CONCEPTUAL DEVELOPMENT PLAN

LOWER NEWPORT BAY CAD SITE FEASIBILITY STUDY

Prepared for

City of Newport Beach

Harbor Resources Division

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April 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

CAD	confined aquatic disposal
CCC	California Coastal Commission
CEQA	California Environmental Quality Act
City	City of Newport Beach
CSTF	Contaminated Sediments Task Force
CWA	Clean Water Act
DMMP	Dredged Material Management Plan
EA	Environmental Assessment
EIR	Environmental Impact Statement
FONSI	Finding of No Significant Impact
LARE	Los Angeles River Estuary
LTMS	Long-Term Management Strategy
MND	Mitigated Negative Declaration
NewFields	NewFields Northwest, LLC
NEPA	National Environmental Policy Act
O&M	Operations and Management
OHD	Oxnard Harbor District
PCB	polychlorinated biphenyl
PCH	Pacific Coast Highway
RHA	Rivers and Harbors Act
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WDR	Waste Discharge Requirement

1 INTRODUCTION AND OVERVIEW

The Newport Bay/San Diego Creek watershed is located in Central Orange County in the southwest corner of the Santa Ana River Basin, about 35 miles southeast of Los Angeles and 70 miles north of San Diego (Figure 1). The watershed encompasses 154 square miles and includes portions of the cities of Newport Beach, Irvine, Laguna Hills, Lake Forest, Tustin, Orange, Santa Ana, and Costa Mesa. Mountains on three sides encircle the watershed; runoff from these mountains drains across the Tustin Plain and enters Upper Newport Bay via San Diego Creek. Newport Bay is a combination of two distinct water bodies, Lower and Upper Newport Bay, which are divided by the Pacific Coast Highway (PCH) Bridge. The Lower Bay, where the majority of commerce and recreational boating exists, is highly developed. The Upper Bay contains both a diverse mix of development in its lower reach and an undeveloped ecological reserve in its upper reach.

The rich history of agricultural and industrial activities in the watershed has resulted in a legacy of sediment contamination in Newport Bay. Sediment contamination in Newport Bay is specifically a result of historic releases from industrial sources and storm drains adjacent to the bay as well as ongoing runoff from the surrounding watershed. Contaminants of concern include metals, pesticides, and polychlorinated biphenyls (PCBs). In addition to the potential for human health and ecological risks associated with these sediments, the presence of elevated chemicals also makes it very expensive to dredge and dispose of accumulated material. As a result, many areas have not been dredged in many years and will eventually become non-navigable.

This document focuses on identifying a solution to the issue of managing contaminated sediments in Newport Bay by evaluating the nature and extent of contaminated sediments, which likely require managing, reviewing, and evaluating the available management options and recommending a course of action for consideration by the City of Newport Beach (City).

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Figure 1
Site Location
Lower Newport Bay CAD Site Feasibility Study

2 NATURE AND EXTENT OF CONTAMINATED SEDIMENTS

The U.S. Army Corps of Engineers (USACE) is responsible for maintaining the federal navigation channel inside Newport Bay. A June 2008 survey of the channel conducted by the USACE shows approximately 1 million cubic meters of sediment accumulated above the authorized Operations and Maintenance (O&M) depths within actively maintained portions of the bay. Figure 2 presents a breakdown of the sediment volumes accumulated in the Lower Newport Bay O&M channel, by dredge segment.

The City of Newport Beach Harbor Resources Department is currently working with NewFields Northwest, LLC (NewFields), to test and evaluate bay sediments to determine suitability for open-ocean disposal. A summary of the most recent chemical and biological data for these segments is contained in Appendix A and summarized below in Table 1. Using the current worst-case, conservative projections from NewFields, the total estimated volume suitable for open-ocean disposal is approximately 300,000 cubic meters, with the balance of 700,000 cubic meters of sediments not likely to pass the suitability determination for open-ocean disposal. These sediments will instead require some form of treatment or alternate disposal. These are very preliminary estimates as testing activities are ongoing. It is possible that the estimated contaminated volume may be reduced significantly as the work progresses, however, for now the worst-case scenario has been assumed.

Table 1
Summary of Operations and Management Dredge Volumes by USACE Channel Reach

Federal Channel Segment	Estimated O&M Volume (cubic meters)	Expected Suitable for Ocean
Entrance Channel	40,580	Yes
Corona Del Mar Bend	2,150	Yes
Balboa Reach	79,370	Yes
Harbor Island Reach	74,570	Yes
Lido Isle Reach	157,500	Yes
Turning Basin	**63,740**	**No**
West Lido Area A	**51,710**	**No**
West Lido Area B	**38,020**	**No**
Newport Channel	**187,050**	**No**
Yacht Anchorage	**359,220**	**No**
Bay Island Anchorage	14,690	Yes
Upper Channel	37,050	Yes
North Anchorage Area	5,720	Yes
South Anchorage Area	9,800	Yes
Balboa Island Channel	40,520	Yes

In addition to the contaminated material from the federal O&M channel, there are several other areas of contaminated sediments in the Lower Newport Bay that also require some form of management. Not all of these areas are the responsibility of the City, but they are documented here as that they may be included as part of a larger bay-wide management plan. Table 2 summarizes the volumes and indicates responsibility for the material.

Table 2
Non-operations and Management Sources of Contaminated Sediments from Lower Newport Bay

Source	Estimated Volume of Contaminated Sediment (cubic meters)	Responsibility
Rhine Channel	100,584	City and Various Shoreline Tenants
Private/Commercial facilities	10,000+	Varies

1 Turning Basin	63,740 m^3	6 Harbor Island Reach	74,570 m^3	11 Balboa Reach	73,370 m^3
2 Lido Isle Reach	157,800 m^3	7 Upper Channel	37,050 m^3	12 South Anchorage	9,800 m^3
3 West Lido Area	89,730 m^3	8 Bay Island Anchorage	14,690 m^3	13 Corona Del Mar Bend	2,150 m^3
4 Newport Channel	36,400 m^3	9 Balboa Island Channel	40,520 m^3	14 Entrance Channel	40,580 m^3
5 Yacht Anchorage	359,220 m^3	10 North Anchorage	5,720 m^3		

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Figure 2

Estimated Operations and Management Dredge Volumes by USACE Channel Reach

Lower Newport Bay CAD Site Feasibility Study

3 OVERVIEW OF SEDIMENT MANAGEMENT OPTIONS

Contaminated sediment management options in southern California have been studied thoroughly and documented in two key regional documents: The Los Angeles Contaminated Sediments Task Force (CSTF) Long-Term Management Strategy (LTMS) and the Los Angeles Regional Dredged Material Management Plan (DMMP).

The CSTF study was the result of a 7-year collaboration by state and federal regulatory agencies, state and federal resource agencies, cities, counties, ports, consultants, and local environmental groups to develop management options that supported beneficial reuse (when possible) and avoided upland disposal options when larger community impacts are observed.

The DMMP project represents a 20-year plan formulated by the Los Angeles District of the USACE for managing clean and contaminated sediments from ports and harbors containing federally maintained navigation channels. Co-sponsors for the DMMP study included the Port of Los Angeles, City of Long Beach, and the Los Angeles County Department of Beaches and Harbors. Both the CSTF study and DMMP include a decision process for evaluating contaminated sediment management options and make recommendations for preference depending on site characteristics, material quality, and availability of existing or constructible disposal sites.

Using these two documents as a basis, and following their decision framework process, the following list of potential management options was selected for evaluation relative to Lower Newport Bay sediments:

- On-site sediment treatment facility
- Future port fill
- Upland landfill disposal
- Long Beach confined aquatic disposal (CAD) site
- Lower Newport Bay CAD site

Each option is described in more detail in the following sections, which is then followed by a comparison of alternatives and a recommendation for a path forward.

3.1 On-site Sediment Treatment Facility

The treatment of contaminated sediments typically consists of one or more physical and/or chemical processes aimed at removing or rendering inert the target chemicals of concern. Treatment system designs usually focus on classes of chemicals (e.g., metals and organics) or particle size fractions of the material. Some recent examples of dredged material treatment systems include cement-based stabilization and sand separation.

Cement-based stabilization is a process where additives (e.g., cement, lime, or kiln dust) are mixed into the contaminated dredged material after it has been removed from the water and placed into a mixing barge or on-shore containment area. The water in the sediment reacts with the additives to form tight bonds, which keep the chemicals from leaching out. As a secondary benefit, the material is rapidly dewatered by the addition of cement additives and can be used as a compactable fill source for construction projects. The treatment process operates in batches of 500 to 1,000 meters at a time and takes approximately 12 hours for the initial mixing phases to be completed, which includes debris removal. After mixing, the material must be placed in a lay down area and tilled to ensure complete curing. The entire process typically requires 24 to 36 hours from start to finish. Additive concentrations can be adjusted to achieve different outputs of material. Lower percentages (1 to 2 percent) typically result in a dry, crumbly material when completed, and higher concentrations (4 to 5 percent) result in a compactable solid that resembles concrete.

