate and monitor the effectiveness of the cap. This should involve sediment core samples to evaluate contaminant migration into the cap, biological samples to evaluate the significance of bioturbation and the transport of capped chemicals to surface sediments where they may be redistributed. Finally, a contingency plan should be prepared describing how significant damage to the cap will be repaired.

5.3 AVIAN RESOURCES

5.3.1 Existing Conditions

Introduction

In terms of bird diversity, southern California's brackish and saltwater bodies are utilized to the greatest extent in the non-breeding months from fall through early spring. However, several species with restricted and vulnerable nesting distributions use bays such as San Diego Bay for reproductive activities, further diversifying the avian use of the bay. The wide variety of bird species on San Diego Bay collectively make use of all elements of the bay system, from shorelines and man-made structures to open water and muddy bay bottoms. Convair Lagoon represents only a small percentage of the total bay area, but is important for its transitional nature between shore, sheltered cove, and open bay water. Calm waters such as these are frequently used for foraging as well as energy-conserving rest behavior.

Water-Associated Birds in the Vicinity of Convair Lagoon

Bird use of the Convair Lagoon is presented here in the context of the greater Harbor Island area, San Diego Bay, which includes a range of shore and water conditions. Table 5.3-1 lists confirmed and potential waterbird species of regular occurrence. Confirmed species are derived and modified from Copper's (1986c) surveys of the area. Those surveys did not include the late fall through early spring period of the year, so the list is supplemented with potential species, based on other published material (e.g., Cogswell 1977, Unitt 1984). For the purposes of this report, species are grouped into broad ecological foraging and seasonal categories. Weekly waterbird surveys of north San Diego Bay are currently being conducted by Ogden for the Navy. Thirty-eight bird species have been documented in the vicinity of Convair Lagoon and an additional 18 species are expected to use the Lagoon to varying degrees.

Sensitive Bird Species

The state of California recognizes several species as being of special concern. Many species without officially protected status are of concern for population declines, restricted and vulnerable habitat requirements, and limited distribution within the state. Others are

Table 5.3-1

CONFIRMED AND POTENTIAL WATER-ASSOCIATED BIRD SPECIES OCCURRING IN THE CONVAIR LAGOON AREA

<u>Shore/waterline feeders</u>

Great Blue Heron (r)*
Great Egret (n)
Snowy Egret (n)
Little Blue Heron (r)
Green-backed Heron (r)*
Black-crowned Night Heron (r)*
Mallard (r)*
Cinnamon Teal (n)*
Black-bellied Plover (n)*
Snowy Plover (r)*
Semipalmated Plover (n)
Killdeer (r)*
Willet (n)*
Spotted Sandpiper (n)
Whimbrel (n)*
Long-billed Curlew (n)*
Marbled Godwit (n)*
Ruddy Turnstone (n)*
Black Trunstone (n)*
Surfbird (n)*
Sanderling (n)*
Short-billed Dowitcher (n)*

<u>Surface/water column feeders</u>

Red-throated Loon (n)
Pacific Loon (n)
Common Loon (n)
Pied-billed Grebe (n)*
Horned Grebe (n)
Brandt's Cormorant (r)
Eared Grebe (n)*
Western Grebe (n)*

<u>Surface/water column feeders (Continued)</u>

Clark's Grebe (n)*
Brown Pelican (n)*
Double-crested Cormorant (r)*
Bufflehead (n)
Red-breasted Merganser (n)
American Coot (n)
Bonaparte's Gull (n)*
Heermann's Gull (n)*
Ring-billed Gull (n)
California Gull (n)*
Herring Gull (n)
Western Gull (r)*
Glaucous-winged Gull (n)*
Caspian Tern (b)*
Elegant Tern (b)*
Forster's Tern (r)*
Least Tern (b)*
Black Skimmer (r)*
Belted Kingfisher (r)*

<u>Benthic/bottom feeders</u>

Greater Scaup (n)
Lesser Scaup (n)
Surf Scoter (n)*
Ruddy Duck (n)

<u>Predators</u>

Osprey (n)
Peregrine Falcon (r)*

For the purposes of this report, species are grouped into broad categories of foraging ecology and annotated as to seasonal occurrence. Seasonal codes: r = resident (year-round), n = non-breeding (fall through early spring), b = breeding (spring and summer). Asterisked species are of confirmed occurrence.

Source: Copper 1986c, Ogden unpublished data.

currently federal and/or state endangered or threatened species or are candidates for such status. Several species of state concern occur in the Convair Lagoon area.

California Least Tern

The California least tern is a state and federal endangered species and is the waterbird species most vulnerable to disturbance on San Diego Bay since it completes its entire nesting cycle within the bay environs. The birds nest in colonies on sandy beaches and forage for small schooling fish in relatively calm water, mostly within 2 miles of the colony (Atwood and Minsky 1983, Bailey 1984). Nesting colonies in proximity to Convair Lagoon are on the North Island Naval Air Station, Naval Training Center, and historically at the southeast corner of Lindbergh airfield (Copper 1986b). Foraging surveys by Copper (1986c, 1986d) showed that the Harbor Island area receives moderate to high foraging use by least terns. Foraging intensity was relatively moderate from Convair Lagoon eastward probably due to the proximity to the Lindbergh Field nesting colony that was active when the foraging surveys were conducted in 1986. Foraging activity in San Diego Bay is highest in May and June, declining afterward as nestlings fledge and birds disperse (Copper 1986c, 1986d). Least terns have usually departed by late September. Significant alterations to the Harbor Island east basin have occurred since Copper's work and subsequent focused foraging studies have not been conducted. The Lindbergh airfield colony has not been active since 1989. The current use of Convair Lagoon is likely to be less than that documented by Copper due to the greater distance from an active colony (about 2 miles from the North Island Colony).

A positive association with least tern foraging and the availability of eelgrass (*Zostera marina*) beds has been demonstrated (ERCE 1989), presumably due to higher fish densities associated with eelgrass. Seasonal shifts in foraging locations have been demonstrated within bay systems (Atwood 1983, Copper 1986a, 1986b, ERCE 1989). Fancher (1992) lists increased degradation of water quality in foraging areas as one of two major factors in the historical decline of the species in California. Although the statewide population has remained fairly stable in recent years, local nesting success and colony site fidelity can vary significantly between years, particularly with major changes in ocean surface conditions associated with *El Niño* weather patterns (Copper 1986b, Fancher 1992).

Snowy Plover

This federally threatened bird requires open, sandy beaches for nesting and foraging. They are likely of marginal occurrence in the vicinity of Convair Lagoon due to a lack of suitable foraging and nesting habitat.

Brown Pelican

This state and federally endangered species nests on islands on the Pacific and Gulf coasts of Baja and Southern California. San Diego Bay is utilized by brown pelicans throughout the year, with the most extensive use during the non-breeding season. Shoreline structures are commonly used for roosting and shallow bay waters are occasionally used for foraging.

Peregrine Falcon

A nesting pair of this federally endangered species has been maintained on a pylon of the Coronado Bridge since 1989 (Pavelka 1991). Peregrine falcons rely on a diet of waterbirds and pigeons. Foraging by adults and young appears to be concentrated on the southern half of San Diego Bay (Pavelka 1992). However, this falcon is wide-ranging and has been documented in the Harbor Island area (Copper 1986c). Foraging by peregrine falcons in the vicinity of Convair Lagoon is likely.

Great Blue Heron

This species is a California Department of Fish and Game (CDFG) species of special concern and nests in highly localized colonies within tree groves. These breeding colonies are vulnerable to disturbance and are of special concern to resource agencies. Several colonies occur on the bay shores of Point Loma and North Island Naval Air Station and foraging adults frequently utilize the shallow shoreline (Unitt 1984).

Black-crowned Night Heron

As with the great blue heron, this species' localized colonies are of concern in California. These birds also forage in shallow shore conditions, but do so nocturnally. Nest colonies are located in Point Loma and on North Island Naval Air Station (Unitt 1984).

5.3.2 Impacts

Successful implementation of either of the remediation alternatives would result in a potentially significant reduction in contaminant exposure to avian resources. Isolation of contaminants from the greater San Diego Bay ecosystem will reduce the potential for 1) resuspension or remobilization of contaminants and redistribution to other areas of San Diego Bay, and 2) bioaccumulation in resident biota and the potential transfer to levels in the food chain, including man.

5.3.2.1 Proposed Project – Nearshore Containment Facility

The proposed NCF would extend the northeastern shore of the Lagoon, reducing the open water surface and other marine habitats by 1.75 acres, or nearly 20% of the total Lagoon area. The nature of the new shoreline as proposed will present a much sharper profile at the water interface, thus limiting its usefulness to most waterbirds as foraging substrate particularly for surface/water column and benthic feeding species (e.g., least tern and brown pelican). The northeast corner of the Lagoon includes the majority of the intertidal habitat within the Lagoon which is the preferred foraging habitat for most shoreline feeding birds (i.e., herons and shorebirds; Table 5.3-1). The remainder of the Lagoon edge is primarily riprap which is utilized by a fewer number of waterbird species (e.g., turnstone spp.).

The loss of 1.75 acres of open water habitat represents a small percentage of the total surface of San Diego Bay; however, Convair Lagoon historically received moderate use by foraging California least terns (Copper 1986a), which still has many of the characteristics of preferred tern foraging habitat (ERCE 1989, Massey and Atwood 1982). Therefore, the loss of 1.75 acres of open water habitat is considered to be a cumulatively significant impact.

Any form of remediation, including the proposed NCF, may temporarily render the Lagoon unavailable to foraging least terns, brown pelican, and other waterbird species. The short-term loss of foraging habitat within the Lagoon due to dredging activity is not considered to be significant if the dredging activity occurs during the non-breeding season (late September through March).

The proposed dredging of contaminated sediments potentially poses a risk of resuspension and dispersion of contaminants, allowing for their introduction into the food chain (Eisler 1986, Ohlendorf 1993, Elliott and Noble 1993). This potential impact is not considered significant since standard methods using silt screen barriers will minimize the dispersion of sediment from the dredging area.

5.3.2.2 No Action

PCBs from a wide variety of industrial sources have historically been released into San Diego Bay. Areas where these outfalls converge are characteristic concentration points for the stable PCB compounds. The nearshore marine environment is the predominant location for bioaccumulation and transport of these contaminants (Borlakoglu and Haegele 1991). The primary route for entry of PCBs into marine food webs is through contaminated sediments and organic particulates in the water column. Laboratory tests have produced PCB concentrations of 100 to 1500 ppm in tissues of waterbirds (Borlakoglu and Haegele 1991), but levels in free-ranging birds are generally lower (Eisler 1986). Ohlendorf et al. (1985) documented PCB levels of 1.5 to 1.8 mg/kg (wet weight) in tern eggs from south San Diego Bay. PCBs have been linked to a number of pathological conditions in bottom-dwelling fish in San Diego Bay and are strongly implicated as carcinogens (McCain et al. 1992). Chronic effects of PCBs in birds include weight loss, immunotoxicity, reduced reproductive success, and various biochemical abnormalities (e.g., induction of liver and blood enzymes; Eisler 1986, Elliott and Noble 1993). The No Action alternative would continue to expose the marine environment to PCB-laden sediments with the continued potential for adverse environmental effects described above.

5.3.2.3 Sand Capping – Preferred Alternative

Implementation of the Sand Capping alternative would avoid the need for dredging. The approximately 3-foot thick sand cap, with a reconfigured shore profile would alter the benthic and other marine habitats within the Lagoon, resulting in a net loss of 0.98 acre of subtidal (open water) habitat and a net increase of 0.98 acre of intertidal mudflat habitats. Increased sand particle size, eelgrass enhancement, and a riprap fringe would minimize erosion of the sand cap. Established benthic biota on the coarser substrate may be less productive, diverse, or otherwise different from the current conditions, although recent preliminary studies of the effect of changing sand grain-size on infauna species composition is highly variable (PSBS 1992). Differential use of fine- and course-grained sand by foraging shorebirds has been demonstrated, with fine-grained sand preferred over course-grained sand (Quammen 1987, Ogden 1992). Portions of the sand cap covered with rock would be utilized by a fewer number of waterbird species. The loss of 0.98 acre of subtidal habitat is not considered to be a significant impact since there is a net gain in intertidal habitat, including eel grass, which is known to be preferred foraging habitat for least terns. This is considered to be a beneficial effect of this alternative.

The long-term integrity of the sand cap to erosion and burrowing invertebrates would be dependent on the strength and pattern of currents within the lagoon and on the thickness of the sand cap relative to the burrowing capability of the invertebrates. The potential failure of the sand cap is a potential risk of avian resources being exposed to contaminants and is considered to be a potentially significant impact of this alternative. Please refer to Section 5.2 for a detailed discussion of this issue.

5.3.3 Mitigation Measures

5.3.3.1 Proposed Project - Nearshore Containment Facility

To mitigate significant impacts to avian resources under the proposed project to below a level of significance, the following measures are recommended:

- Due to the presence of the endangered California least tern in the spring and summer months, remediation activities should be limited to the period from late September through early March, if feasible.

- Temporary barriers for the containment of suspended contaminated sediment from dredging should be in place to prevent further spread of contaminants into the bay during the operation.

- Net loss of open water on the bay edge from shoreline extension is not directly mitigable. Further, a definite acreage of ecologically valuable eelgrass bottom habitat will be lost permanently and all benthic habitats will be impacted on a temporary basis within the dredging footprint. Restoration of bottom habitats, specifically eelgrass beds, must be provided in the portion of the Lagoon not permanently lost to shoreline extension.

- Enhancement of degraded eelgrass beds in one other shallow portion of San Diego Bay at a 1.2:1 ratio should be done for areas of permanent loss of marine habitats within the Lagoon. This ratio will compensate for the permanent loss of open water.

5.3.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.3.3.3 Sand Capping – Preferred Alternative

No significant impacts have been identified; therefore, no mitigation measures are required.