The Los Angeles District of the USACE sponsored a series of laboratory and field pilot studies to test the feasibility of cement-based stabilization using regional dredged material as part of the CSTF strategy development process. A range of sediments was tested including sandy material from Marina del Rey, fine-grained sediments from along berths at the Port of Los Angeles, and extremely contaminated, fine-grained material from the Consolidated Slip area of the Port of Los Angeles. The results of those studies (summarized in Appendix B) showed that the process can be effective in immobilizing the contaminants and, assuming sufficient upland processing and storage space was available for the equipment, could feasibly be constructed in the region. The major disadvantage of this option is that it requires the City to have not only a recipient for the treated material but the regulatory approval for its use in some beneficial manner. This issue has not yet been addressed in the region and attempting to address this issue at a new site (such as Lower Newport Bay) would require some extensive testing and consultation with the local regulatory agencies. With the USACE pilot study, the costs for cement-based stabilization was approximately $45 per cubic meter, excluding the final handling and placement costs for reuse and acquisition cost for property required near the dredge site for setting up the treatment system.

Sand separation is a process where the relatively clean sand fraction is mechanically separated from the fine-grained and relatively contaminated material to produce two products: beach suitable sand and contaminated fines for landfill disposal. Separation typically occurs when using hydrocyclones, shaker screens, or a combination of the two can be used to treat a sediment stream resulting from clamshell or hydraulic dredging operations. Like the cement-based stabilization process, the Los Angeles District of the USACE has been conducting pilot studies in the region to evaluate the effectiveness and feasibility of the treatment process for large-scale use. A small pilot study was conducted several years ago in Long Beach in order to demonstrate the effectiveness of the process. This project was then followed by a much larger project that was just completed in Marina del Rey, California (March 2009).

The results of the earlier study (presented in Appendix C) show that the approach can indeed be effective at removing contaminants. The Marina del Rey maintenance dredging and sand separation project, however, showed that these results are difficult to achieve consistently under large-scale (more than 500 cubic meters per day) production rates. Therefore, using a system of this type with the volumes present here could result in extremely long construction timeframes.

Site requirements for setting up the treatment system are quite extensive and include facilities for either pumping the material or mechanically offloading it to the separation system; equipment needed for separating the clean sand and filtering the water from the contaminated fines; space for a wastewater treatment system to process all the discharge water; and storage space to stockpile the sand and fines prior to transport and disposal/reuse.

The costs for sand separation are variable and have ranged from approximately $30 to $200 per cubic meter, including both dredging and processing. Costs for acquiring the land to house the treatment facility and for transporting and placing the final product would be additional. The biggest disadvantage of this approach is that it still requires landfill disposal of all fine-grained material, which for much of Lower Newport Bay could be as high as 50 percent of the total volume. A summary of the pros and cons for each of these on-site treatment approaches is presented below.

Treatment Alternative	Pros	Cons
Cement-based Stabilization	• Cost effective • Can treat metals and organics • Agency approved treatment process • Removes material from the water	• Lack of recipients for treated material • Unclear Agency support for material reuse • Requires upland treatment site • Requires multiple rehandling • Adjacent land impacts likely to be significant • Slow process (approximately 1,000 yards per day)
Sand Separation	• Actual treatment process is cost effective • Can remove metals and organics • Removes material from the water • Creates beneficial product	• Process not yet refined • Unclear Agency support for material reuse • Still requires upland disposal of fine grained material • Requires adjacent land for treatment system • Slow

3.2 Future Port Fill

Another potential option for disposal of contaminated dredged material from the Lower Newport Bay would be to contribute the sediment to a current or future fill project within the Port of Los Angeles or Port of Long Beach. This option would require mechanically dredging the sediments using a clamshell dredge and placing the material into a hopper barge for transport to the fill site via tugboat. Once at the disposal site, the material would then be either placed in the fill by towing the barge inside the disposal area and opening it to drop the sediment or, in the case of an enclosed disposal area with a barrier dike, by rehandling the material over the top of the dike using a derrick barge and clamshell or hydraulic unloader.

From a constructability standpoint, this form of sediment management is relatively straightforward in terms of implementation and requires standard construction equipment.

For potential outside users of these fills (e.g., potentially the City), agency permitting can also be very straightforward, provided that the recipient port fill project has already been separately and successfully authorized. The material serves a beneficial use by lessening or eliminating the need for the ports to harvest fill material from the adjacent harbor bottom, and the contaminants are completely isolated inside the fill material such that the potential for release is very minor. Disposing of contaminated sediments inside a port fill is also very cost effective, with typical projects costing approximately $10 to $15 per meter for transport and disposal (depending on the distance traveled to the fill site).

The major disadvantage of using a port fill site as a management tool for contaminated sediment disposal is that these fill sites are becoming increasingly rare opportunities, and when these sites do arise, they are only able to receive sediment for a relatively short amount of time. Recently, port fill projects have been subject to highly contentious and unpredictable authorization processes and have been the subject of complex and lengthy lawsuits related to future operations at the affected facilities. It typically takes a port authority between 5 and 10 years (when including authorizations) from conceptual development to the start of construction for a fill site. This process is further complicated by the fact that many fill sites are actually part of much larger terminal development projects with numerous smaller components that are all dependant on each other. A delay in any one of the pieces causes a domino effect that can delay the overall project schedule. As such, successfully lining up the timing of an available fill site with the planned dredging effort proposed for disposal in the fill site is usually the most difficult challenge. With the down turn in the economy and increased environmental scrutiny, the creation of new fill sites has become more and more rare, and thus the need has far outweighed the available capacity.

Currently, the Port of Long Beach is in the final stages of designing a large fill site at Pier G for construction in early 2010, but this fill site is already at capacity. Another fill site is planned for the next 2 to 4 years (i.e., Middle Harbor), but permitting is not yet completed, and it is unclear if any need or capacity for “outside” fill sources exists. Typically, when ports do allow external material for disposal inside one of their fill sites, the volume of material accepted is less than 100,000 cubic meters, which is far less than what is expected for the City’s needs in the Lower Newport Bay.

The following summarizes the pros and cons associated with selecting port fill sites as a management option for Lower Newport Bay contaminated sediments.

Management Alternative	Pros	Cons
Future Port Fill	• Cost effective • Agency approved management approach • Removes material from the water	• Limited duration of availability; highly schedule dependent • Uncertain schedule for permits and authorizations • May not be able to accept all material requiring disposal • Liability transfer agreement with Port will be required • Does not provide a guaranteed solution for the City

3.3 Upland Landfill Disposal

Upland landfill disposal has been used for relatively small quantities (fewer than 10,000 meters) of contaminated dredged material within the region, but never for a project as large as the current estimates for Lower Newport Bay. Officially, this approach is not supported by the Water Resources Control Board (RWQCB) because of concerns related to salinity in the sediments affecting underlying groundwater reserves. As a result, marine dredging projects utilizing upland landfills are typically required to use private landfills, which is costly.

In terms of implementation, sediments are mechanically dredged using a clamshell bucket and placed into a hopper barge for storage. Once full, the barge would be relocated to an offloading area where the sediments would be removed using a shore-based excavator or an excavator mounted on a derrick barge and placed into a dewatering area to remove most of the moisture prior to transport to a landfill. Once sufficiently dry (i.e., able to pass the "paint filter" test), the material can be loaded into haul trucks and transported to a suitable landfill for disposal or reuse as daily cover material. The costs for landfill disposal can be quite high depending on the location of the landfill. Typical costs range between $100 and $250 per meter.

In addition to the very high disposal costs, adjacent land impacts associated with the dewatering facility and truck trips through local roads would likely be significant. For example, a project requiring the disposal of 500,000 cubic meters of sediment would require approximately 30,000 one-way truck trips to haul all the material to a landfill. A typical dredge project may remove up to 3,000 cubic meters per day, which would take 250 one-way truck trips to dispose, each day. This calculation means that there would be 500 daily truck trips on the local roads when assuming each truck has to return to the site empty for the next load.

The following summarizes the pros and cons associated with selecting upland landfill disposal as a management option for Lower Newport Bay contaminated sediments.

Management Alternative	Pros	Cons
Upland Landfill Disposal	• Removes material from the water • No schedule constraints	• Very expensive • Not supported by agencies • Local landfills will not accept the material • Significant adjacent land and community impacts including air and traffic

3.4 Long Beach CAD Site

CAD is a process where the contaminated sediments are placed inside either an existing submerged depression or a newly excavated cell for the purpose of physical isolation from the surrounding environment. Once inside the cell, the material is capped with clean sand to act as a barrier between the contaminants and the overlying water column and benthic organisms. This management approach is relatively new to the West Coast, but has been used for decades in the Northeast and in Europe.

The construction process for disposal of Lower Newport Bay sediments within the Long Beach CAD cell would be nearly identical to port fill site disposal in that the material is mechanically dredged and barged to the CAD site where it would be bottom dropped into the disposal cell. Clean sand would then need to be harvested and placed in the cell on top of the contaminated material using the same process. The costs for implementing this process for the Long Beach pilot study was $45 per meter. A pilot study was conducted to prove the technology regionally in Long Beach in 2001 by the USACE Los Angeles District in support of the CSTF and DMMP long-term sediment management documents. The Long Beach CAD pilot study was conducted by dredging 100,000 cubic meters of contaminated sediment from the Los Angeles River Estuary (LARE) and placing it into an existing cell in the inner harbor called the North Energy Island Borrow Pit (NEIBP). Clean sand was harvested from an adjacent pit to be used as the cap material. A long-term monitoring program has been conducted annually since the project was constructed, and the results show that the material remains isolated beneath the cap with no chemical migration detected.

The primary downside to selecting this management option is that the NEIBP is not currently permitted for additional disposal events and the City of Long Beach is not actively promoting its use. The disposal site is located in the Long Beach Inner Harbor on land that the City of Long Beach manages through a Tidelands Trust Agreement with the California State Lands Commission. The City of Long Beach has been considering applying for a multi-user permit for the site, which would allow disposal of material from multiple sources, but no steps have been taken toward this action thus far and thus its viability is uncertain. If steps were taken, however, this option would be very advantageous, owing to its cost effectiveness and environmental protectiveness.

The following summarizes the pros and cons associated with selecting the Long Beach CAD site as a management option for Lower Newport Bay contaminated sediments.

Management Alternative	Pros	Cons
Long Beach CAD Site	• Cost effective compared to upland disposal • Can accept all material • Could possibly tie to another project for cap material	• Not yet permitted by the City of Long Beach • Approximately 20 mile round trip for each disposal event • Not supported by Los Angeles County environmental activist groups

3.5 Lower Newport Bay CAD Site

Constructing a project-specific CAD site in Lower Newport Bay is another possible option for on-site management of contaminated sediments. This option would require the excavating a disposal cell within the Lower Newport Bay, mechanically dredging contaminated sediment from around the bay, and placing the material inside the cell. Once completed, the cell would be capped with clean, sandy dredged material to isolate the sediment from the overlying water. Reusing clean dredged material from the bay would eliminate the costs for harvesting cap material and would also provide an in-bay beneficial use for the clean sands. Most of the material excavated from the cell could be pumped to the beach or barged and dropped in the nearshore zone and used as nourishment material.

A recent example of this option is currently in construction in Port Hueneme, California, where the USACE, U.S. Navy, and Oxnard Harbor District (OHD) are jointly implementing a maintenance dredging project that includes excavating a CAD cell and placing approximately 260,000 cubic meters of contaminated sediment within the cell. A thick sand cap and rock layer will be added at the end to isolate the material from the overlying water column and to protect the material from vessel scour (the CAD is located in the center of the turning basin in an active shipping harbor). The per unit cost for this project is approximately $50 to $60 per cubic meter, which includes the costs for engineering design, permitting, and construction.

The major downside to selecting this approach is that it will require a detailed entitlement process and a large construction effort in the Lower Newport Bay, which will be visible to the local community for about a year while construction is underway. The following summarizes the pros and cons associated with selecting the Lower Newport Bay CAD site disposal as a management option for Lower Newport Bay contaminated sediments.

Management Alternative	Pros	Cons
Lower Newport Bay CAD Site	• Cost effective compared to upland disposal • Can accept all material at once • City controls schedule and process • Use Port Hueneme as example for permitting and design • Cell excavation could provide material for beach nourishment	• Local community will be impacted in terms of aesthetics and disruptions to navigation • Temporary displacement of some boaters • Environmental groups might be opposed to disposing of contaminated sediments in the bay

4 REVIEW AND COMPARISON OF ALTERNATIVES

The previous section reviewed the available management alternatives for contaminated sediments from the Lower Newport Bay and presents some generic pros and cons with each approach. This section provides a more in-depth comparison of the alternatives and presents a recommended approach for moving forward.

The criteria selected for this evaluation includes cost, feasibility, permitability, and environmental impacts. Cost is simple to define; it is the estimated per unit (cubic meter) cost for implementing the approach. Feasibility refers to the anticipated difficulty in designing and constructing the project. Permitability is the ease or difficulty expected in obtaining the necessary permits to implement the project.

4.1 Cost

From a cost perspective, a port fill site will always be the lowest cost solution for the City because it requires the least amount of construction. The dredged material is only handled once, and disposal occurs very quickly. Similarly, the second least expensive option is disposing of the material in the Long Beach CAD site. Although the sediment transport distance would likely be similar, construction costs for Long Beach CAD site alternative are slightly higher than those for the port fill, because cap material would need to be excavated to place over the material in the cell, and the City, in theory, would bear some of this cost. This additional cost could hypothetically be avoided if the project were conducted in parallel with a clean maintenance dredging project (e.g., dredging portions of the LARE), which could provide the clean capping material for the CAD cell. If this parallelism were to occur, both the Long Beach CAD and the port fill alternatives would have similar construction costs.

Costs for landfill disposal or sediment treatment would be significantly higher than those for the options described above. Construction of a CAD cell in the Lower Newport Bay would entail higher costs than the Port fill or Long Beach CAD site alternatives, but significantly less than landfill or treatment.

4.2 Feasibility

All of the management alternatives presented in this document are technically feasible from a construction standpoint and have recent examples of their success in the region. From an engineering design standpoint and in terms of City efforts, a port fill disposal effort would be the simplest to design as it would take advantage of the fact that a disposal site has been designed by others. In terms of complexity, the next desirable option would be the Long Beach CAD site, as it is essentially similar to the port fill with the addition of a sand cap layer. Constructing a CAD cell in the Lower Newport Bay is more complex, since the City of Newport Beach would be responsible for designing and constructing the cell. However, this approach benefits from the fact that the Port Hueneme CAD Site provides an actual, recent example for agencies and contractors.

The most challenging of the alternatives would be those that require an upland processing area component (i.e., cement-based stabilization, sand separation, and upland landfill disposal). Implementing one of these projects would require that land adjoining the Lower Newport Bay be obtained and prepped, if needed, for construction activities, significant volumes of stockpiled sediment, and equipment for sediment processing and/or dewatering. Similar projects have required between 1 to 2 acres of land for this work. Each of these alternatives would require site preparation activities, such as containment cells for dewatering (landfill), mixing (cement-based stabilization), or installing asphalt and a wastewater treatment system for hydrocyclones (sand separation). The upland design challenges combined with the dredge and transport requirements for the project, in general, make these latter three alternatives the least feasible.

4.3 Permitability

From the City's perspective, the simplest contaminated sediment dredging and disposal project to permit is one where the material is isolated inside a permitted port fill, because the most difficult aspect of the project is the port obtaining authorization for its fill, which would already be complete. However, the difficulty with this option is that these authorizations are highly contentious and have frequently resulted in litigation. Once a port fill site is permitted for construction, the only construction elements that require evaluation and approval for the City are the dredging, transport, and placement within the fill, if space exists and allowed by the port.

Permitting a disposal event for the Long Beach CAD site will be difficult to achieve without the City of Long Beach's support and participation, since they are responsible for managing the submerged lands containing the NEIBP through their Tidelands Trust Agreement with the state. At the current time, the City of Long Beach does not intend to permit the NEIBP for use by outside entities as a regional disposal facility, and no permits or authorizations to do so exist.

Permitting the construction of a CAD site within the City requires environmental review under both state (California Environmental Quality Act [CEQA]) and federal (National Environmental Policy Act [NEPA]) guidelines. The City would act as the lead CEQA agency, and the USACE would act as the lead NEPA agency. Based on expected construction methodology; knowledge of sediment contamination in the bay;, and extensive experience with CAD development, excavation of a CAD cell, placement of clean excavated sands on City beaches, and placement and capping of contaminated sediments within the CAD cell is not expected to produce any significant environmental impacts. It is worth stating that the landfill disposal alternative would entail potentially significant impacts to air and traffic due to the vast number of truck trips (more than 50,000) involved. While no significant impacts are foreseen with in-water CAD construction, and therefore a Mitigated Negative Declaration (MND) is available as a CEQA document, the City may choose to pursue an Environmental Impact Report (EIR) to more fully and thoroughly analyze alternatives to the CAD site. The USACE is expected to prepare an Environmental Assessment (EA) and associated Finding of No Significant Impact (FONSI) under NEPA.