5.4 UTILITIES

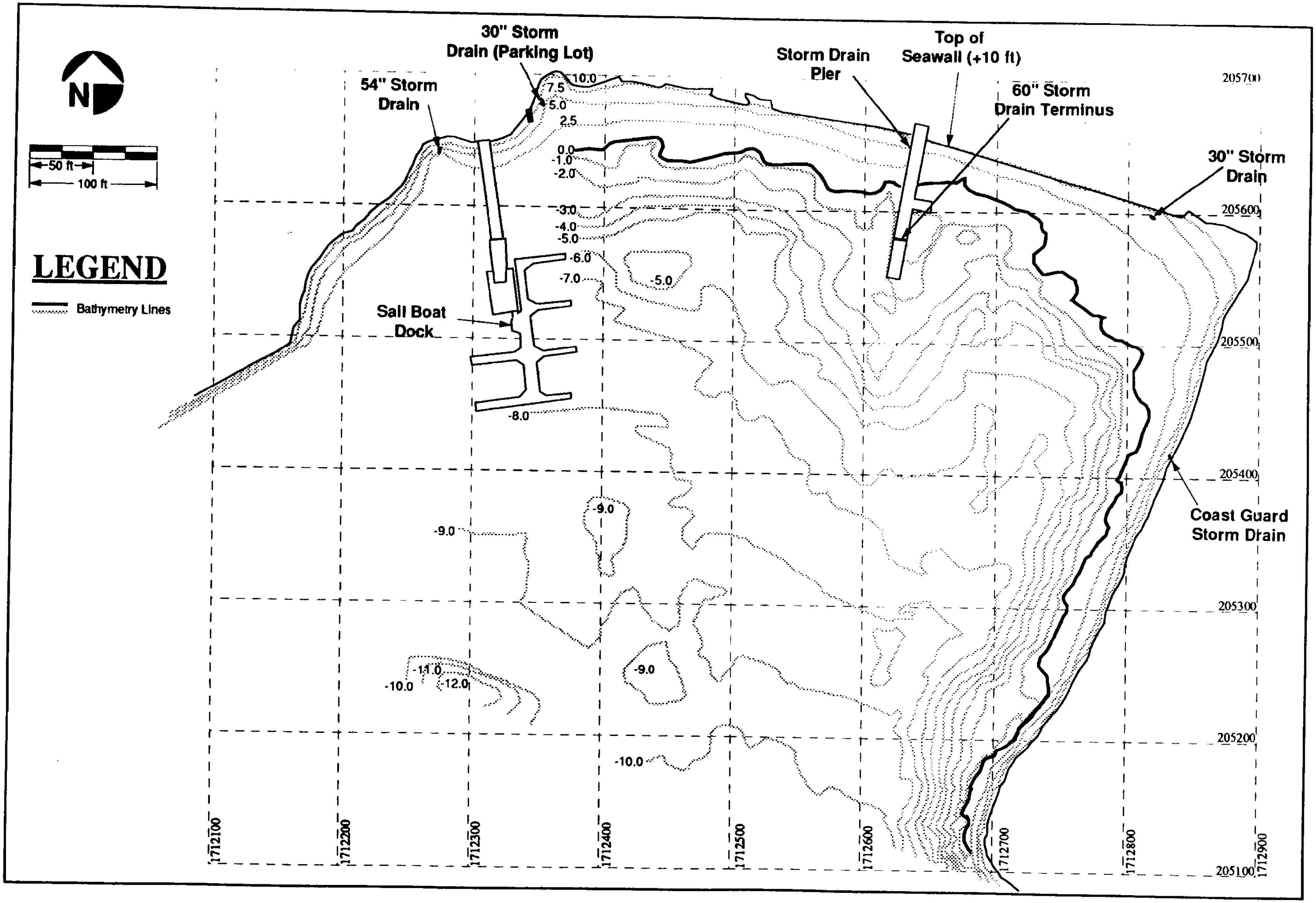
5.4.1 Existing Conditions

Four major storm drain systems discharge into Convair Lagoon from industrial areas to the north of Harbor Drive, along with several smaller drains from the Coast Guard property to the east.

Figure 5.4-1 shows the location of the four major storm drain outfalls into Convair Lagoon. In the northeast corner of the Lagoon, a 30-inch storm drain discharges storm water solely from the central portion of Teledyne Ryan Aeronautical's (TRA) leasehold. The 60-inch storm drain that discharges water under the pier in the northern central portion of the Lagoon drains a large area north of the Lagoon. This includes a central portion of TRA's leasehold (an area west of the 30-inch storm drain's drainage area), a portion of the eastern end of Lindbergh Field runways, the northern portion of General Dynamics Convair Division's facility on Pacific Highway, a portion of the Marine Corps Recruit Depot, an industrial area and railroad spur north of General Dynamics, and residential areas further north up into Mission Hills.

The 54-inch storm drain that discharges storm water west of the Convair Sailing Club dock drains a somewhat smaller area north of the Lagoon and west of the 60-inch drainage area. The 54-inch drainage area includes the western portion of TRA's facility, a central portion of the Lindbergh Field runways, and several hangars. A 30-inch storm drain outfall located between the 60-inch storm drain and the 54-inch storm drain discharges storm water from a TRA parking lot.

The contamination in the Lagoon most likely occurred from discharges into the storm drains. The storm drain pipe system associated with the 30-inch outfall into the northeast corner of the Lagoon was removed and replaced in 1989. This drainage system is expected to be largely free of contamination, although the final section of this drain into the Lagoon is the original pipe and has not been cleaned out. A limited amount of sampling reveals that the other storm drains discharging into Convair Lagoon contain PCB contamination in the sediment.



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Major Storm Drain Outfalls in Convair Lagoon

FIGURE 5.4-1

5.4.2 Impacts

5.4.2.1 Proposed Project - Nearshore Containment Facility

The location of the NCF would block the discharge of the 30-inch storm drain that drains a portion of Teledyne Ryan Aeronautical's leasehold, and discharges into the northeast section of the Lagoon. The design of the NCF (Ebasco 1992) includes several alternatives that will involve reinstallation of this storm drain around the NCF; therefore, no significant impacts would occur.

5.4.2.2 No Action

Under the No Action alternative, there are no impacts to the storm drain systems.

5.4.2.3 Sand Capping - Preferred Alternative

The placement of a sand cap would potentially impact stormwater discharges from the 60-inch storm drain. The plan for this alternative (described in Section 3.4.5) includes provisions for extending this storm drain with the intent of minimizing the disturbance of the contaminated sediment; therefore, no significant impacts would occur.

5.4.3 Mitigation Measures

5.4.3.1 Proposed Project - Nearshore Containment Facility

No significant impacts have been identified; therefore, no mitigation measures are required.

5.4.3.2 No Action

No mitigation is assumed under the No Action Alternative.

5.4.3.3 Sand Capping - Preferred Alternative

No significant impacts have been identified; therefore, no mitigation measures are required.

5.5 GEOTECHNICAL/SEISMICITY

5.5.1 Existing Conditions

Geologic and seismic data for the following section was obtained from a review of recently published geologic maps, stereopair aerial photographs, and current geologic literature.

Geologic Setting

The present-day configuration of the southern California coastline is said to have had its early beginning during Cretaceous time (120 to 85 million years ago) when the southern California Batholiths intruded existing Triassic and Jurassic-age strata, causing uplift to the east, and subsidence to the west where the deposition of marine sediments has continued through the last 60 to 80 million years.

The project site lies within the San Diego Embayment Graben, a structural block down-dropped between the Rose Canyon fault zone, located approximately 4,000 feet east of the site, and the Point Loma fault zone located approximately 12,000 to 13,000 feet west of the site. The formation of San Diego Bay is directly related to the relative downward displacement of the San Diego Embayment Graben.

Convair Lagoon is situated near the southerly edge of a large man-made hydraulic fill, placed in the Lindbergh Field area at the northerly end of San Diego Bay. The Lagoon, approximately 500 feet by 700 feet in lateral extent, with bottom elevations ranging from 8- to 10-feet below mean lower low water (MLLW), overlies the southerly end of the former San Diego River Delta. Prior to extensive dredging and filling, the site area was a marsh, known as "Dutch Flat." Historic records indicate that major storm events have periodically diverted the flow of the San Diego River, alternately to the north and south of the Loma Portal Rise, between Mission Bay (previously known as "False Bay") and San Diego Bay. By the early 1950s, the river levees and the Mission Bay jetties were completed, confining tidal flow to a new man-made river channel.

<u>Soils and Geologic Units</u>

The unpaved land area surrounding Convair Lagoon was created by hydraulic placement of approximately 10 to 15 feet of medium dense, gray, clayey to silty, fine to medium sands with shell fragments. These materials, dredged from the bottom of San Diego Bay, are typical of the fill soils used to construct Harbor Island and the Lindbergh Field fill area (Group Delta Consultants Inc. 1986, Ebasco Environmental 1992).

No site-specific geotechnical test borings have been drilled for Convair Lagoon; however, by extrapolating data from nearby sites, it is estimated that the above-described hydraulic fill and the bottom surface of Convair Lagoon are underlain by approximately 10 to 20 feet of geologically-recent to Holocene-age (0 to 11,000 years old) soft, dark gray organic silts, clays, and loose fine embayment sands. These "bay deposits" are in turn underlain by a sequence of interbedded Pleistocene-age fluvial and marine terrace deposits, likely on the order of 100 feet in thickness (Group Delta Consultants, Inc., 1986; and Kennedy, 1975).

Seismicity and Geologic Hazards

The southern California region is subject to significant hazards from moderate to large earthquakes. Rupture of the ground surface is a potential hazard at locations underlain by or near active faults. Tsunamis (earthquake-induced flooding) and liquefaction are all hazards in the San Diego Bay area.

The major San Diego and southern California fault systems form a northwest-southeast trending regional structural fabric, generally parallel to the San Andreas fault zone, which extends over land from the Gulf of California to Bodega Basin north of San Francisco Bay. Structural geologists relate movement during the past 5 million years along the San Andreas and associated fault zones to movement along the boundary between the North American and Pacific tectonic plates.

Table 5.5-1 presents data for significant regional fault systems. The active fault zones nearest the site include the Rose Canyon, Coronado Bank, and the Elsinore fault zones (Figure 5.5-1). These faults are discussed as follows.

Table 5.5-1

EARTHQUAKE PARAMETERS FOR ACTIVE FAULTS WITHIN 62 MILES OF THE SITE AND SELECTED OTHER FAULTS

Active Fault or Fault Zone[1]	Slip Type	Fault Length[3,4] (miles)	Least Distance to Site[6] (miles)	Maximum Probable Earthquake			Maximum Credible Earthquake		
				Magnitude (M)	Peak Horizontal Acceleration	RHGA Horizontal Acceleration	Magnitude (M)	Peak Horizontal Acceleration	RHGA Horizontal Acceleration
Rose Canyon	Oblique?	66	1/2	6 1/4	0.50	0.33	7 1/2	0.60	0.39
Coronado Banks	Strike	110	11	6 1/4	0.22	0.15	7 1/2	0.26	0.17
Elsinore	Strike	255	42	6 3/4	0.03	0.03	7 1/2	0.05	0.05
San Clemente	Strike	100	41	6 1/2	0.02	0.02	7 1/2	0.05	0.05
San Jacinto	Strike	155	74	7 1/4	0.13	0.13	7 3/4	0.20	0.20
San Andreas	Strike	500+	90	7 3/4	0.10	0.10	8	0.18	0.18
Calabasas	Strike	18	44	6	0.01	0.01	6 1/2	0.03	0.03

1 Fault zones reported to have displaced Holocene-age (11,000 years old or younger) geologic units, with geologic evidence of high slip rate, the probable sources of recorded earthquakes of M_L5.0 or greater, or classified by professional judgment of available information.

2 Fault zones of low slip rate that displace Quaternary-age (11,000 to 1.6 million years old) geologic units.

3 Total length of seismic zone, including all approximately aligned fault zones and segments.

4 Derived from regional segmentation model of Anderson and others (1989).

5 Measured from Active Fault and Epicenter Map (reproduced in this report).

6 Estimated to be the maximum earthquake capable of occurring. Derived from the maximum rupture length using length-magnitude relationship like Slemmons (1977, Fig. 27). Relationship used is for California earthquakes greater than or equal to M_L 6.0, plus one standard deviation.

7 Estimated from Schnabel and Seed (1973) for use as an index to prioritize earthquake sources. Acceleration value is for rock. Ground acceleration may be less for sites on significant thicknesses of sedimentary rock. Design accelerations usually vary.