The aforementioned construction activities are also subject to permits issued under Section 10 of the Rivers and Harbors Act (RHA), Sections 404 and 401 of the Clean Water Act (CWA), and the California Coastal Act. The USACE would be the lead agency for RHA and CWA Section 404 permits as well as associated consultations for Endangered Species Act (ESA) and Essential Fish Habitat (EFH) issues, including eelgrass. The California Coastal Commission (CCC) would be the lead California Coastal Act agency, and may choose to treat the project as either a City or USACE O&M consistency situation. The Santa Ana Regional RWQCB would be the lead agency for CWA Section 401 as well Waste Discharge Requirements (WDRs). All of the above mentioned agencies, including other consulting agencies such as the U.S. Environmental Protection Agency (USEPA), have experience with review and approval of CAD site development using essentially the same methodology proposed here.

The above agencies understand the environmental and logistical benefits of the CAD site approach, including beach nourishment, cost-effective solutions to contaminated sediments, and avoidance of significant air and traffic impacts associated with landfill disposal. Given that off-site options (other CAD sites or landfills) are not available (e.g., no port fill with capacity), the costs and impacts of landfill, and the proven benefits of CAD development, the proposed development of a CAD site in the Lower Newport Bay can be easily shown as the preferred environmental option.

Permitting the treatment alternatives will be challenging, as there are limited local examples of similar projects to rely on for information. Pilot studies have been conducted for each option and thus the engineering aspect has been addressed, but the regulatory issues have not been fully addressed. While the regulatory agencies favor treatment and reuse of contaminated dredged material, they have not all agreed on what level of treatment is suitable for various reuse alternatives. For example, the Marina del Rey maintenance dredging and sand separation project sponsored by the USACE was recently halted prematurely because the agencies could not all agree on what defined beach suitability for the treated sands.

The air quality, transportation, and community impacts of a landfill disposal process for contaminated sediments in the bay would be severe. The RWQCB would likely not issue a WDR for the landfill to handle the material at public landfills, and furthermore, most landfills in Orange County do not have the capacity to receive this much material. Thus, the only option for upland landfill disposal would be to transport the material to a private hazardous waste facility located outside the county, which would be of great expense and expand the transportation-related impacts over a larger area.

4.4 Environmental Impacts

The potential environmental impacts associated with the various alternatives are quite variable. All of the alternatives entail potential impacts in the Lower Newport Bay due to large scale dredging. These impacts include potential effects on water quality and sensitive ecological communities. The alternatives differ relative to impact in terms of disposal site.

With respect to the transport and disposal of City sediments, port fill or Long Beach CAD site disposal have the least impact from the City's point of view, as in both cases the fill site is separately approved and authorized.

Landfill disposal actually involves potentially significant environmental impacts to the City and surrounding communities as it relates to air and traffic impacts. New CEQA guidelines require an assessment of greenhouse gas emissions as part of any project. The amount of toxic air contaminant and greenhouse gas emissions related to thousands of truck trips for landfill disposal is significant and lends serious weight to a CAD alternative.

Construction of a CAD site in the Lower Newport Bay will have increased temporary dredging effects due to excavation of the CAD cell but has no long-term impact. The CAD site construction completely isolates chemical contaminants from the environment. The CAD site option also results in a significant beneficial beach nourishment option. Regardless of the selected disposal option, dredging of sediments in the bay may have the potential to impact eelgrass. The CAD solution may provide a habitat benefit in that the surface of the CAD site can be planted with eelgrass, thereby providing a large square footage of new eelgrass habitat.

4.5 Summary

Because of the very large potential volume of contaminated sediments within the Lower Newport Bay (more than 500,000 cubic meters), management options are limited. Disposing of dredged material within a construction fill at the Port of Los Angeles or Port of Long Beach is by far the least expensive, environmentally protective option, but the likelihood that a port fill would be available is quite low. In the last 5 years, port fill sites have been a rare occurrence due to the extreme environmental regulations associated with terminal expansion projects. As a result, when these projects do occur, space is limited and priority is given to internal port sediment projects.

Sediment treatment projects are rare mostly because they do not provide a complete solution to the problem. These types of projects require an end use for the treated product that is usually difficult to find. The regulatory agencies do not have policies in place to regulate the treated material, which affects the lack of recipients for the material; the technology is specialized, which means that there are limited vendors; they typically cost more than other alternatives, daily production is slow which means the projects take a long time to complete; and they require large parcels of land adjacent to the dredge areas for processing the material. For these reasons, the use of one or more sediment treatment processes is not recommended for Lower Newport Bay sediments.

Upland landfill disposal is not a feasible option for large quantities of dredged material unless it is delivered to a private facility permitted to handle such material. Landfills located in Orange and Los Angeles counties do not have the capacity for the material locally, and the RWQCB does not currently allow such disposal at county landfills. The costs for private landfill disposal could be more than $100 per meter and the project would require tens of thousands of truck trips to complete causing significant air, noise, and community impacts. As such, this option is also not recommended for Lower Newport Bay sediments.

Given the quantities of sediments involved, CAD site disposal is perhaps the only feasible option for the Lower Newport Bay. This process has been conducted within the region twice in the past 7 years. The most recent occurrence (Port Hueneme) is in active construction at the time this report is being prepared and is proceeding smoothly. CAD site placement is a preferred option of the USACE and has proved to be a cost-effective and environmentally protective solution for managing contaminated sediments. A CAD site allows the City to manage the issue within the confines of the Lower Newport Bay and not rely on outside sources with variable schedules to affect its progress. The state and federal regulatory agencies completed the approval process for the Port of Hueneme maintenance dredging and CAD site construction project within 6 months, and the agencies are comfortable with the regulatory issues and how to mitigate for potential problems. The only real downside to the selection of CAD for managing Lower Newport Bay sediments is that it will cause some disruptions within the bay and some vessels will need to be temporarily relocated during construction.

A CAD cell was constructed in Long Beach in 2001, but it has not been used since. The City of Long Beach currently has no plans to permit the site as such. The Long Beach CAD cell has the capacity for more than 5 million cubic meters of sediments, and if the City of Long Beach ever decided to proceed with permitting its use, this would present an attractive option for Lower Newport Bay material. Table 3 summarizes the pros and cons of each management alternative. A ranking system was not employed for this process because the assignments would be too subjective to provide useful information. The process of selecting the best alternative is actually quite simple when you consider that only one option (i.e., CAD site) is actually feasible for construction. The following sections of this document detail the steps required to construct a CAD cell in Lower Newport Bay.

Table 3
Summary of Pros and Cons for Each Management Alternative

Management Alternative	Pros	Cons
Cement-based Stabilization	• Cost effective • Can treat metals and organics • Agency approved treatment process • Removes material from the water	• Lack of recipients for treated material • Unclear agency support for material reuse • Requires upland treatment site • Requires multiple rehandling • Adjacent land impacts likely to be significant • Slow process (approximately 1,000 yards per day)
Sand Separation	• Actual treatment process is cost effective • Can remove metals and organics • Removes material from the water • Creates beneficial product	• Process not yet refined • Unclear Agency support for material reuse • Still requires upland disposal of fine grained material • Requires adjacent land for treatment system
Port Fill	• Cost effective • Agency approved management approach • Removes material from the water	• Limited duration of availability; highly schedule dependent • Uncertain schedule for permits and authorizations • May not be able to accept all material requiring disposal • Liability transfer agreement with port will be required • Does not provide a guaranteed solution for the City

Table 3
Summary of Pros and Cons for Each Management Alternative

Management Alternative	Pros	Cons
Upland Landfill Disposal	• Removes material from the water • No schedule constraints	• Very expensive • Not supported by agencies • Local landfills will not accept the material • Significant adjacent land and community impacts including air and traffic
Long Beach CAD Site	• Cost effective compared to upland disposal • Can accept all material • Could possibly tie to another project for cap material	• Not yet permitted by the City • Approximately 20 mile round trip for each disposal event • Not supported by Los Angeles County environmental activist groups
Lower Newport Bay CAD Site	• Cost effective compared to upland disposal • Can accept all material at once • City controls schedule and process • Use Port Hueneme as example for permitting and design • Cell excavation could provide material for beach nourishment	• Local community will be impacted in terms of aesthetics and disruptions to navigation • Temporary displacement of some boaters • Environmental groups might be opposed to disposing of contaminated sediments in the bay

5 PROPOSED PATH FORWARD

Considering the evaluation of available alternatives presented in the previous section, constructing a project-specific CAD cell within the Lower Newport Bay appears to be the best alternative for managing the City's contaminated sediment challenges. The CAD appears to be the most cost-effective solution, as it:

- Minimizes environmental impacts
- Is within the control of the City (not dependent on outside entitlements/schedules)
- Is a complete solution that is technically proven
- Provides beneficial reuse of dredged material for nourishment of City beaches
- Is cost effective in comparison to expensive treatment solutions or landfill

Using the Port of Hueneme maintenance dredging and CAD site construction project as a guide, the proposed path forward would include excavating a CAD cell (of sufficient size) in the bay to handle all the contaminated sediments. The nature of the material to be excavated from the CAD cell would first need to be verified through a field sampling program. If it is beach suitable sand, it could be hydraulically pumped or barged and dropped in the nearshore zone of the groin field on the northwest portion of Newport Beach, where erosion is a constant problem. Once the cell is excavated, contaminated sediment dredging could commence with one or more mechanical clamshell dredges. The contaminated material would be placed into the cell and then would capped using clean maintenance material from within the bay. The City could then use the surface of the cap as a possible enhanced habitat area by planting eelgrass and incorporating it into the bay-wide master plan for eelgrass protection.

Considering the potential volume of material that would need to be placed in the CAD cell (approximately 800,000 cubic meters), there are only three potential locations within Lower Newport Bay where it could be constructed: West Lido Area A, Yacht Anchorage, or the South Anchorage area (Figure 3). In practice, however, the Yacht Anchorage appears to be poorly suited for CAD site excavation, since it receives a relatively high sedimentation rate, receives heavy vessel traffic, and has known existing surface sediment contamination. Therefore, only the West Lido Area A and North Anchorage areas were considered feasible for construction of the CAD cell. These two areas each present unique opportunities and constraints.

The West Lido Area A is closer to most of the contaminated sediments and proposed beach nourishment area assuming that a hydraulic pipeline is used, which will facilitate the processes of transporting excavated material to the nearby groin field beach and contaminated sediments into the CAD cell. This location has the disadvantage, however, of an estimated 2- to 3-foot-thick veneer of contaminated sediments that is known to be present across the presumed footprint of the CAD. This could be managed by utilizing a dual-cell CAD concept, wherein an initial CAD cell (CAD-A) is created to hold the veneer sediments, and a second CAD cell (CAD-B) receives the remainder of the bay sediments. Estimated layouts and dimensions of this dual-cell CAD approach are shown in plan view on Figure 4 and in cross section on Figure 5. The dimensions shown would be suitable for holding up to 800,000 cubic meters of sediment. Specifically, this process would involve the following sequence of steps:

- Remove the 2- to 3-foot-thick contaminated sediment veneer from the footprint of CAD-A (estimated to be approximately 20,000 cubic meters). The removed material would be temporarily placed within the footprint of CAD-B.
- Complete the excavation of CAD-A to the required extents and an estimated depth of -9.8 meters, using hydraulic dredging equipment with the excavated sand pumped to the nearby beach groin field or loaded onto a barge and dropped in the nearshore zone. This is expected to generate approximately 100,000 cubic meters of material for the beach.
- Using mechanical dredging equipment and a bottom-dump barge, place the contaminated sediment veneer material from the surface of CAD-B, into the excavated CAD-A. This material includes both the 20,000 cubic meters of relocated material from the footprint of CAD-A, plus another 65,000 cubic meters of contaminated veneer that is present within the surface footprint of CAD-B. Altogether, given the dimensions of CAD-A depicted on Figures 4 and 5, the anticipated volume capacity for contaminated surface sediments in CAD-A is approximately 86,500 cubic meters, sufficient to hold the contaminated veneer material removed in the previous step.
- Excavate the cell for CAD-B to an estimated depth of -17.7 meters, producing approximately 750,000 cubic metes of material. Some of this excavated material can be used to create a 1.5-meter-thick cap on CAD-A while the remainder can be sent to the nearby beach groin field.
- Place the remainder of the contaminated sediments from Newport Harbor within CAD-B. Altogether, given the dimensions of CAD-B depicted on Figures 4 and 5, the anticipated volume capacity for contaminated surface sediments in CAD-B is

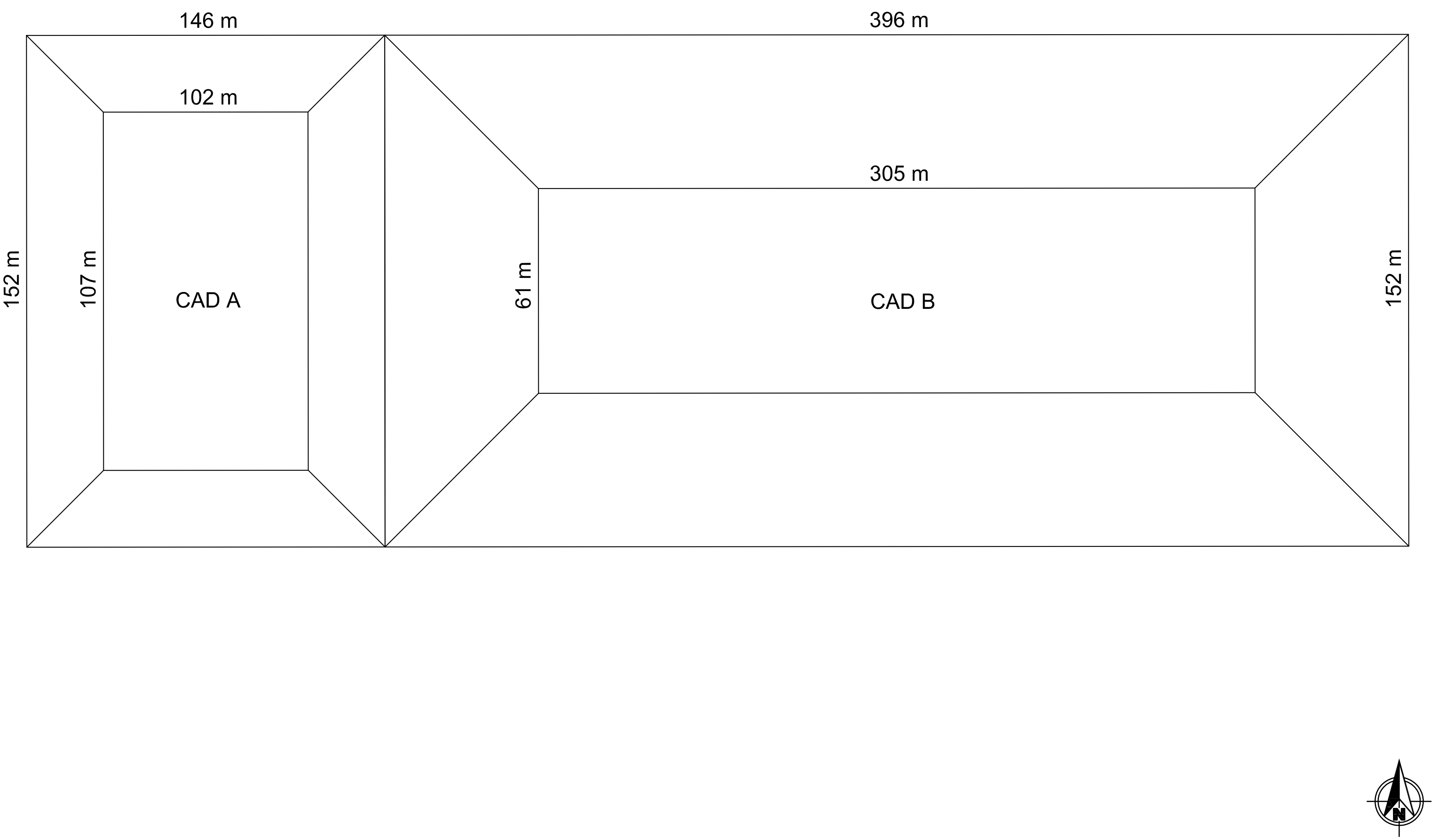
approximately 720,000 cubic meters.

- Cap CAD-B using clean maintenance sediments dredged from elsewhere in the bay. It is estimated that CAD-B will require approximately 108,000 cubic meters of material to create a 1.5-meter-thick cap.