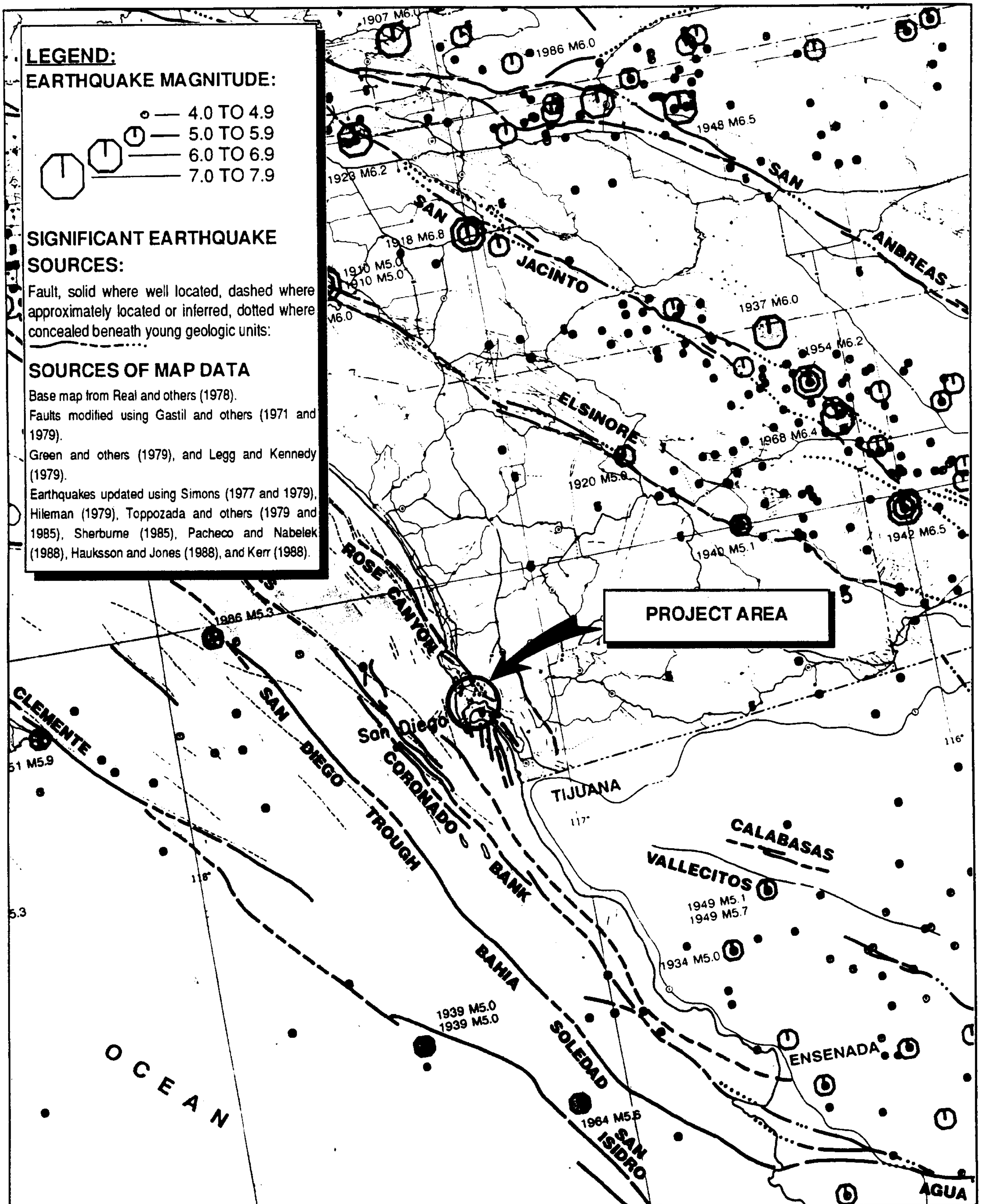

FIGURE 5.5-1

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Regional Fault Map

Rose Canyon Fault Zone. The most significant fault zone in the vicinity of the project site (approximately 4,000 feet to the northeast) is the Rose Canyon fault zone, portions of which are currently classified as active by the California Division of Mines and Geology (CDMG). The Spanish Bight fault, inferred by some investigators to extend within approximately 1/4 mile to the west of Convair Lagoon, is part of the general structural fabric of the Rose Canyon fault zone within the San Diego Embayment Graben.

A cluster of small (Richter magnitude (magnitude) 3.5 to 4.5) earthquakes within the San Diego Embayment Graben over the past several years corroborates the CDMG "active" classification for the Rose Canyon fault zone. It is generally considered that the Rose Canyon fault zone may be subject to a maximum credible earthquake of magnitude 7, and that an magnitude 6.25 earthquake is likely to occur on this fault system during a typical 100-year period (Blake 1989).

Coronado Banks Fault Zone. The Coronado Bank fault zone is located offshore from San Diego, approximately 10 miles southwest of the project area. It appears to be part of a discontinuous zone of faulting which includes the Palos Verdes fault near Los Angeles, which extends southeastward beyond the Mexican border (Greene et. al., 1979; Legg and Kennedy 1979). The total length of this fault zone, which predominantly exhibits strike-slip movement, is estimated to be approximately 130 miles in length. Because of its mapped geologic displacements, one-half of total fault zone length was used as the length of surface rupture in order to estimate a maximum credible earthquake of magnitude 7. Offshore from San Diego, the Coronado Bank fault zone is near an area where the epicenters of numerous microearthquakes (magnitude 2.0 to 3.4) have been plotted. The Coronado Bank fault zone may be associated with an earthquake at magnitude 6.25 during a typical 100-year period (Blake 1989).

Elsinore Fault Zone. The Elsinore/Laguna Salada fault zone, which lies approximately 40 miles northeast of the project site, is generally characterized by strike-slip displacement. The total length of the fault zone is approximately 255 miles; however, geologic displacements are relatively discontinuous and sinuous compared to those of the other major active faults. Therefore, it appears likely that the Elsinore fault zone would rupture in shorter segments (as a proportion of total length) than the other major active faults in the region. The general tectonic environment and expression of geologic displacements along the Elsinore fault zone suggest that it may be subject to a maximum credible earthquake of magnitude 7.5, which would be associated with a length of surface rupture of approximately 80 miles. The epicenters of numerous small earthquakes of magnitude 3.0 to 5.0 are located near the fault, suggesting that a magnitude 7 earthquake is likely to occur on the Elsinore fault zone during a typical 100-year period (Blake 1989).

5.5.2 Impacts

5.5.2.1 Proposed Project - Nearshore Containment Facility

The geologic and soil conditions at the Convair Lagoon project site pose two potential constraints to construction of the proposed nearshore containment facility (NCF) at the Lagoon site. They include the following:

1. Ground settlement due to consolidation of the estuarine/fluvial deposits and the artificial fill soils on site; and

2. Seismic hazards, including ground shaking, surface displacement, liquefaction, and tsunamis.

Ground Settlement

Ground settlement is attributable to the presence of relatively shallow surficial deposits of soft, compressible estuarine and fluvial muds, as well as loose to medium dense hydraulic fill soils underlying and near the site. The sandy hydraulic fill soils would likely consolidate immediately when loaded into the NCF and its impounded sediment fill; however, the underlying estuarine "Bay" mud, and organic silty clay is highly compressible under load, and would likely take years to stabilize under the weight of the proposed NCF. The degree of risk and the significance of potential differential settlement impacts, including a relatively rigorous evaluation of both long- and short-term settlement potential for the NCF and ancillary structures, should be addressed after completion of a geotechnical investigation.

Seismic Hazards

Ground shaking. Ground shaking would likely occur during the anticipated life of the proposed project. Embayment deposits tend to magnify the effects of ground shaking by amplifying the intensity of movement caused by earthquakes. Ground surface accelerations and site periods will vary somewhat across the general site area due to lateral and vertical variations in material type and density. Although ground displacement could result from shaking anywhere throughout the proposed NCF structure, the perimeter walls, portions of which will encroach out onto the bay muds, have the highest risk of failure during earthquake shaking. The stability of these perimeter walls is entirely dependent upon the integrity of the proposed sheet-pile walls, which will tend to yield as a result of lateral loading.

Liquefaction. Liquefaction is a potential hazard in all areas underlain by saturated, sandy soils. In the general site vicinity, nearly all relatively clean sandy soils may be considered to be moderately to highly susceptible to liquefaction.

Tsunamis. Tsunamis are also potential hazards within the San Diego Bay area, and a sufficient length of water surface exists within the bay to cause earthquake-induced flooding within low-lying areas.

Ground Rupture. Differential vertical displacement by the vertical component of a fault trace across the site would directly affect the NCF, the degree of impact likely being directly proportional to the offset displacement. Because no faults are known to exist in the immediate site area, and because none have been mapped as trending toward the site, the potential for direct fault offset at the site is small. Furthermore, unless the offset were relatively large, measuring at least several feet, it is likely that the impact to the impoundment of hazardous materials would be insignificant.

5.5.2.2 No Action

Under the No Action alternative, the proposed remediation activities would not occur and the Lagoon would remain in its existing state. The existing contaminated sediment would continue to be subject to disturbance as a result of propwash erosion, anchor dragging, potential onsite vertical fault offset, and sand boils resulting from seismically-induced liquefaction.

5.5.2.3 Sand Capping - Preferred Alternative

Implementation of the Sand Capping alternative would involve the placement of approximately 3 feet of sand over the in-place contaminated soils within Convair Lagoon.

The potential for the integrity of the cap to be disturbed and recontamination to occur as a result of erosion due to boat propwash is not considered to be significant based on the types of small recreational boats which normally enter into or pass near the Lagoon. Boat anchoring, however, could violate the integrity of the cap and result in a significant impact.

The potential for a large vertical fault offset to occur, which could cause vertical displacement of the contaminated sediment and disturb the integrity of the cap, is highly unlikely and is therefore not considered to be a potentially significant impact. Vertical fault displacement is discussed in more detail under Section 5.5.3.1.

5.5.3 Mitigation Measures

5.5.3.1 Proposed Project - Nearshore Containment Facility

The following measures are recommended to address potential and adverse impacts associated with the potential geologic hazards described above.

- The results of a site-specific geotechnical engineering investigation should be incorporated into the design and construction of the project. A site-specific geotechnical engineering investigation should be performed for each proposed separate structure as a condition of issuance of construction permits. Each investigation should contain adequate subsurface explorations and analyses to determine the potential for and degree of short- and long-term settlement, expected seismic ground acceleration values, and the potential for seismic ground failure (including liquefaction). Each investigation should contain detailed foundation recommendations, and should be subject to review by the appropriate regulatory agencies.

- The design of structures, embankments, and/or engineered fills encroaching onto existing compressible estuarine bay deposits may require site modification to improve the support capacity of those existing soils, and to reduce long-term post-construction settlement. Soil improvement could include partial or total removal of compressible soils and replacement with hydraulic fill soils, and/or the use of surcharged fills, to precompress the saturated bay deposits. A site-specific geotechnical study should specifically address post-construction settlement potential in these areas, and recommend methods to mitigate post-construction total and differential settlement to acceptable ranges, given the types of improvements at particular locations.

- To reduce the risk of structural damage caused by seismic shaking, geotechnical studies should specifically address seismic analysis based on site-specific subsurface data. As a minimum, seismic analyses should address seismically-induced slope failure, liquefaction, and ground surface accelerations.

- A cantilevered sheet-pile wall is being considered for the containment wall for the NCF. Three relatively practical and economic wall designs for the NCF are described below. Foundation soils for all three alternative structures are likely liquefiable in the event of a maximum credible earthquake. It should be observed that the trapezoidal section rock dike, with geogrid base and interlayers, is a flexible system that is, by far, the most accommodating to liquefaction-induced failure of the foundation soils.

Cantilevered Sheet-Pile Wall

The NCF impoundment wall can be designed to be unrestrained at the top; however, because of the potential for yielding due to lateral pressure from the backfill soils, it may be desirable to add toe protection in the form of 1/4-ton stone to reduce wall deflection and pile strength requirements.

Tied-Back Sheet-Pile Wall

A variation on the cantilevered sheet-pile wall, the tied-back sheet-pile wall consists of a series of ties and deadmen embedded in the backfill soils to restrain the wall at the top. Although this system of restraint permits lighter (and consequently less expensive) sheet piles, the cost of the tieback system considerably outweighs the savings by the use of lighter sheets.

Trapezoidal Rock Section

A berm or dike, constructed of 1/4-ton stone with slopes inclined at 1-1/2:1 (horizontal to vertical), a 70-foot-wide base, 10-foot-wide top, and 20-foot height would provide the most stable of the three alternatives suggested. Further seismic stability would be achieved if placed on a geogrid base with geogrid placed between rock layers during construction.

- An evaluation should be made to consider the stability of the embankment during expected seismic and hydraulic conditions.

- A site specific hydrology study should be performed for the site, addressing such issues as flooding during high-tide conditions and the effect of wind-driven waves generated from within San Diego Bay.

5.5.4.2 No Action

No mitigation is assumed under the No Action alternative.

5.5.4.3 Sand Capping - Preferred Alternative

To ensure that the integrity cap is not disturbed as a result of boat anchoring, the following measures are recommended:

- An ordinance prohibiting anchoring within Convair Lagoon should be adopted by the SDUPD.

- The SDUPD should, upon adoption of the ordinance, notify the San Diego Harbor Police and the U.S. Coast Guard of the anchoring restriction within Convair Lagoon.

- Signs should be posted within the water area along the mouth of Convair Lagoon notifying boaters of the anchoring restriction in the Lagoon area.

5.6 HUMAN HEALTH AND SAFETY

5.6.1 Existing Conditions

Convair Lagoon has PCB-containing sediment at concentrations greater than regulatory standards. Human exposure to these sediments can occur directly through sediment contact and also indirectly through the consumption of contaminated marine organisms.

Direct exposure to PCB contaminated sediment is not likely for the general public as there are no readily available shoreside access points to Convair Lagoon. For those individuals who do access the Lagoon for recreational or occupational activities, direct exposure to PCB contaminated sediment is possible. Figure 5.2-4 (Marine Resources) presents contamination trends for PCBs based on sediment sample results from Ogden and Ebasco Environmental. The PCB concentrations identified in sediment are above the EPA residential lifetime health-based criteria for oral exposure to soil (0.09 ppm) by more than two orders of magnitude. Direct exposure to PCB-contaminated water can also occur if PCB-contaminated sediment is resuspended into the Lagoon water. Information on water sample analytical results from Ebasco Environmental show PCB concentrations exist in the part per trillion (ppt) level, a level evaluated by the EPA as being potentially conducive to human health effects based upon the EPA's carcinogenic health-based drinking water criteria (EPA 1989). This water, however, is not designated as drinking water and as such probably poses less of a human health hazard than the contaminated sediment.

Indirect exposure to PCBs potentially exists through the consumption of PCB-contaminated marine organisms. Elevated PCB levels in fish caught around the Lagoon have been associated with the elevated PCB levels in Lagoon sediment (McCain 1992, San Diego County Department of Health Services 1990). These results suggest the source of contamination is sediment. California State Mussel Watch data show that PCB concentrations in mussels exceed the Food and Drug Administration's accepted levels (Hayes and Philips 1987).

Marine organisms ingesting contaminated sediment and subsequently sequestering the contamination can biologically accumulate the PCBs. This can result in a biological concentration of PCBs through the direct consumption of contaminated media by the higher level organism. For example, if fish caught for human consumption were feeding on organisms contaminated with PCBs as a result of the PCB-contaminated Lagoon sediment, a biological concentration of PCBs could occur from one organism to the next organism in the trophic level. Bottom-feeding-type fish can also directly consume contaminated sediments. Biological accumulation could also occur via the gills where soluble uncomplexed fractions of PCBs in pore water can exist in equilibrium with sediment concentrations (Adams 1992). Organisms continuing to biologically concentrate PCBs could have internal PCB concentrations that pose a potential for chronic adverse human health effects for those individuals consuming the organisms.

5.6.2 Impacts

5.6.2.1 Proposed Project - Nearshore Containment Facility

The Nearshore Containment Facility (NCF) could potentially produce both direct short-term and indirect long-term human health effects. The direct short-term effect that could be encountered is based upon the likelihood of exposure. Dredging processes which take place would result in resuspension of PCB-containing sediments increasing the potential for exposure. Depending on the degree of PCB-containing resuspended sediment and its potential to spread beyond the project area, a potential short-term increase in direct exposures to PCBs could occur. Short-term exposure is also possible from the NCF due to the containment facility being left open while work is being completed. Human health effects could also potentially exist if the NCF's structural integrity is compromised to the extent that contaminated sediment becomes available to humans. However, the likelihood for indirect long-term exposure should be significantly lower than the existing condition.

No significant direct short-term or indirect long-term adverse human health impacts should occur as a result of the proposed project as long as exposure to PCB-containing sediment is minimized.

5.6.2.2 No Action

The No Action alternative would result in the likelihood of continued direct and indirect human exposure to PCB-containing sediment with the potential for adverse human health effects to occur. Any direct and indirect adverse human health effects which exist would remain.

5.6.2.3 Sand Capping - Preferred Alternative

As long as biological exposure to PCB contaminated sediments and water does not occur, human health would not continue to be impacted from the PCB-containing sediments under the Sand Capping alternative. The likelihood of exposure may be very slightly higher than the existing condition during the capping procedure due to resuspended sediments; however, compared to other alternatives, the likelihood of exposure from capping should decrease since no handling of the sediment would occur. The long-term likelihood of exposure should also be lower, provided that cap integrity is maintained.

Direct short-term exposure could be slightly higher than the existing condition. Indirect long-term exposure could be significant if cap integrity is not maintained.

5.6.3 Mitigation Measures

5.6.3.1 Proposed Project - Nearshore Containment Facility

If the NCF alternative is carried out, control measures should be implemented to insure minimization of exposure to PCB-containing sediment and water during dredging activities.

For onsite workers in the immediate vicinity of the dredging and the Nearshore Containment Facility, implementation of a health and safety plan which addresses the following should be prepared:

- appropriate use of personal protective equipment; and
- guidelines for containment procedures that minimize contamination migration from the site.

5.6.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.6.3.3 Sand Capping - Preferred Alternative

If the sand capping alternative is carried out, verification of cap integrity through the development of appropriate monitoring plans should be prepared and implemented to determine whether short-term and/or long-term exposures to PCB-containing media are reintroduced.

5.7 LAND/WATER USE COMPATIBILITY

5.7.1 Existing Conditions

Existing Onsite and Surrounding Land Uses

The Convair Lagoon Remediation project site encompasses approximately five acres within the eastern portion of Convair Lagoon, northern San Diego Bay, in the City of San Diego. The project site is currently fenced from public access and contaminated water warning signs are posted around the Lagoon. A small pier approximately 45 feet in length extends into the water from the asphalt pavement along the northeast boundary of the Lagoon area. Historically, Convair Lagoon was used as a dumping ground and retrieval area for derelict vessels.

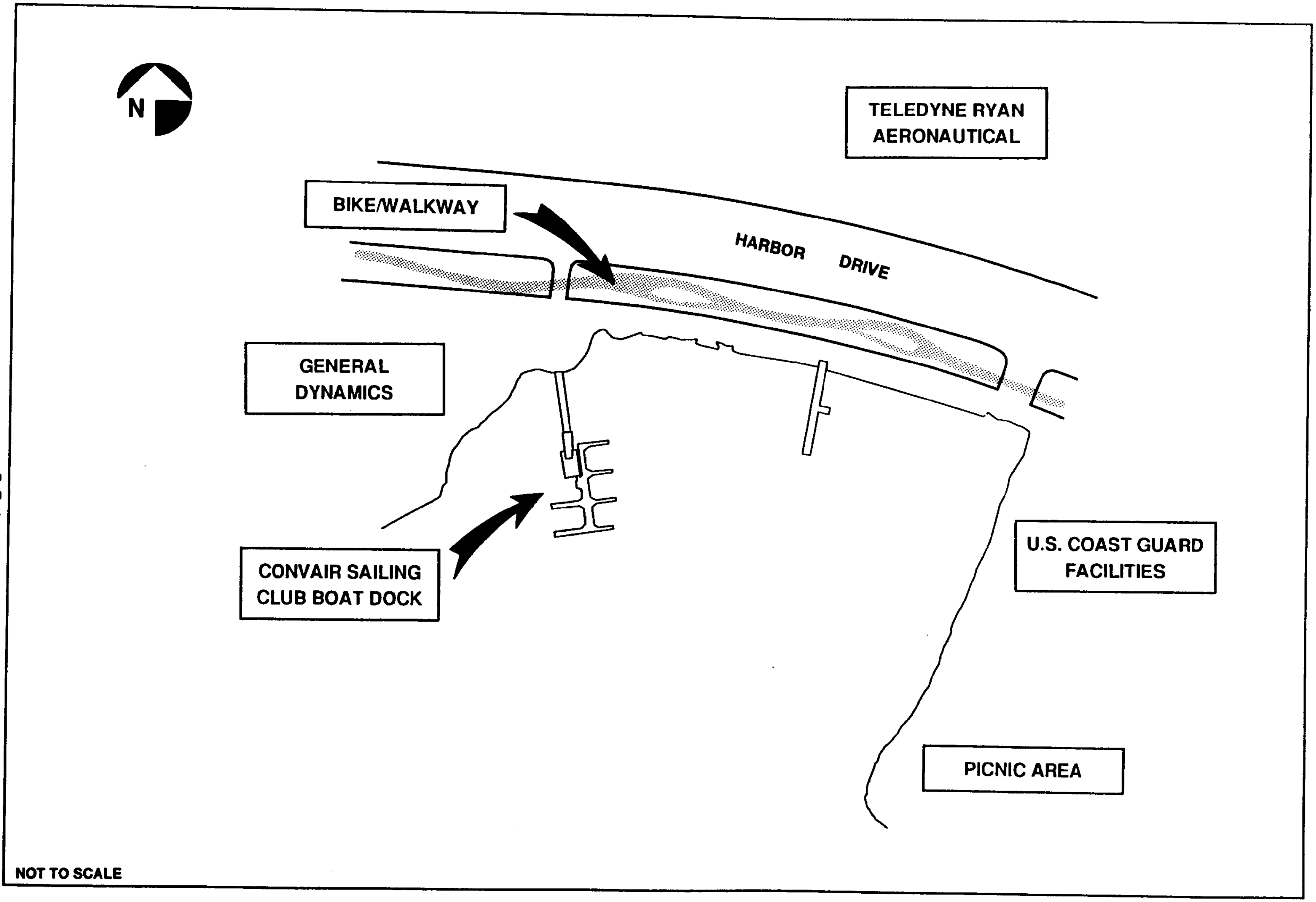
Surrounding land uses in the immediate project vicinity are primarily industrial and include Teledyne Ryan Aeronautical to the north, General Dynamics to the northwest, and the United States (U.S.) Coast Guard facility to the east. Harbor Drive, a six-lane thoroughfare, is located directly north of the project site. A 1.3-mile pedestrian walkway/bicycle path which follows the bayside alignment of Harbor Drive passes the project site to the north.

Within the Lagoon to the northwest of the project site, the Convair Sailing Club, which is associated with General Dynamics, maintains a pier and floating dock for small sailboats. Approximately 12 sailboats are currently docked at the pier. Harbor Island, a commercial recreation area which is developed with uses such as hotels, restaurants, marinas, and marine-related commercial businesses, is located to the southwest of the Lagoon. Onsite and surrounding land uses are illustrated in Figure 5.7-1.

Land Use Plans, Policies, and Regulations

<u>San Diego Unified Port District Master Plan</u>

The State Lands Commission has jurisdiction and authority over waterfront property along the bay; however, it has granted this land in trust to the San Diego Unified Port District (SDUPD). The Convair Lagoon project area is thus subject to the goals, objectives, and planned uses identified in the SDUPD Master Plan.



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Existing Onsite and Surrounding Land Uses

FIGURE 5.7-1

The SDUPD Master Plan was adopted in 1980 and last revised in October of 1992. Planning goals outlined in the Master Plan include administration of the tidelands to provide economic, social, and aesthetic benefits; to emphasize public, state-wide considerations over private considerations; to cooperate with adjacent communities; to enhance and maintain the biological and physical entity of the bay and tidelands; to ensure access to the water; and to maintain water quality.

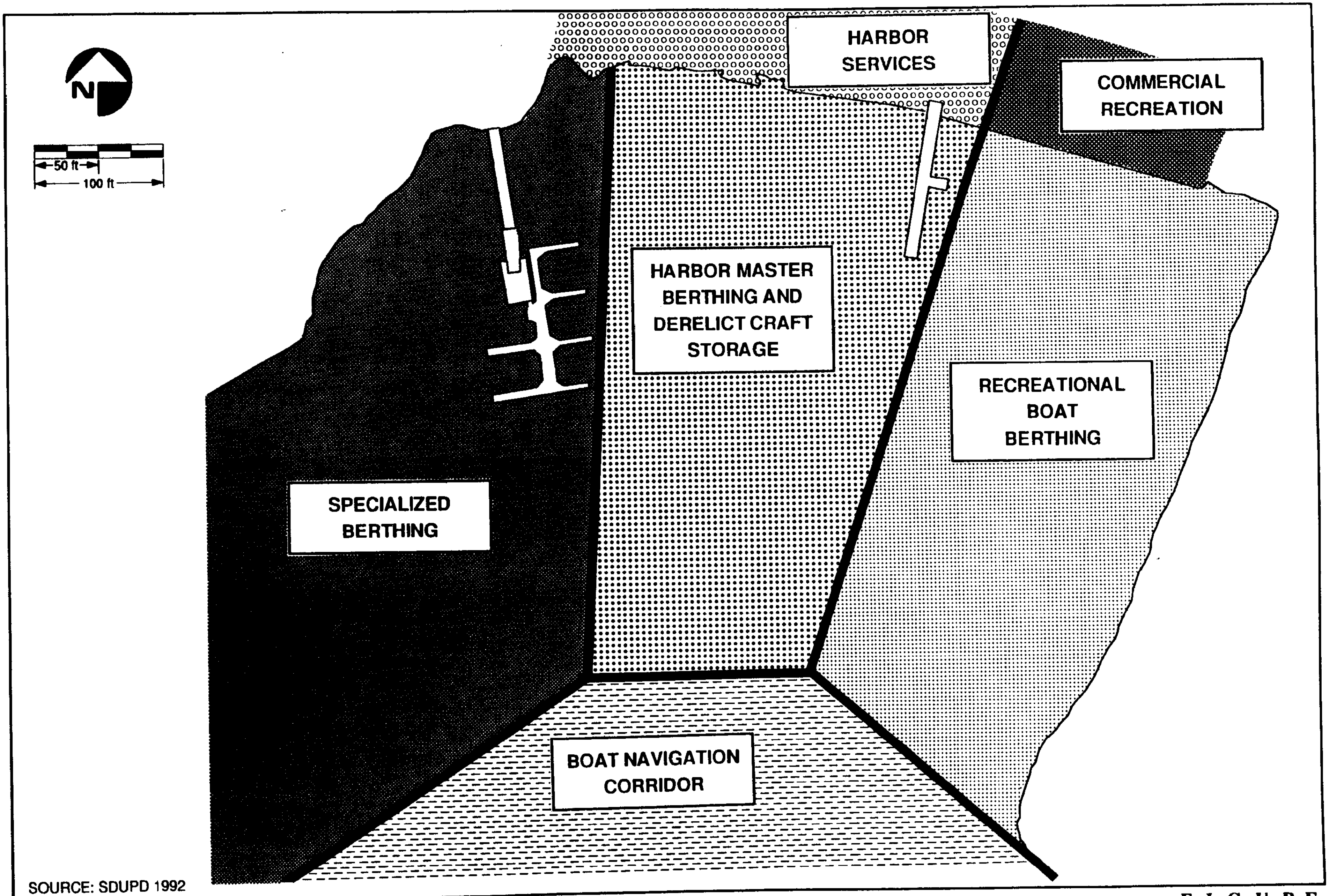
For planning purposes, the SDUPD Master Plan has divided the tidelands into nine separate Planning Districts to facilitate the preparation of Precise Plans for each of the districts. The Precise Plans are more detailed than the overall Master Plan; however, they are not intended to create an inflexible, static, unmanageable set of guidelines for development. Instead, the land use designations identified for the Planning Districts are intended to be flexible and to indicate compatible use groups. Specific uses that are currently not listed may be included in a use group if the use is determined to be similar in character and compatible (SDUPD 1992).

Convair Lagoon is located within the Harbor Island/Lindbergh Field Planning District. Permitted uses for the Harbor Island/Lindbergh Field Planning District are identified in terms of the land and water use designations defined within the Master Plan.

Commercial land and water use designations within the project area are Commercial Recreation (land) and Recreational Boat Berthing (water). Industrial land use designations include Specialized Berthing (water). Public Facility land use designations include Harbor Services (land), Boat Navigation Corridor (water), Derelict Craft Storage (water), and Harbor Master Berthing (water). These land and water use designations are illustrated in Figure 5.7-2 and described as follows:

Commercial Land Use Designations

Commercial Recreation. The Commercial Recreation land use designation is intended to promote land uses that will contribute to the economic base of the region with full time jobs, secondary employment for part-time help, and spin-off employment opportunities in construction, warehousing, trucking, custodial, and personal services. Specific uses include hotels, restaurants, recreational vehicle parks, specialty shopping, pleasure craft marinas, and sportfishing.



SOURCE: SDUPD 1992

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Existing Land and Water Use Designations

FIGURE 5.7-2

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Recreational Boat Berthing. Recreational Boat Berthing is the water use category used to classify water sites located adjacent to land areas identified in the SDUPD Master Plan under Commercial Recreation. Typical associated land uses would be marinas, yacht clubs, hotels, and restaurants. Water uses could include boat berthing for tenants and patrons of the above uses, boat rental, boat charter, water sports, boating instruction, sailing clubs, fuel docks, boat sales and service, disposal facilities for waste oil and hazardous substances, liveaboards, dockside utilities, on-water boat outfitting and maintenance, boat storage, and security arrangements.