Apr 03, 2009 2:05pm ghowell K:\Jobs\090243-newport cad\090243-01-RP-02.dwg FIG-3

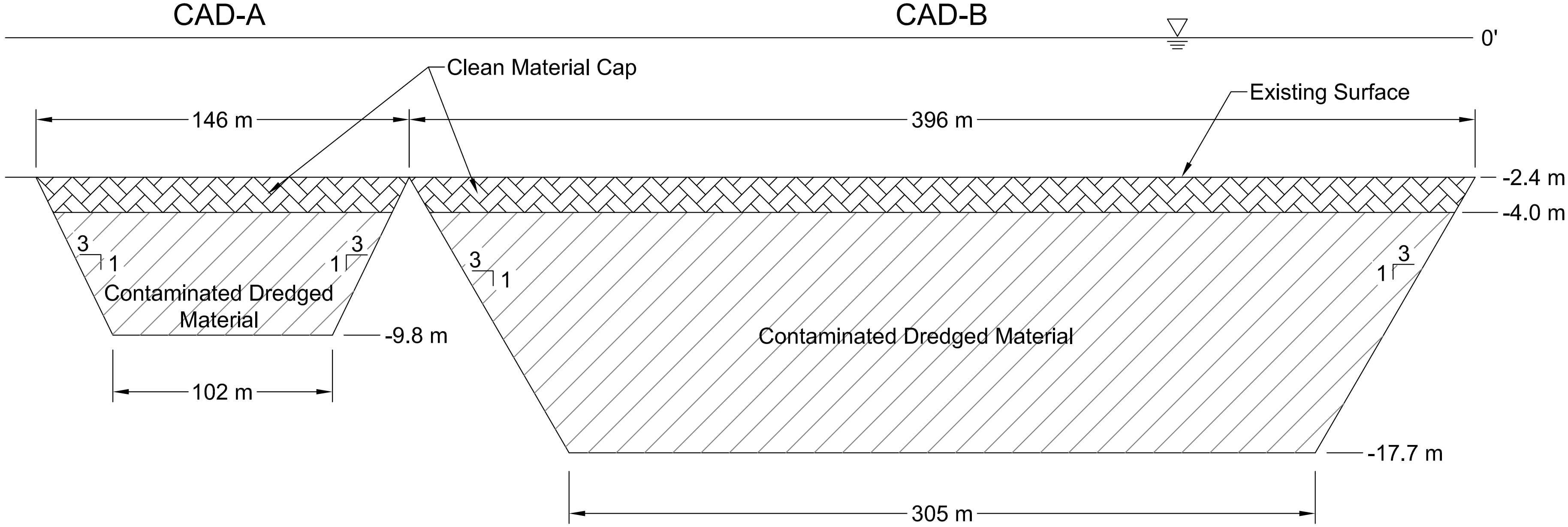
ANCHOR QEA

Figure 3
Example CAD Cell Locations
Lower Newport Bay CAD Site Feasibility Study



ANCHOR QEA

Figure 4
Estimated Geometry of CAD (Plan View)
Lower Newport Bay CAD Site Feasibility Study



Apr 08, 2009 2:33pm heriksen K:\Jobs\090243-newport cad\09024301-RP-03-METER.dwg FIG-5

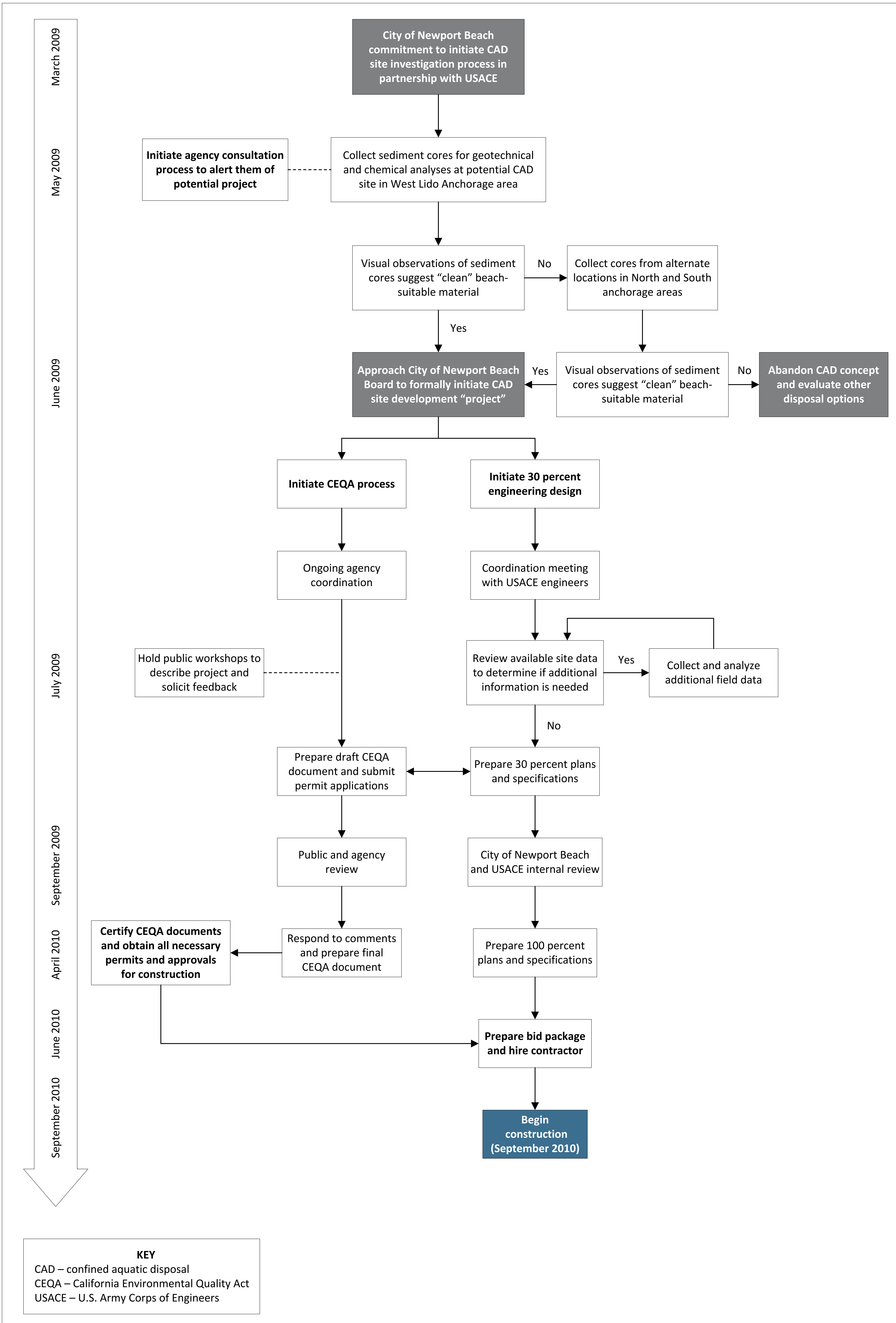
ANCHOR QEA

Figure 5
Estimated Geometry of CAD (Cross-sectional View)
Lower Newport Bay CAD Site Feasibility Study

An alternative CAD location, the South Anchorage area, does not contain any existing surface contamination; therefore, this option avoids the need for a dual-cell CAD construction process. However, this location is further from the target beach nourishment area if hydraulic dredging is used, thus requiring a significantly longer pumping distance.[1] This location is also in a portion of the bay that has much higher vessel congestion and is adjacent to the most dense eelgrass beds in the bay, which could be impacted during CAD construction, adding mitigation requirements to the project.

Figure 6 presents the decision process for navigating through the various regulatory and engineering steps required to get the project ready for construction. The first step in the process is to verify the suitability of subsurface sediments for placement on the beach as nourishment material. Once that step is complete, the City would need to formally initiate a project, which starts the CEQA and preliminary design process. The permitting and design tasks would be completed in tandem, working in parallel and using field and laboratory data from the target construction site. For example, elements of the design plans would be used in completing the permit application package, feedback from the agency consultation process would feed into the design, final permit conditions would be added to the engineering specifications.

[1] The South Anchorage Area would be closer to the target nourishment area if the material is mechanically dredged and barged to the nearshore zone along the beach.



ANCHOR QEA

Figure 6
CAD Site Development Decision Process

APPENDIX A
LOWER NEWPORT BAY – AVAILABLE QUANTITIES AND SUMMARY OF EXISTING DATA

(PREPARED BY NEWFIELDS NORTHWEST)

Lower Newport Bay – Available Quantities and Summary of Existing Data

The following summary of data is based on area definitions and estimated quantities provided by Joe Ryan at SPL-ED-DC on January 14, 2009. Data regarding sediment chemistry, toxicity, and bioaccumulation potential is based on dredged material evaluations supporting the Regional General Permit 54 (RGP-54; Weston Solutions 2005) and the proposed dredging of the Lower Newport Bay Federal Channels (Weston Solutions 2006). Sediment investigations were conducted on sediment cores collected to design/as built depth plus 1 ft. overdredge (for the RGP-54) and 2 ft. overdredge for the Federal Channels project. Chemical evaluations included sediment conventionals (particularly grain size and TOC), metals, organotins, petroleum aromatic hydrocarbons, chlorinated pesticides, and plychloronated biphenyls (PCBs). Toxicity testing included two benthic tests (amphipod and mysid/polychaete) and three water-column tests (mysid shrimp, fish, larval bivalve). Bioaccumulation potential was evaluation for the RGP-54 program and included two species (clam and polychaete) evaluated for mercury, organotins, and chlorinated pesticides.