Industrial Land Use Designations

Specialized Berthing. Specialized berthing is the water use category used to classify water sites located adjacent to land areas identified in the SDUPD Master Plan as Marine Related Industry, Aviation Related Industry, and Industrial-Business Park. This close relationship of land and water uses is required because of the wide range of uses permitted in the industrial categories. Some of the activities which would be permitted are ship building and repair facilities, ship and boat berthing, drydocks, marine rails and lifts, graving docks, cargo piers, equipment and material testing facilities, vessel maintenance and storage, tugboat services, marine contractors, kelp processing, water transportation docks, and the transhipment of goods and materials to and from the landside development.

Public Facility Land Use Designations

Harbor Services. The Harbor Service land use designation identifies areas devoted to maritime services and harbor regulatory activities of the Port District.

Boat Navigation Corridor. Boat navigation corridors are those water areas delineated by navigational channel markers or by conventional waterborne traffic movements. Boat corridors are designated by their predominant traffic and their general physical characteristics (these channels are usually too shallow and too narrow to accommodate larger ships). These corridors are required to serve marina development; maintenance dredging and improvements to existing channels, as required, are to be conducted.

Harbor Master Berthing. Harbor Master Berthing identifies water areas located offshore of land areas classified in the SDUPD Master Plan as Harbor Services. Typical associated land uses would include Harbor Police, and other governmental functions. Water uses could include berthing for the above law enforcement and governmental vessels, transient boat berthing, temporary storage of disabled and abandoned vessels, temporary storage of confiscated vessels, berthing for customs and pilot boats, and activities associated with conducting the designated services.

California Coastal Act

The project area is also within the coastal zone as designated by the California Coastal Act. The California Coastal Act requires that each non-federal jurisdiction located along the coastline prepare a Local Coastal Program (LCP) that provides guidelines, policies, and ordinances for the development of properties within the coastal zone. The California Coastal Commission (CCC), established in 1972, was granted the authority to approve LCPs and regulate development and land use within the coastal zone. The SDUPD Master Plan, which serves as the SDUPD's LCP, was certified by the CCC in 1981 with the most recent amendment certified in 1992. Upon certification of the SDUPD Master Plan coastal development permit authority was transferred to the Board of Port Commissioners. Appeals of Board of Port Commission decisions regarding specific types of development, including the proposed project, are appealable to the CCC (Chapter 8, Article 3, Section 30715.(2)4 of the Coastal Act). Appeals may be based upon the project's consistency with the SDUPD Master Plan. If the project is appealed, it is forwarded to the State Coastal Commission, which retains final discretionary authority over approval of Coastal Development Permits pursuant to Section 30625(b)(3).

The California Coastal Act of 1976 established basic goals for the coastal area. These goals include (CCC 1976):

- Protect, maintain, and, where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and manmade resources.
- Assure orderly, balanced utilization and conservation of coastal zone resources taking into account the social and economic needs of the people of the state.
- Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resources conservation principles and constitutionally protected rights of private property owners.

- Assure priority for coastal-dependent development over other development on the coast.

- Encourage state and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone.

5.7.2 Impacts

5.7.2.1 Proposed Project - Nearshore Containment Facility

Compatibility with Existing Land Uses

The proposed remediation project for Convair Lagoon consists of a combination of dredging and containment to isolate PCBs from the environment. Approximately 13,300 cubic yards (cy) of sediment would be dredged from the Lagoon and pumped into a Nearshore Containment Facility (NCF), which would permanently occupy an area approximately 430 feet x 177 along the north side of the U.S. Coast Guard facility. Additional fill material would eventually be placed on top of the dredged material to bring the facility to an elevation level with shoreside topography. The project would thus permanently convert a portion of Convair Lagoon to upland area. The future land use of the proposed upland area has not yet been determined and will therefore require subsequent environmental review with respect to land/water use compatibility; however, the creation of the upland area itself would not conflict with existing or surrounding land uses. The project's compatibility with water related uses is discussed in the Recreational Boating/Navigational Safety section of this report (refer to Section 5.10).

Settling of the dredged material would generate water which would require treatment in a water treatment facility. A temporary water treatment facility (WTF) has been proposed to be located along the westernmost portion of the NCF within the northernmost area of the U.S. Coast Guard facility property. This temporary facility would require further federal environmental review, a permit from the U.S. Coast Guard, and concurrence therein by the California Coastal Commission. The WTF would be removed once the dewatering process is complete (approximately 1.5 years). The industrial nature of the WTF would be compatible with the surrounding industrial land uses; however, because the U.S. Coast

Guard facility is currently not fenced off from Convair Lagoon potential security impacts could occur temporarily during the remediation process. Refer to Section 5.9, Coast Guard Operations and Security, for additional discussion of this issue.

Consistency with Land Use Plans, Policies and Regulations

San Diego Unified Port District Master Plan

The proposed remediation project is consistent with the overall goals of the SDUPD Master Plan to enhance and maintain the biological and physical entity of the bay and to maintain water quality. The project would clean up the contaminated Lagoon, thereby enhancing both the long-term biological and physical entity of the bay and greatly improving water quality.

The NCF is proposed to be located primarily in an area designated in the Port Master Plan as Recreational Boat Berthing; margins of the NCF may extend into areas designated as Boat Navigation Corridor; Harbor Master Berthing, and Derelict Craft Storage. Because the Recreational Boat Berthing area allows disposal facilities for waste oil and hazardous substances, the proposed use is consistent with the Port Master Plan. However, the landfill necessary to create the NCF is not consistent with the policies of the Port Master Plan and an amendment would be required. The loss of water area within the lagoon is not considered to be significant by the SDUPD (Trull 1993). Because there is currently such a small land area surrounding the Lagoon that could support water related uses under the Recreational Boat Berthing designation, the conversion of a portion of the Lagoon area to upland could allow for these uses to be developed in the future and result in an overall beneficial land use impact, depending on the proposed use of the site. As mentioned above, subsequent environmental review would be required.

Land use related impacts with respect to coastal access, Coast Guard operations and security, and recreational boating and navigational safety are discussed in their respective sections of this report.

California Coastal Act

The proposed project is consistent with both the general and port-specific conservation development policies of the coastal act.

5.7.2.2 No Action

Under the No Action alternative, the proposed remediation project would not occur and the Convair Lagoon would remain contaminated. Although this alternative would result in no land/water use changes and would therefore be compatible with the existing onsite and surrounding land uses, it would conflict with the goal of the SDUPD Master Plan to enhance and maintain the biological and physical entity of the bay and to maintain water quality.

5.7.2.3 Sand Capping - Preferred Alternative

The Sand Capping alternative would not result in any land/water use change from existing conditions and would therefore not conflict with the existing or surrounding land uses. Because no land or water use changes would occur, this alternative would also be consistent with the existing land/water use designations. No adverse impacts would occur.

5.7.3 Mitigation Measures

5.7.3.1 Proposed Project - Nearshore Containment Facility

No significant impacts have been identified; therefore, no mitigation measures would be required.

5.7.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.7.3.3 Sand Capping - Preferred Alternative

No significant impacts have been identified; therefore, no mitigation measures would be required.

5.8 Coastal Access

5.8.1 Existing Conditions

The project area is currently fenced off and there are no readily available shore side access points to Convair Lagoon, thus public shore use is limited in order to protect the public from the contamination. Controlled access is presently available to General Dynamics employees through the Convair Sailing Club that maintains a pier and floating dock in the southwestern portion of the Lagoon.

The SDUPD Master Plan makes provision for differing degrees of physical and visual access to the shoreline in a manner that is consistent with the activities being conducted on the land and water areas involved, and the proprietary interests of the private land owners, lessees, and public rights and needs. Maximum access to the shoreline is encouraged except where security or public safety factors would negate. The location and size of public access ways are guided by considerations for the availability of other recreational areas and support facilities, the proximity to users, the size and physical characteristics of the site and the potential impact the access way has on the nature, intensity, and ownership of existing and planned uses both onsite and in adjacent developments. The Master Plan has established access categories (Class I-IV) to pursue the development of access ways (SDUPD 1992).

The Convair Lagoon falls under Access Class IV which applies to non-recreational areas developed with public or private funds to accommodate industrial activities, military bases, and sea or air transportation facilities. General public access is prohibited in Class IV areas due to security and public safety reasons, although, when possible, visual access is encouraged.

5.8.2 Impacts

5.8.2.1 Proposed Project - Nearshore Containment Facility

With the exception of the creation of upland area and the water treatment facility, the proposed remediation project does not propose any specific land or water uses. The existing fence along Harbor Drive would remain and access to the site may be restricted. Future land access to Convair Lagoon is dependent upon the final use of the proposed cover, which has not yet been determined. Planned uses would provide for public access and boating use of the site at which time the site would be Access Class III.

The proposed project would require the temporary removal of the Convair Sailing Club pier and floating dock during construction. This is considered to be an adverse impact of the proposed project; however, it is not considered to be significant due to the temporary nature of the impact.

5.8.2.2 No Action

Under the No Action alternative, the fence along Harbor Drive would remain and coastal access would continue to be limited to General Dynamics employees through the Convair Sailing Club.

5.8.2.3 Sand Capping - Preferred Alternative

The implementation of the Sand Capping alternative would not result in any coastal access changes from existing conditions. Similar to the proposed project, the fence along Harbor Drive would remain and access would continue to be limited to General Dynamics employees through the use of the Convair Sailing Club.

This alternative would not require the temporary removal of the Convair Sailing Club pier and floating dock. No coastal access impacts would occur.

5.8.3 Mitigation Measures

5.8.3.1 Proposed Project - Nearshore Containment Facility

No significant impacts have been identified; therefore, no mitigation measures would be required.

5.8.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.8.3.3 Sand Capping - Preferred Alternative

No significant impacts have been identified; therefore, no mitigation measures would be required.

5.9 COAST GUARD OPERATIONS/SECURITY

5.9.1 Existing Conditions

Three United States (U.S.) Coast Guard offices are located to the south of Convair Lagoon and west of Harbor Drive, and perform different functions in the Port. Primary responsibilities of the Coast Guard Group/Air Station include search and rescue, enforcement of laws and treaties, and aid to navigation. Also in the immediate project vicinity, the Coast Guard maintains employee recreation facilities which include a tennis court, a volleyball court, and an open barbeque/picnic area. The Coast Guard property is currently not fenced-off from the Convair Lagoon.

5.9.2 Impacts

5.9.2.1 Proposed Project - Nearshore Containment Facility

No specific land or water uses are proposed as a component of this project; therefore, with the exception of the nearshore containment facility (NCF) and the temporary water treatment facility (WTF) proposed on Coast Guard property, the site would be returned to its existing state post-remediation (approximately 1.5 years). Use of Coast Guard property for the proposed WTF would require further federal environmental review and a special permit. Any specific land or water use proposals for the upland area would require subsequent environmental review. No long-term impacts to the Coast Guard facilities would occur as a result of the proposed remediation project.

5.9.2.2 No Action

Under the No Action alternative, the proposed remediation project would not occur and the Convair Lagoon would remain in its existing state. Access to the Lagoon area for remediation activities would not be necessary and there would be no potential for impacts to Coast Guard operations and security.

5.9.2.3 Sand Capping - Preferred Alternative

After the remediation process has been completed the Lagoon would be returned to its existing state. Therefore, no long-term impacts to Coast Guard operations and security would occur.

5.9.3 Mitigation Measures

5.9.3.1 Proposed Project - Nearshore Containment Facility

To mitigate short-term security impacts during the dredging/construction phase of the proposed project, a fence would be installed by the SDUPD between the Coast Guard property and the Convair Lagoon project site, and around the temporary water treatment facility. The fence would be permanent if determined by the Coast Guard to be necessary to ensure long-term security

5.9.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.9.3.3 Sand Capping - Preferred Alternative

No significant impacts have been identified; therefore, no mitigation measures are required.

5.10 Recreational Boating/Navigational Safety

5.10.1 Existing Conditions

Convair Lagoon currently supports an extremely limited amount of small craft recreational boating traffic, primarily on the weekends. Limited recreational boating opportunities are currently available to General Dynamics employees through the Convair Sailing Club, which maintains a pier and floating dock in the southwestern portion of the Lagoon on land and water area leased to General Dynamics by the SDUPD.

Due to its location, the Lagoon is fairly isolated from the higher use water areas within San Diego Bay; therefore, the majority of the existing boating activity occurs within the southwestern-most portion of the Lagoon area and increases out toward the Bay. The Lagoon and Bay are regulated by general navigational standards enforced by the San Diego Harbor Police. The San Diego Harbor Police is responsible for ensuring that all local boating requirements, such as delinquent and illegal anchoring and safe boating practices, are complied with. The Bay and Lagoon are also regulated by the U.S. Coast Guard navigational standards. These federal standards include safe boating practices and pollution control. To ensure navigational safety in waters regulated by the Coast Guard, a standard has been adopted which requires all projects within Coast Guard waters to submit a request for "Notice to Mariners" with the dates and times of operations. This information is then broadcast by radio and published in the local Notice to Mariners by the Coast Guard to alert all boat operators in the area of potential navigational hazards. Projects are also required to comply with the International Rules of the Road for lighting and day markers which outline specific lighting and marker requirements for operations within the water.

According to the U.S. Coast Guard, there have been no reported accidents involving dredging vessels in San Diego Bay within the last ten years (U.S. Navy 1992).

5.10.2 Impacts

5.10.2.1 Proposed Project - Nearshore Containment Facility

The creation of approximately 76,110 square feet (1.75 acres) of upland area within Convair Lagoon would result in a decrease of water area available for recreational boating activities. As discussed under Section 5.10.1, Existing Conditions, the Lagoon area is fairly isolated and is currently a low use area with respect to recreational boating activity. However, the project has the potential to optimize use of the lagoon for recreational boating activities by correcting the inadequacies of the size of the land side support. The reduction of water area available for recreational boating activity is therefore not considered to be significant.

Within the Lagoon area, construction of the proposed project would require dredging activities. To minimize the extent of disturbance around the proposed dredging area, a silt curtain would be temporarily installed. This silt curtain as well as other associated construction activities would require that the Lagoon area be temporarily blocked from boating access. After the construction phase of the project is completed, the water area of the project site would return to its former state. As discussed above, the Lagoon is not currently a high traffic area for recreational boating and the access restriction would be temporary. In addition, the proposed project would be required to comply with Coast Guard standards and the International Rules of the Road with respect to lighting and day shapes. Therefore, the proposed project is not expected to interfere with vessel traffic and no significant impacts with respect to recreational boating/navigational safety would occur.

The proposed project would require the temporary removal of the General Dynamics Convair Sailing Club pier and floating dock during construction. The pier and dock removal would affect recreational boating opportunities associated with the sailing club in the short-term and is considered to be an adverse impact of the proposed project. However, the impact is not considered to be significant due to its temporary, short-term nature.

5.10.2.2 No Action

Under the No Action alternative, recreational boating opportunities and navigational safety would not experience any change from existing conditions; the area would continue to be restricted to boating access due to contamination.

5.10.2.3 Sand Capping - Preferred Alternative

Implementation of the Sand Capping alternative would involve the "sprinkling" of approximately 3 feet of rock and sand along the bottom of the Lagoon area which would reduce the amount of navigable area for boating activities. Because the Lagoon area is fairly isolated and is currently a low use area with respect to recreational boating activity, the reduction of water area available for recreational boating activity is not considered to be a significant impact.

The anchoring of boats within the Lagoon could disturb the cap area and recontaminate the sediment. Therefore, boats would have to be restricted from the Lagoon if appropriate mitigation measures are not adopted. The restriction of boats from the Lagoon is considered a significant impact.

Temporary impacts to adjacent recreational boating activities and navigational safety under the Sand Capping alternative are primarily associated with the capping phase of the project and are similar to the dredging/construction phase of the proposed project (refer to Section 5.10.3.1). These impacts are not considered to be significant.

5.10.3 Mitigation Measures

5.10.3.1 Proposed Project - Nearshore Containment Facility

No significant impacts have been identified; therefore, no mitigation measures are required.

5.10.3.2 No Action

No mitigation is assumed under the No Action alternative.

5.10.3.3 Sand Capping - Preferred Alternative

To ensure that anchoring within the Lagoon area does not disturb the sand cap and recontaminate the sediment, the following mitigation measures are recommended:

- An ordinance prohibiting anchoring within Convair Lagoon should be adopted by the SDUPD.
- The SDUPD should, upon adoption of the ordinance, notify the San Diego Harbor Police and the U.S. Coast Guard of the anchoring restriction within Convair Lagoon.

- Signs should be posted within the water area along the mouth of the Lagoon notifying boaters of the anchoring restriction within Convair Lagoon.

5.11 SHORT-TERM VS. LONG-TERM PRODUCTIVITY

5.11.1 Proposed Project - Nearshore Containment Facility

Implementation of the proposed project would involve certain short-term and long-term effects on the Lagoon and surrounding area. The short-term physical effects of implementing the proposed project includes dredging and construction-related impacts on noise and security to the adjacent U.S. Coast Guard facility, and temporary closure of the Convair Sailing Club. During the short-term dredging/construction phase of the project, these effects would be unavoidable as construction activities proceed.

Notwithstanding these short-term effects, implementation of the proposed project would create gains in the long-term productivity of the Lagoon area. Implementation of the proposed project would result in an overall improvement in water and sediment quality in Convair Lagoon and thus reduce significant bioaccumulations of PCBs in fish and shellfish. Further, these long-term benefits would result in a decreased health and safety risk to the human population. The creation of a developable waterfrontage as a result of the proposed fill activities could also allow for future long-term socioeconomic benefits as well as the potential for the development of future commercial recreation land uses in accordance with the existing SDUPD Master Plan designation for the Lagoon area. Any specific land use proposal would be subject to subsequent environmental review.

5.11.2 No Action

Under the No Action alternative, the short-term construction-related impacts would not occur; however, the Lagoon would remain contaminated which would reduce the long-term productivity of the project area.

5.11.3 Sand Capping - Preferred Alternative

Implementation of the Sand Capping alternative would involve certain short-term and long-term effects on the Lagoon and surrounding area. The short-term physical effects of implementing the preferred alternative includes capping-related impacts on noise and security to the adjacent U.S. Coast Guard facility. During the short-term remediation phase of the project, these effects would be unavoidable as remediation activities proceed.

Notwithstanding these short-term effects, implementation of the Sand Capping alternative would create gains in the long-term productivity of the Lagoon area provided the integrity of the cap is maintained. Implementation of this alternative would result in an overall improvement in water and sediment quality in Convair Lagoon and thus reduce significant bioaccumulations of PCBs in fish and shellfish. Further, these long-term benefits would result in a decreased health and safety risk to the human population.

5.12 Cumulative Impacts

Cumulative impacts refers to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts (Section 15355 of the State CEQA Guidelines). Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. The CEQA guidelines state that cumulative impacts shall be discussed when they are significant (Section 15130a).

Section 3 of this EIR addresses two remediation alternatives for the clean-up of Convair Lagoon. The first alternative, which is analyzed as the proposed project, consists of a combination of dredging and containment to isolate PCBs from the environment. The second alternative, sand capping, involves covering the contaminated sediment in Convair Lagoon with a layer of uncontaminated "clean" material to isolate the PCBs. Because all significant impacts are mitigated, there are no cumulative adverse impacts. Therefore, no cumulatively significant impacts are associated with the following issue areas: water quality, marine resources, avian resources, utilities, geotechnical/seismicity, land/water use, coastal access, coast guard operations/security, and recreational boating/navigational safety.

Implementation of the proposed remediation project in conjunction with the removal of copper contaminated sediment at the Paco Terminal would result in a cumulative improvement in both water and sediment quality in the Bay as contaminated sediments are removed and isolated or contained beneath fill. The cumulative improvement in water quality would also cumulatively improve conditions for certain marine and avian resources which have continued to show significant bioaccumulation of contaminants. Cumulative beneficial impacts to human health and safety would also occur, as the exposure to PCBs and heavy metals through direct exposure to contaminated sediments and the ingestion of contaminated shellfish would be reduced.

5.13 GROWTH INDUCING IMPACTS

Section 15126(g) of the California Environmental Quality Act (CEQA) Guidelines requires a discussion of the ways in which the project could foster economic or population growth, or the construction of additional housing, either directly or indirectly. Induced growth is distinguished from the direct employment, population, or housing growth of a project. A project could induce growth by lowering or removing barriers to growth or by creating or allowing an amenity such as an industrial facility that attracts new population or economic activity.

5.13.1 Proposed Project - Nearshore Containment Facility

In the case of the proposed project, the potential exists for the future development of the upland area created to accommodate the nearshore containment facility (NCF). Any future utilization of the NCF area will be consistent with the certified Port Master Plan. At this time, there are no specific development proposals for the upland area and any future proposals would be subject to subsequent environmental review. Therefore, the proposed project is not considered to be growth inducing.

5.13.2 No Action

Under the No Action alternative, the project site would remain in its existing state. Because no changes from existing conditions are proposed under the No Action alternative, there is no potential for growth inducing impacts to occur.

5.13.3 Sand Capping - Preferred Alternative

Under the Sand Capping alternative, the project site would be returned to its existing state post-remediation. Because no changes from existing conditions are proposed under this alternative, there is no potential for growth inducing impacts to occur.

5.14 UNAVOIDABLE AND IRREVERSIBLE SIGNIFICANT ENVIRONMENTAL EFFECTS

The proposed nearshore containment facility project would result in the incremental loss of water area within San Diego Bay. No additional unavoidable and/or irreversible significant environmental effects would occur.

6.0 EFFECTS FOUND NOT TO BE SIGNIFICANT

The Port District prepared an Initial Study that determined that various possible significant effects of the proposed project were found not be significant, and, therefore, are not discussed in detail in the EIR. The Initial Study is attached as Appendix E.

7.0 REFERENCES

Adams, W., Kimerle, R., Barnett, J. 1992. Sediment Quality and Aquatic Life Assessment. Environmental Science and Technology, Vol. 26, no. 10.

Aller, R.C. and R.E. Dodge. 1974. Animal-sediment relations in a tropical lagoon, Discovery Bay, Jamaica. Journal of Mar. Res. 32 (2): 209-232.

Ankley, G.T., V.R. Mattson, E.N. Leonard, C.W. West , and J.L. Bennett. 1993. Predicting the acute toxicity of copper in freshwater sediments: Evaluation of the role of acid-volatile sulfide. Environ. Toxicol. Chem. 12 (2): 315-320.

Applicant for Department of the Army Permit, Pier 53 Capping Project. 1991. November.

Artim, E.R., and Elder-Mills, Dorian. 1982. The Rose Canyon fault: a review, In Abbott, P.L., Geologic studies in San Diego, pp. 35-45.

Atwood, J.L. and D. Minsky. 1983. Least tern foraging ecology at three major California breeding colonies. Western Birds 14:54-71.

Bailey, S. 1984. California least tern foraging and other off-colony activities around Alameda Naval Air Station during 1984. Prepared for NAS Alameda.

Barker, D.T., D. Davis, et. al. "Investigation of Polychlorinated Biphenyls (PCBs) in the Convair Lagoon Portion of San Diego Bay." 1986. Staff Testimony for Regional Board Meeting of July 29, 1986.

Bay, Jamaica. Journal of Mar. Res. 32 (2): 209-232.

Blake, T.F. 1989. EQFAULT – A computer program for the deterministic prediction of peak horizontal acceleration from digitized California faults: Blake, 79 p., appendices.

Bokuniewicz, H.J., and J.T. Liu. 1988. Stability of layered dredge sediment deposits at subaqueous sites. New York State University, Marine Science Research Center, Stonybrook, NY.

Borlakoglu, J.T. and K.D. Haegele. 1991. Comparative aspects on the bioaccumulation, metabolism, and toxicity with PCBs. Comparative Biochemistry and Physiology 100C:327-338.

Bosworth, W.S. and L.J. Thibodeaux. 1990. Bioturbation: A facilitator of contaminant transport in bed sediment. Environmental Progress 9 (4): 211-217.

Branch, G.M. and A. Pringle. 1987. The impact of the sand prawn *Callianassa kraussi* Stebbing on sediment turnover and on bacteria, meiofauna, and benthic microfauna. J. Exp. Mar. Biol. Ecol. 107:219-235.

Brannon, J.M. et al. 1985. Effectiveness of capping in isolating contaminated dredge material from biota and overlying water. Technical Report D-85-10. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

______________ 1986. Effectiveness of Capping in isolating Dutch Kill sediment from biota and the overlying water. Technical Report D-86-2. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

______________ 1987. Capping contaminated dredge material. Marine Pollution Bulletin, Vol. 18, No. 4. pp 175-179.

California Department of Conservation, Division of Mines and Geology. 1992. Peak acceleration from maximum credible earthquakes in California (rock and stiff-soil sites), DMG Open File Report 92-1.

California Division of Mines and Geology. 1975. Recommended guidelines for determining the maximum credible and the maximum probable earthquakes: California Division of Mines and Geology, Note No. 49, 4 p.

Cogswell, H.L. Waterbirds of California. University of California Press, Berkeley.

Copper, E.A. 1986a. A report on the results of bird surveys conducted in the vicinity of Harbor Island, San Diego Bay, 14 May - 10 September, 1986. Appendix A in Phillips Brandt Reddick. Final EIR for Sunroad Marina, Harbor Island, San Diego, California.

Copper, E.A. 1986b. A report on least tern nesting in south San Diego County, 1986. Prepared for California Department of Fish and Game.

Copper, E.A. 1986c. An interim report on the foraging activity of the California least tern in north San Diego Bay. Appendix B in Phillips Brandt Reddick. Final EIR for Sunroad Marina, Harbor Island, San Diego, California.

Copper, E.A. 1986d. A supplemental report on the foraging activity of the California least tern in north San Diego Bay, 2 July - 10 September, 1986. Appendix C in Phillips Brandt Reddick. Final EIR for Sunroad Marina, Harbor Island, San Diego, California.

De Vaugelas, J. 1985. Sediment reworking by Callianassid mud shrimp in tropical lagoons: a review with perspectives. Proceedings of the Fifth International Coral Reef Congress, Tahiti 6:617-622.

Deleeuw, J.J. , and M.R. Vaneerden. 1992. Size selection in diving Tufted Ducks *Aythya fuligula* explained by differential handling of small and large mussels *Dreissena polymorpha*. Ardea. 80 (3): 353-362.

DMG. 1992. Peak acceleration from maximum credible earthquakes in California (rock and stiff-soil sites), DMG Open-File Report 92-1.

Dworschak, P.C. 1983. The biology of *Upogebia pusilla* (Petagna) (Decapoda, Thalassinidea), I. The burrows. Marine Ecology 4(1): 19-43.

Ebasco Environmental. 1992. Convair Lagoon basis of design report prepared for Teledyne Ryan Aeronautical for submittal to California Regional Water Quality Control Board, San Diego Region. June.

Ebasco. 1991. Engineering Evaluation Report Sediment Cleanup Options: Convair Lagoon. January.

Ebasco. 1991. Evaluation of Residual Sediment PCB Levels in Convair Lagoon.

Ebasco. 1992. Results of Chemical Analysis and Elutriate Testing for Convair Lagoon. October.

Eisler, R. 1986. Polychlorinated biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85 (1.7).

Elliott, J.E. and D.G. Noble. 1993. Chlorinated hydrocarbon contaminants in marine birds of the temperate north Pacific. Pages 241-253 in K. Vermeer, K.T. Briggs, K.H. Morgan, D. Siegel-Causey (eds.). The status, ecology, and conservation of marine birds of the north Pacific. Canadian Wildlife Service Special Publication, Ottawa.

EPA. 1992. Draft Contaminated Sediments Management Strategy. March.

ERCE (Ogden). 1988. "Characterization of the Vertical Extent of Contaminated Sediments in Convair Lagoon, San Diego, Bay, Volume II." 1988. Original analytical reports.

ERCE (Ogden). 1989. "Characterization of the Extent of Contaminated Sediments in Convair Lagoon, Volume IIa." Original analytical laboratory reports.