It is important to note that the dredge areas defined by Joe Ryan do not necessarily have the same footprint as the composited areas defined in each of the sediment evaluations. This is due to the different project objectives. Existing data from the previous studies was compiled to provide an indication of sediment quality for the proposed volumes. Estimated quantities include a 0.3 m overdredge. Chemistry data is presented only for those analytes of note (that either exceed ERM values or have been a concern in the area).

Area 1: Entrance Channel
Volume: 40,580 m^3
Project Depth: 6.1 m

This area has not been part of the 2005 and 2006 dredged material evaluations.

Area 2: Corona del Mar Bend
Volume: 2,150 m^3
Project Depth: 6.1 m

This area has not been part of the 2005 and 2006 dredged material evaluations.

Area 3: Balboa Reach
Volume: 79,370 m^3
Project Depth: 6.1 m

Synopsis: Three stations were sampled in this reach and were evaluated as an individual composite (Area 1b in Weston Solutions 2006). Grain size was 79% silt and clay, with 0.83% TOC. Mercury (0.21 mg/kg) and 4,4-DDE (46 µg/kg) were the only analytes of note. All bioassay responses met the LPC criteria, with the exception of the amphipod test with *Eohaustorius estuarius*. This area is expected to pass for ocean disposal following the amphipod study.

Federal Channel Area 1	
Grain size (%)	79% silt & clay
Total organic carbon (%)	0.83
Mercury (mg/kg)	0.21
4,4'DDD (µg/kg)	10
4,4'DDE (µg/kg)	**46**
4,4'DDT (µg/kg)	4.4
Total Detected DDT (µg/kg)	**60.4**
Eohaustorius estuarius survival (%)	**51%** (LA-3: 82%)

Area 4: Harbor Island Reach
Volume: 74,570 m^3
Project Depth: 6.1 m

Synopsis: This area was represented by five stations in two composites (Areas 3b and 2c in Weston Solutions 2006). Sediment grain size was 51% and 44% sand, with TOC of approximately 0.75%. Mercury concentrations were below the ERL. 4,4'-DDE was above the ERM. Bioassay responses met the LPC criteria. This area is expected to pass for ocean disposal following bioaccumulation tests.

Federal Channel Areas 3b and 2c		
Parameter	**Area 3b**	**Area 2c**
Grain size (%)	51% sand; 25% clay	44% sand; 29% clay
Total organic carbon (%)	0.75	0.72
Mercury (mg/kg)	0.15	0.20
4,4'DDD (µg/kg)	5.1	19
4,4'DDE (µg/kg)	**37**	**38**
4,4'DDT (µg/kg)	4.7	3.8
Total Detected DDT (µg/kg)	**46.8**	**67.2**
Eohaustorius estuarius survival (%)	64 (LA-3: 82%)	75 (LA-3: 82%)
Bold number indicates concentration is above the ER-M for chemistry and statistically different from reference for bioassay.		

Area 5: Lido Isle Reach

Volume: 157,500 m^3 Volume: 157,500 m^3

Project Depth: 6.1 m Project Depth: 3.0 m

Synopsis: This area includes two subareas: the main channel with a design depth of 6.1 m and the southern portion of the channel that has a design depth of 3.0 m. The main channel was represented by three stations; however, it was evaluated as a composite with two stations in the Harbor Island Reach (Area 2 in Weston Solution 2006). Two stations have been evaluated in the shallow portion of the reach and were evaluated as part of a composite that included stations along the nearshore areas of the West Lido Channel, along the Balboa Peninsula, and the southern shores of Lido Isle (Area 1 in Weston Solutions 2005). Sediment grain size was approximately 75% silt/clay with high percentages of clay. TOC was 0.87 to 1.3 %. Mercury, organotin, and 4,4;-DDE were detected in notable concentrations; however, the mercury concentrations were likely influenced by sediment from the West Lido Channel area. Organotins were not accumulated in tissues from the bioaccumulation tests. Bioassay responses met the LPC criteria; except *E. estuarius* survival in the Federal Channels sample. This area is expected to pass for ocean disposal following the amphipod and bioaccumulation tests.

Federal Channel Area 2	
Parameter	**Area 2**
Grain size (%)	32% sand; 32% silt; 35% clay
Total organic carbon (%)	0.87
Mercury (mg/kg)	**0.73**
4,4'DDD (µg/kg)	ND
4,4'DDE (µg/kg)	**38**
4,4'DDT (µg/kg)	4.5
Total Detected DDT (µg/kg)	42.5
Eohaustorius estuarius survival (%)	**60%** (LA-3: 82%)

RGP-54 Area 1 Comp	
Parameter	**2005**
Grain size (%)	43% clay
Total organic carbon (%)	1.29
Mercury (mg/kg)	**0.82**
No toxicity observed for this composite	

Area 6: Turning Basin
Volume: 63,740 m^3
Project Depth: 6.1 m

Synopsis: This area was represented by three stations in one composite (Areas 2b in Weston Solutions 2006). Sediment grain size was 68% clay with TOC of 1.26%. Mercury concentrations were above the ERM. 4,4'-DDE was above the ERL but below the ERM. Bioassay responses met the LPC criteria, with the exception of *E. estuarius*. This area may pass for ocean disposal following the amphipod reevaluation. However, this area should be included in volume estimates for alternative disposal options due to mercury concentrations.

Parameter	**Area 2b (Turning Basin Only)**
Grain size (%)	68% clay
Total organic carbon (%)	1.26
Mercury (mg/kg)	**1.42**
4,4'DDD (µg/kg)	11
4,4'DDE (µg/kg)	**39**
4,4'DDT (µg/kg)	11
Total Detected DDT (µg/kg)	**61**
Eohaustorius estuarius survival (%)	**38** (LA-3: 82%)

Area 7: West Lido Area A
Volume: 51,710 m^3
Project Depth: 3.0 m

Synopsis: This area was represented by five stations as part of a composite that included stations in Lido Isle Reach and along the Balboa Peninsula (Area 1 in Weston Solutions 2005). In addition, this area is part of an ongoing effort to understand mercury concentrations in West Lido and Newport Channels. Sediment grain size was generally dominated by silt; however, there are portions of this area that are dominated by sand. TOC is generally above 1%. Mercury concentrations were above the ERM throughout the area ranging from below the ERM of 0.7 mg/kg to >5 mg/kg in some locations. Bioassay responses and bioaccumulation tissue residues met the LPC criteria for the entire Area 1 composite; however, they have not been evaluated for the West Lido Area A specifically. While studies are ongoing, this area should be included in volume estimates for alternative disposal options.

RGP-54 Area 1 Comp	
Parameter	**2005**
Grain size (%)	43% clay
Total organic carbon (%)	1.29
Mercury (mg/kg)	**0.82**
No toxicity observed for this composite	
Bold number indicates concentration is above the ER-M for chemistry and statistically different from reference for bioassay. Additional data collected from the area indicate that mercury concentrations range from the ERM to approximately 5 mg/kg.	

Area 7: West Lido Area B
Volume: 38,020 m^3
Project Depth: 3.0 m

Synopsis: This area was represented by two stations as part of a composite that included the Yacht Anchorage (Area 4 in Weston Solutions 2006) and a composite that include the Lido Isle Reach and West Lido Area A (Area 1 in Weston Solution 2005). This area is also part of an ongoing effort to understand mercury concentrations in West Lido and Newport Channels. Sediment grain size is generally dominated by silt, with 46 to 49% clay. TOC is generally above 1%. Mercury and DDE were the primary analytes of concern observed in area sediments. Bioassay responses and bioaccumulation tissue residues met the LPC criteria for the entire RGP-54 Area 1 composite; however, poor survival has been observed in the Federal Channels Area 4 composite. Recent data indicates that the Area composites may not necessarily represent West Lido Area B. While studies are ongoing and this area is could possibly meet the LA-3 LPC criteria, this area should be included in volume estimates for alternative disposal options.

Federal Channel Area 4	
Parameter	**Area 4**
Grain size (%)	49% clay
Total organic carbon (%)	1.08
Mercury (mg/kg)	0.25
4,4'DDD (µg/kg)	18
4,4'DDE (µg/kg)	**71**
4,4'DDT (µg/kg)	6.6
Total Detected DDT (µg/kg)	**95.6**
Eohaustorius estuarius survival (%)	**26** (LA-3: 82%)
C. gigas (EC50 - % of SPP)	**60**

RGP-54 Area 1 Comp	
Parameter	**2005**
Grain size (%)	43% clay
Total organic carbon (%)	1.29
Mercury (mg/kg)	**0.82**
No toxicity observed for this composite	
Bold number indicates concentration is above the ER-M for chemistry and statistically different from reference for bioassay.	