ERCE (Ogden). 1989. "Characterization of the Extent of Contaminated Sediments in Convair Lagoon, Volume IIb." Original analytical laboratory reports.

ERCE (Ogden). 1989. "Characterization of the Extent of Contaminated Sediments in Convair Lagoon, Volume III." Field notes and logs.

ERCE (Ogden). 1989. "Characterization of the Vertical Extent of Contaminated Sediments in Convair Lagoon, San Diego, Bay, Volume I." Technical report.

ERCE (Ogden). 1989. "Recommendations for PCB Action Levels in Sediments: Convair Lagoon, San Diego Bay."

ERCE (Ogden). 1989. "Supplemental Report, Characterization of the Extent of Contaminated Sediments in Convair Lagoon, Volume I." Technical report.

ERCE (Ogden). "Proposed Scope of Work to Characterize Contaminated Sediments in Convair Lagoon, San Diego Bay."

ERCE (Ogden). 1989. Mission Bay least tern foraging ecology study. Prepared for San Diego City Parks and Recreation Department.

Fancher, J.M. 1992. Population status and trends of the California least tern. Transactions of the Western Section of The Wildlife Society 28:59-66.

Fonseca, M.S. and J.A. Cahalan. 1992. A Preliminary Evaluation of Wave Attenuation by Four Species of Seagrass. Estuarine, Coastal and Shelf Science 335:565-576.

Ford, R.F. and K.B. Macdonald. 1986. Marine Resource Survey Harbor Island East and West Basins, San Diego Bay, California. Appendix A IN: Final Environmental Impact Report, Sunroad Marina, Harbor Island. UPD #83356-EIR-42; SCH #86021209. Prepared by Phillips Brandt Reddick.

Fredette, Dr. 1991. DAMOS Program Manager, USACE. Personal Communication. August 12.

Gastil, R.G., K. Kies, and D.J. Mellus. 1979. Active and potentially active faults: San Diego County and northernmost Baja California, in Abbott, P.L., and Elliott, W.J., Earthquakes and other perils, San Diego region: San Diego Association of Geologists, pp. 47-58.

Green et al. 1979. Geology.

Griffis, R.B. and F.L. Chavez. 1988. Effects of sediment type on burrows of *Callianassa californiensis* Dana and *C. gigas* Dana. J. Exp. Mar. Biol. Ecol. 117: 239-253.

Group Delta Consultants, Inc. May 22. 1986. Geotechnical investigation and design criteria for Harbor Cove Marina, San Diego, California, Project No. 6S333A.

Gunnison, D. et al. 1987. Development of a simplified column test for evaluation of thickness of capping material required to isolate contaminated dredge material. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Kennedy, M.P. 1975. Geology of the San Diego metropolitan area, California, Section A, western San Diego metropolitan area, Point Loma and La Jolla 7 1/2-minute quadrangles: California Division of Mines and Geology, Bulletin 200, pp. 1-39.

Legg, M.R., and M.P. Kennedy. 1979. Faulting offshore San Diego and northern Baja California, in Abbott, P.L., and Elliott, W.J., Earthquakes and other perils, San Diego region: San Diego Association of Geologists, pp. 29-46.

Leighton and Associates. 1983. City of San Diego seismic safety study: City of San Diego, 4 p. text and figures, 154 map sheets, scale 1 inch = 1778 feet.

Lofgren, B. 1990. Riedel International, Portland Oregon. Personal Communication, March.

MacGinitie, G.E. 1930. The natural history of the mud shrimp *Upogebia pugettensis* (Dana). Ann. Mag. Nat. Hist. 6:36-44.

MacGinitie, G.E. 1934. The natural history of *Callianassa californiensis* Dana. Ann. Midl. Nat. 15: 166-177.

Mansky, James A. 1984. "Underwater Capping of Contaminated Dredged Material in New York Bight Apex." Environmental Effects of Dredging. August: Vol. D-84-4.

Massey, B. and J.L. Atwood. 1982. Application of ecological information to habitat management for the California least tern. Progress report No. 4. Prepared for U.S. Fish and Wildlife Service, Laguna Niguel, California.

McCain, B.B., S. Chan, M.M. Krahn, D.W. Brown, M.S. Myers, J.T. Landahl, S. Pierce, R.C. Clark, Jr., and U. Varanasi. 1992. Chemical contamination and associated fish diseases in San Diego Bay. Environmental Science and Technology 26:725-733.

Macdonald, Keith B. 1985. Marine Service Center Cite Convair Lagoon Final Environmental Impact Report (UPD #83356-EIR-35; SCH #84101003). March. San Diego Unified Port District.

McLean, J.H. 1969. Marine Shells of Southern California. Los Angeles County Museum of Natural History Science Series 24, Zoology No. 11, October 1969.

Montgomery, Raymond L. 1984. "Engineering Aspects of Capping Contaminated Dredged Material." Environmental Effects of Dredging. May: Vol. 8-84-2. U.S. Army Corps of Engineers Waterways Experiment Station.

Morris, R.H., D.P. Abbott, and E.C. Haderlie. 1980. Intertidal Invertebrates of California. Stanford University Press, Stanford, California.

Murphy, R.C. and J.N. Kremer. 1992. Benthic community metabolism and the role of deposit-feeding callianassid shrimp. Journal of Mar. Res. 50: 321-340.

Myers, A.C. 1979. Summer and winter burrows of a mantis shrimp, *Squilla empusa*, in Narragansett Bay, Rhode Island (U.S.A.). Estuarine and Coastal Marine Sciences.

Neal, R.W. et al. 1978. Evaluation of the submerged discharge of dredged material slurry during pipeline dredge operations. Technical Report D-78-44. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

O'Connor, J.M. 1983. Evaluation of the 1980 capping operations at the experimental Mud Dump site. N.Y.U. Institute of Environmental Studies, Stonybrook, NY.

Ogden Environmental and Energy Services (Ogden). 1992. Shorebird monitoring. Pages 44-45 in Report of findings, Mission Bay beach stabilization sand test project, Mission Bay Park, San Diego, California. Prepared for City of San Diego Department of Pakes and Recreation.

Ohlendorf, H.M. 1993. Marine birds and trace elements in the temperate north Pacific. Pages 232-240 in K. Vermeer, K.T. Briggs, K.H. Morgan, D. Siegel-Causey (eds.). The status, ecology, and conservation of marine birds of the north Pacific. Canandian Wildlife Service Special Publication, Ottawa.

Ohlendorf, H.M., Schaffner, F.G., T.W. Custer, and C.J. Stafford. 1985. Reproduction and organochlorene contaminants in terns at San Diego Bay. Colonial Waterbirds 8:42-53.

Otis, M.J. et al. 1990. Pilot study of the dredging and dredged material disposal methods, New Bedford Superfund site. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Pacific Southwest Biological Services (PSBS). 1992. Eelgrass, fisheries, and marine invertebrate monitoring. Pages 20-41 in Report of findings, Mission Bay beach stabilization sand test project, Mission Bay Park, San Diego, California. Prepared for City of San Diego Department of Lakes and Recreation.

Palermo, M.R. et al. 1989. Evaluation of dredged material disposal alternatives for U.S. Navy Homeport at Everett, WA. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Palermo, Michael R., Ph.D., Fredette, Thomas J., Ph.D., Robert E. Randall, Ph.D. 1992. "Monitoring Considerations for Capping." Dredging Research Technical Notes DRP-5-05. June. U.S. Army Corps of Engineers Waterways Experiment Station.

Parametrix, Inc. 1989. 1988 Sediment Monitoring, Simpson Kraft capping project, Tacoma. WA. Unpublished.

Pavelka, M. 1991. Peregrine falcons nesting in San Diego California. Western Birds 21:181-183.

Pemberton, G.S., M.J. Risk, and D.E. Buckley. 1976. Supershrimp: Deep bioturbation in the Strait of Canso, Nova Scotia. Science 192: 790-791.

Proceedings, Workshop on "The seismic risk in the San Diego Region: special focus on the Rose Canyon fault system," June 29-30, 1989.

Quammen, M.L. 1982. Influence of subtle substrate differences on feeding by intertidal mudflats. Marine Biology 71:339-343.

Reish, D.J. 1961. A study of benthic fauna in a recently constructed boat harbor in southern California. Ecology 42 (1): 84-91.

Riddle, M.J. 1988. Cyclone and bioturbation effects on sediments from coral reef lagoons. Estuarine, Coastal and Shelf Science 27: 687-695.

Robertson, J.E. 1993. Practical issues from the Loma Prieta earthquake - highway bridges, Loma Prieta Earthquake Symposium, San Francisco.

Romberg, P. et al. 1989. Sediment capping at Denny combined sewer overflow (CSO), METRO, Seattle, WA. and U.S. Army Corps of Engineers, Seattle District.

San Diego Bay Health Risk Study. 1990. Prepared for the Port of San Diego by San Diego County Department of Health Services, Environmental Health Services, San Diego, June 12, 1990

San Diego Unified Port District. 1980 (revised 1988). Port Master Plan. January. SDUPD Planning Department.

San Diego Unified Port District. 1980. Final Environmental Impact Report for the San Diego Unified Port District Master Plan (Vols. 1 and 2) (SCH# 78030604). February. SDUPD Environmental Management.

Sanders, C.M. 1989. Capping of contaminated sediment in Puget Sound, Puget Sound Research '91, Proceedings, Vol. 1., pp 256-266.

Seed, H.B. 1987. Design problems in soil liquefaction. Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8.

Shields, D.F. et al. 1984. Fundamentals of capping contaminated dredge material, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Short, F.T. 1983. The seagrass *Zostera marina* L.: plant morphology and bed structure in relation to sediment ammonium in Izembek Lagoon, Alaska. Aquatic Botany 16: 149-161.

Southwestern Divisional Naval Facilities Engineering Command. 1992. Programmatic Environmental Impact Statement for Dredged Material Disposal. September. U.S. Department of the Navy.

Stanton, S.C. et al. (unpublished), Consolidation and settlement of shallow ocean dredge material mounds, masters dissertation, University of Virgina.

Suchanek, T.H. 1983. Control of seagrass communities and sediment distribution by *Callianassa* (Crustacea, Thallassinidea) bioturbation. Journal of Mar. Res. 41: 281-298.

Suchanek, T.H., and P.L. Colin. 1986. Rates and effects of bioturbation by invertebrates and fishes at Enewetak and Bikini Atolls. Bull. of Mar. Sci. 38 (1): 25-34.

Suchanek, T.H., P.L. Colin, G.M. McMurtry, and C.S. Suchanek. 1986. Bioturbation and redistribution of sediment radionuclides in Enewetak Atoll Lagoon by callianassid shrimp: biological aspects. Bull. of Mar. Sci. 38 (1): 144-154.

Sumeri, Alex, P.E. 1984. "Capped In-Water Disposal of Contaminated Dredged Material." Dredging and Dredge Material Disposal. Volume 2, pp. 644-653. Proceedings of the Conference Dredging '84. November. American Society of Civil Engineers.

Sumeri, Alex, P.E. 1989. "Confined Aquatic Disposal and Capping of Contaminated Bottom Sediments in Puget Sound." Pp. 565-582. World Dredging Congress XII Proceedings. May.

Sumeri, Alex, P.E. 1991. "Capping of Contaminated Bottom Sediment in Elliott Bay, Washington." Environmental Effects of Dredging. September: Vol DRP-91-3. U.S. Army Corps of Engineers Waterways Experiment Station.

Sumeri, Alex, P.E. 1991. "Duwamish Water Confined Aquatic Disposal (CAD) of Contaminated Dredge Material - Five Years Later." U.S. Army Corps of Engineers.

Sumeri, Alex, P.E. and Romberg, Pat. 1990. Contaminated Bottom Sediment Capping Demonstration in Elliott Bay. Beneficial Uses of Dredge Material Workshop Proceedings - San Diego. May.

Sumeri, Alex, P.E., Fredette Thomas J., Ph.D., Kullberg, Paula G., Germano, Joseph D., Carey, Drew A., Pechko, Patricia. 1991. Sediment Chemistry Profiles of Capped In-Situ and Dredged Sediment Deposits: Results from Three US Army Corps of Engineers Offices. Western Dredging Association, WEDA XII Proceedings.

Toppozada, T.R., C.R. Real, and D.L. Parke. 1986. Earthquake history of California: California Geology, v. 39, no. 2, p. 27-33.

Trull, Fred. 1993. Director of Planning, San Diego Unified Port District. Personal Communication. March 18.

Tudhope, A.W. and T.P. Scoffin. 1984. The effects of *Callianassa* bioturbation of the preservation of carbonate grains in Davies Reef Lagoon, Great Barrier Reef, Australia. Journal of Sedimentary Petrology 54 (4): 1091-1096.

U.S. Department of Agriculture, Stereographic aerial photograph nos. AXN-3M-10 through 15, flown May 1953.

U.S. Geological Survey. 1975. La Jolla Quadrangle, California - San Diego Co., 7.5-minute series (topographic), photo revised 1975.

U.S. Navy. 1987. Biological Reconnaissance Survey at the Electromagnetic Roll Garden Pier, North San Diego Bay. Prepared as an index to an EIR for the pier.

Unitt, P. The birds of San Diego County. Memoir 13, San Diego Society of Natural History.

Wang, X.Q. et al. 1991. Efficiency of capping contaminated bed sediments in situ; laboratory-scale experiments on diffusion-adsorption in the capping layer, Environ. Sci. Technolo. 1991, Vol. 25, 1578-1584.

Waste Management Division Office of Solid Waste, U.S. EPA. 1989. Interim Final RCRA Facility Investigation (RFI) Guidance vol 1. Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations. EPA 530/sw-89-031.

WCC. 1982. Evaluation of liquefaction susceptibility in the San Diego, California urban area, report by Woodward-Clyde Consultants, U.S. Geological Survey Contract No. 14-08-0001-19110.

Youd, T.L. and D.M. Perkins. 1978. Mapping liquefaction-induced ground failure potential, Journal of Geotechnical Engineering, ASCE, Vol. 104, No. GT4.

Ziony, J.I. 1973. Recency of faulting in the greater San Diego area, California, in Studies of the geology and geologic hazards of the greater San Diego area, California, pp. 68-75.

The above references are available for public inspection during normal business hours at:

Ogden Environmental and Energy Services Company, Inc.
5510 Morehouse Drive
San Diego, California 92121
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8.0 AGENCIES/ORGANIZATION/PERSONS CONTACTED

California Department of Fish and Game

California State Coastal Commission

City of San Diego, Planning Department
- Development and Environmental Planning Division
  - Rob Rundle

County of San Diego, Department of Health Services

National Oceanic and Atmospheric Administration
- National Marine Fisheries Service
  - Bob Hoffman

Regional Water Quality Control Board

San Diego Unified Port District
- Environmental Management
  - Ralph T. Hicks, Environmental Management Coordinator
  - Ken Andrecht, Assistant Environmental Management Coordinator
  - Melissa Mailander, Associate Environmental Management Analyst
- Planning
  - Fred Trull, Planning Director

State Lands Commission

U.S. Army Corps of Engineers

U.S. Coast Guard

U.S. Fish and Wildlife Service

9.0 PREPARERS OF EIR AND CERTIFICATION

This report was prepared by Ogden Environmental and Energy Services Company (Ogden), located at 5510 Morehouse Drive, San Diego, California 92121. The following professional staff of Ogden and its subconsultants participated in the preparation of this document:

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I hereby affirm that to the best of our knowledge and belief, the statements and information herein contained are in all respects true and correct and that all known information concerning the potentially significant environmental effects of the project has been included and fully evaluated in this EIR.

David A. Potter, AICP
Project Manager

10.0 PUBLIC REVIEW

10.1 INITIAL DISTRIBUTION

The initial distribution of the Draft EIR was to the following public agencies which may have jurisdiction by law and/or to organizations and individuals with special environmental interests.

U.S. Army Corps of Engineers
  Los Angeles
    Regulatory Function Branch (Chief)
  San Diego (David Zoutendyk)

U.S. Coast Guard
  San Diego
    Marine Safety Office (Commander)
  Alameda
    Civil Engineering Division (Chief)

U.S. Department of Commerce
  National Marine Fisheries Service
    Southwest Regional Director

U.S. Fish and Wildlife Service
  Division of Ecological Services, Carlsbad

Environmental Protection Agency
  Regional Administrator, San Francisco

Office of Planning and Research, Sacramento
  State Clearinghouse (10 copies)

California Coastal Commission
  Executive Director, San Francisco
  Port Coordinator, San Francisco

Department of Fish and Game
  Environmental Services Division, Long Beach

California Department of Parks and Recreation

California Department of Boating and Waterways

California Department of Transportation
  District 11

State Lands Commission, Sacramento

SANDAG
  Areawide Clearinghouse

SD Air Pollution Control District, Exec. Officer

San Diego County
Environmental Health Services

City of San Diego
City Manager
Development and Environmental Planning Division, Deputy Director

City of Chula Vista
City Manager

City of Coronado
City Manager

City of Imperial Beach
City Manager

City of National City
City Manager

Teledyne Ryan Aeronautical

San Diego Bay Committee

I Love A Clean San Diego

Save Our Bay, Inc. (Forming)

Environmental Health Coalition

San Diego Aududon Society

Sierra Club, San Diego Chapter

Citizens Coordinate for Century III

Nathan Slater

San Diego Public Library
Documents Librarian

City of Chula Vista Public Library

City of Coronado Public Library

City of Imperial Beach Public Library

San Diego County Library
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Governmental Reference Library

San Diego State University
Main Library
Institute of Public & Urban Affairs
General Reference Library

UCSD
Governmental Public Library

San Diego Chamber of Commerce
San Diego Unified Port District
Port Planning

Chula Vista Chamber of Commerce

10.2 COMMENTS RECEIVED AND RESPONSES

To be added to Final EIR.

APPENDIX A

BASIS OF DESIGN REPORT

Convair Lagoon
Basis of Design Report

prepared for
Teledyne Ryan Aeronautical
by
EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated
for submittal to
California Regional Water Quality Control Board, San Diego Region

JUNE 1992

Convair Lagoon
BASIS OF DESIGN REPORT

Submitted to:

California Regional Water Quality Control Board
San Diego Region

Submitted by:

Teledyne Ryan Aeronautical
2701 Harbor Drive
San Diego, California 92101

June 1992

MISC.3/5-28-92/02514A

CONTENTS (continued)

CONTENTS

CONTENTS (continued)

FIGURES

FIGURES (Continued)

TABLES

GLOSSARY

ACOE	ACOE
AET	Apparent Effects Threshold
BACT	Best available control technology
BDR	Basis of Design Report
BOD	biological oxygen demand
CAF & G	California Department of Fish and Game
CAL-OSHA	California Occupational Safety and Health Act
CB	Catch basin -
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response and Compensation Liability
CFR	Code of Federal Regulations
cfs	cubic feet per second
COD	Chemical oxygen demand
CSI	Construction Specific Institute
DAF	Dissolved air flotation
EER	Engineering Evaluation Report
EIR	Environmental Impact Report
EP	Equilibrium Partitioning
EPA	U.S. Environmental Protection Agency
FWPCA	Federal Water Pollution Control Act
GAC	Granular activated carbon
GIS	Geographical Information System
gpm	gallons per minute
HDPE	High density polyethylene
kg	Kilograms
M	Richter magnitude for earthquakes
MDL	MDL Laser Track range-azimuth navigation system
mg	Milligram
MLLW	Mean Lower Low Water
mph	Miles per hour
NCDC	National Climatic Data Center

GLOSSARY (continued)

NCF	Nearshore Containment Facility
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPW	Net present worth
NSR	New Source Review
O&M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
pcf	pounds per cubic foot
PCWQA	California Porter Cologne Water Quality Act
pH	chemical acidity or alkalinity measure
ppb	parts per billion
ppm	parts per million
PSD	Port of San Diego
psf	pounds per square foot
RCP	Reinforced concrete pipe
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SAP	Sample and Analysis Plan
APCD	San Diego County Air Pollution Control District
SLC	Screening Level Concentrations
SMW	State Mussel Watch
SQT	Sediment Quality Triad
TOC	Total Organic Carbon
TRA	Teledyne Ryan Aeronautical
TSCA	Toxic Substances Control Act
TTLCs	Total Threshold Limit Concentrations

EXECUTIVE SUMMARY

This document is the Basis of Design Report (BDR) which presents the preliminary design and cleanup plan for the remediation of polychlorinated biphenyl (PCB) containing sediments in Convair Lagoon, San Diego Bay, California. The BDR was prepared in response to Directive 2a of Addendum Number 4 to Cleanup and Abatement Order 86-92 issued by the California Regional Water Quality Control Board (RWQCB) on December 9, 1991. The proposed remediation option consists of a combination of dredging and containment and was selected because it has historical precedent, minimizes potential impacts to the Lagoon, and effectively isolates PCBs from the environment.

In the dredging and containment option, up to 13,300 cubic yards of sediment in Convair Lagoon would be hydraulically dredged and pumped directly into a Nearshore Containment Facility (NCF). The dredging volume reflects the quantity of sediment required to remove sediment which exceeds the 10 mg/kg PCB action level prescribed in the Order. The proposed NCF design and configuration would accommodate the volume of dredged material, provide sufficient volume for the settlement of dredged material, and effectively isolate PCBs from the environment due to the construction of impermeable walls and the installation of an impermeable surface liner.

Settling of dredged material within the NCF generates water which must be treated in a treatment facility. Treatment would occur at a rate compatible with the dredging and settling schedule, and three treatment processes in series would be used to remove PCBs and other contaminants from the water. Monitoring would be conducted in the sediment and water column during and immediately following the remediation to document the success of the dredging and to ensure continuing water quality. In addition, piezometers would also be installed to monitor the long-term performance of the NCF.

The remedial plan would comply with federal, state, and local regulatory statutes including Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, the Toxic Substances Control Act, the California Environmental Quality Act, the California Porter Cologne Water Quality Act, and other state and local requirements regarding hazardous substances, water and air quality, and mitigation. The proposed schedule for the remedial option satisfies the requirements listed in Directive 2 of

Addendum Number 4 to the Order. It is expected that the permitting process would be initiated in October 1, 1992 and continue through August 1, 1993, with construction beginning in the fall of 1993. Dredging operations could then be completed by June 1, 1994. Overall remediation, including installation of the final cover, could be accomplished by spring of 1995. It should be noted that the remedial activities are sequential and time periods in which they can occur are highly constrained. For example, all permitting must be complete before dredging and NCF construction can begin. Furthermore, dredging and construction can only occur from September through March, due to the habitat requirements by key biological species in the Lagoon. Thus if all permits are not issued by August 1,1993, the remediation schedule would necessarily be extended by one year. Therefore, each milestone set in the proposed schedule must be met in order to comply with the deadlines set forth in the Order. However, even if these deadlines are met, overall remediation will not be complete until Spring 1995. The Order should be modified accordingly.

The preliminary design and cleanup plan presented in the BDR satisfy the first milestone prescribed in the Order. Additional documents will follow including a monitoring program, a mitigation project description, a final design plan, a post-cleanup sampling plan and its results, and a monitoring plan for the NCF cover. Each of these documents will be prepared to ensure the successful remediation of Convair Lagoon.

1.0 INTRODUCTION

This Basis of Design Report (BDR) presents the preliminary design and cleanup plan for the remediation of polychlorinated biphenyl (PCB) containing sediments in Convair Lagoon, San Diego Bay, California. The document was prepared in response to Directive 2a of Addendum Number 4 to Cleanup and Abatement Order 86-92 issued by the California Regional Water Quality Control Board (RWQCB) on December 9, 1991. The BDR outlines the proposed remedial option consisting of a combination of dredging and containment. In this option, up to 13,300 cubic yards of sediment would be dredged and contained in a Nearshore Containment Facility (NCF), to effectively isolate the PCBs from the environment. The details of the dredging, NCF construction, and other components of the proposed cleanup plan are outlined in the BDR as shown below.

The BDR is comprised of seven major sections. Section 1 contains the site history and location of Convair Lagoon, as well as a summary of the selected cleanup plan. Section 2 contains a summary of the recent site investigations required to develop this plan, including field surveys and storm drain systems operation analysis. Section 3 contains the remedial design objectives, the sequence of cleanup activities, and the remedial design criteria for the following clean up activities: site mobilization, storm drain modifications, NCF configuration, sediment removal procedures, water treatment processes, site restoration strategy, operation and maintenance considerations, and a long-term monitoring program. In addition, several special technical considerations that will control implementation of cleanup activities are discussed in Section 3. Section 4 covers permit and regulatory compliance, right-of-way and access, health and safety, and community relations activities. Section 5 contains the project schedule. Section 6 contains a preliminary list of construction drawings and an outline of construction specifications anticipated for the final design. Section 7 contains the references. Supporting appendices, including engineering drawings, are also attached.

1.1 SITE LOCATION AND HISTORY

Convair Lagoon is a 10-acre embayment located northeast of Harbor Island and immediately west of the U.S. Coast Guard Station within northern San Diego Bay (Figure 1-1 and Appendix C drawings C1 and C2). General Dynamics, Port of San Diego,

MISC.3/, Port of San Diego.

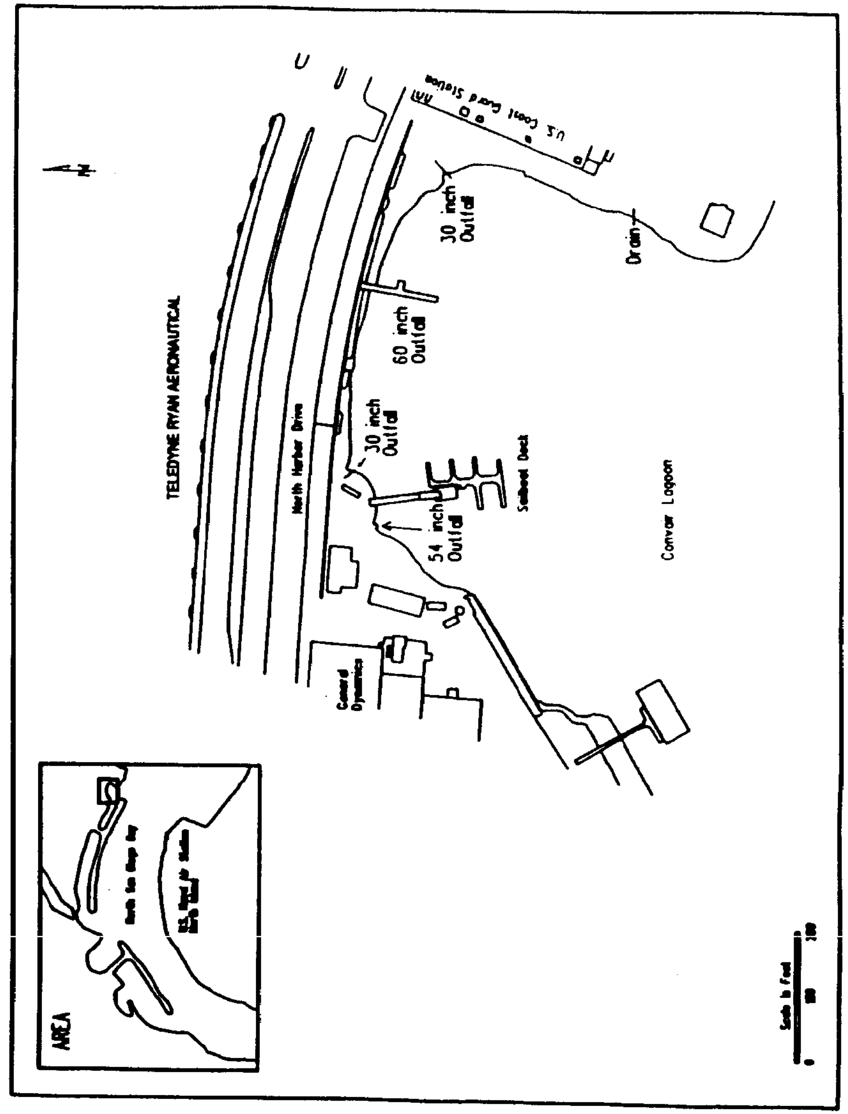

Figure 1-1. Location of Convair Lagoon.