Area 8: Newport Channel
Volume: 187,050 m^3
Project Depth: 4.6 m

Synopsis: As with the West Lido Area B, the Newport Channel has not been evaluated as a discrete area, but as two composite areas (Area 4 in Weston Solutions 2006 and the Lido Isle composite as part of the RGP-54; Area 1 in Weston Solution 2005). As with the previous two areas, the Newport Channel is part of an ongoing effort to understand mercury concentrations in West Lido and Newport Channels. Sediment grain size is generally dominated by silt, with 46 to 49% clay. TOC is generally above 1%. Mercury is expected to be the primary analyte of concern observed in area sediments, with concentrations ranging from below the ERM to >5 mg/kg. Bioassay responses and bioaccumulation tissue residues met the LPC criteria for the entire RGP-54 Area 1 composite; however, poor survival has been observed in the Federal Channels Area 4 composite. Recent data indicates that the Newport Channel sediment may not prove to be acutely toxic to amphipods and bioavailability of mercury may not be significant. While studies are ongoing, this area should be included in volume estimates for alternative disposal options.

Federal Channel Area 4	
Parameter	**Area 4**
Grain size (%)	49% clay
Total organic carbon (%)	1.08
Mercury (mg/kg)	0.25
4,4'DDD (µg/kg)	18
4,4'DDE (µg/kg)	**71**
4,4'DDT (µg/kg)	6.6
Total Detected DDT (µg/kg)	**95.6**
Eohaustorius estuarius survival (%)	**26** (LA-3: 82%)
C. gigas (EC50 - % of SPP)	**60**

RGP-54 Area 1 Comp	
Parameter	**2005**
Grain size (%)	43% clay
Total organic carbon (%)	1.29
Mercury (mg/kg)	**0.82**
No toxicity observed for this composite	
Bold number indicates concentration is above the ER-M for chemistry and statistically different from reference for bioassay.	

Area 9: Yacht Anchorage
Volume: 359,220 m^3
Project Depth: 4.6 m

Synopsis: The Yacht Anchorage has been evaluated as two subareas during the Federal Channels investigation (Areas 4 and 4b in Weston Solutions 2006). Sediment grain size was generally dominated by silt, with 46% clay in the overall area and 95% silt/clay in the area immediately east of Lido Island. TOC is generally above 1%. 4,4'-DDE is the primary analyte of concern observed in area sediments; however, similar concentrations of 4,4-DDE observed in other portions of the Harbor have not been associated with toxicity or unacceptable uptake in bioaccumulation tests. Poor amphipod survival has been consistently observed in this area. TIE studies have been conducted with sediment from both Area 4 and Area 4b to determine the potential cause of toxicity. These studies are ongoing.

Due to the large volume of sediment represented by this area, the Yacht Anchorage will likely be evaluated as three distinct areas. A portion of this area may meet LA-3 LPCs; however, the entire area should be included in volume estimates for alternative disposal options.

Federal Channel Areas 4 and 4b		
Parameter	**Area 4**	**Area 4b (East tip of Lido Isle)**
Grain size (%)	49% clay	95% silt & clay
Total organic carbon (%)	1.08	1.01
Mercury (mg/kg)	0.25	0.12
4,4'DDD (µg/kg)	18	12
4,4'DDE (µg/kg)	**71**	**60**
4,4'DDT (µg/kg)	6.6	4.8
Total Detected DDT (µg/kg)	**95.6**	**76.8**
Eohaustorius estuarius survival (%)	**26** (LA-3: 82%)	**49** (LA-3: 82%)
C. gigas (EC50 - % of SPP)	**60**	**63**

Area 10: Bay Island Anchorage
Volume: 14,690 m^3
Project Depth: 3.0 m

Synopsis: One station was sampled in the Bay Island Anchorage and analyzed as part of a composite that included stations along the southern shore of Balboa Island and the Balboa Island Channel (Area 4a in Weston Solutions 2005). Sediment grain size was comprised of 40% and 31% clay, with 1.07% TOC. No analytes of concern were identified for this area. No toxicity or significant bioaccumulation was observed for this area. Recent surface samples from the nearby A-anchorage showed similar results with high amphipod survival. Chemistry data will be available in mid-March for the A-anchorage. Sediment from the Bay Island Anchorage is expected to meet suitability requirements for LA-3.

RGP-54 Area 4a Comp	
Parameter	**2005**
Grain size (%)	40% sand; 31% clay
Total organic carbon (%)	1.07
Sediment chemistry showed no concentrations above the ER-M	
No toxicity observed for this composite	

Area 11: Upper Channel
Volume: 37,050 m^3
Project Depth: 3.0 m

Synopsis: Two stations were sampled in the Bay Island Anchorage and analyzed as part of a composite that included stations around Linda Isle (Area 2 in Weston Solutions 2005). Sediment grain size was comprised of 44% clay, with 1.36% TOC. No analytes of concern were identified for this area. Chemical analyses were also conducted on each station within Area 2. Stations 2-4 and 2-7 were within the Upper Channel. Tribultin (7.4 µg/kg; Station 4-7) and 4,4-DDE (52 µg/kg; Station 4-2) were the only analytes of concern observed in the station sediments. No toxicity or significant bioaccumulation was observed for this area. Sediment from the Upper Channel is expected to meet suitability requirements for LA-3.

RGP-54 Area 2 Comp	
Parameter	**2005**
Grain size (%)	44% clay
Total organic carbon (%)	1.36
Sediment chemistry showed no concentrations about the ER-M	
No Toxicity Observed in the Area 2 Composite	
Chemistry in Area 2 evaluated for each station - Stations 2-4 and 2-7 are within the Upper Channel.	

Area 12: North Anchorage Area
Volume: ~5,000 m^3
Project Depth: 3.0 m

Synopsis: Four stations were sampled in the North Anchorage Area and analyzed as part of a composite that included stations Bay Island Anchorage and the Balboa Island Channel (Area 4a in Weston Solutions 2005). Sediment grain size was comprised of nearly equal portions of sand, silt, and clay, with 1.07% TOC. No analytes of concern were identified for this area. No toxicity or significant bioaccumulation was observed for this area. Sediment from the North Anchorage Area is expected to meet suitability requirements for LA-3.

RGP-54 Area 4a Comp	
Parameter	**2005**
Grain size (%)	40% sand; 31% clay
Total organic carbon (%)	1.07
Sediment chemistry showed no concentrations above the ER-M	
No toxicity observed for this composite	

Area 13: South Anchorage Area
Volume: ~5,000 m^3
Project Depth: 3.0 m

Synopsis: Three stations were sampled in the South Anchorage Area and analyzed as a single composite (Area 4b in Weston Solutions 2005). Sediment grain size was comprised of 60% sand, with 0.99% TOC. No analytes of concern were identified for this area. No toxicity or significant bioaccumulation was observed for this area. Sediment from the North Anchorage Area is expected to meet suitability requirements for LA-3.

RGP-54 Area 4b Comp	
Parameter	**2005**
Grain size (%)	60% sand; 20% clay
Total organic carbon (%)	0.99
Sediment chemistry showed no concentrations about the ER-M	
No toxicity observed for this composite	

Area 14: Balboa Island Channel
Volume: 40,520 m^3
Project Depth: 3.0 m

Synopsis: Three stations sampled in this reach were evaluated as part of a composite that included two stations immediately west of Collins Island (Area 3 in Weston Solutions 2006). Grain size was 96% silt and clay, with 1.03% TOC. 4,4-DDE was slightly above the ERM concentration. All bioassay responses met the LPC criteria, with the exception of the amphipod test with *Eohaustorius estuarius*. However, subsequent tests with *Ampelisca abdita* indicate that this area is expected to pass for ocean disposal following the amphipod study.

Federal Channel Area 3	
Parameter	**2006**
Grain size (%)	96% silt & clay
Total organic carbon (%)	1.03
Mercury (mg/kg)	0.6
4,4'DDD (µg/kg)	5.6
4,4'DDE (µg/kg)	**50**
Total Detected DDT (µg/kg)	**61.2**
Eohaustorius estuarius survival (%)	**36** (LA-3: 82%)
Ampelisca abdita survival (%)	61 (LA-3: 74%)

APPENDIX B
LOS ANGELES COUNTY REGIONAL DREDGED MATERIAL MANAGEMENT CEMENT-BASED STABILIZATION OF DREDGED MATERIAL FIELD PILOT STUDY

(PROVIDED ON CD)

APPENDIX C
SAND SEPARATION TREATMENT OF DREDGED MATERIAL – LABORATORY STUDIES

(PROVIDED ON CD)