### 2.1.2.2 Caisson Removal Methodologies

Two alternatives are examined for the removal of the caissons: use of mechanical cutting devices with explosives to demolish the caissons and, due to concerns over the use of explosives in the marine environment, use of mechanical cutters only. Either method would also require the small-scale removal of loose materials from inside and around the caissons as noted in Section 2.1.1.4. Section 2.6 describes an alternative to caisson removal: augmentation of the caissons with an artificial reef after dredging or leveling of the Hazel shell mound.

*Use of Both Mechanical Methods and Explosives*

The feasibility of combined explosive and mechanical methods in marine demolition projects has been demonstrated (e.g., the 4H Platform and Mobil Seacliff Pier Decommissioning Projects); thus this approach is analyzed in this Program EIR/EA.

*Use of Mechanical Methods Only*

At least four mechanical cutting methods have been used during the decommissioning of offshore oil rigs, particularly in the Gulf of Mexico: diamond wire cutting methods, cable cutters, abrasive water jet cutting devices, and casing cutters. The diamond-wire cutting tool, which is positioned by a diver then operated remotely from the surface, is generally used to sever well conductors up to 8 feet (2.4 meters) in diameter (Byrd 2003). Also, the jig used to position the tool is large and cumbersome and would require considerable dredging to position it below the mudline around a caisson. A diamond-wire cutter, however, might be used to cut the central piling after removing the concrete.

A cable cutter could also cut the concrete and steel inside the caissons into smaller pieces. This would entail anchoring two large devices on the sea floor, then running a cable back and forth across the caissons. SMIT Salvage B.V. developed an underwater saw (a form of cable cutter) utilizing a wire with cutting bushes coated with abrasives and driven by hydraulics. This device was used to sever the damaged bow of the Russian submarine *Kursk*, which sank in 361 feet (110 meters) of water in the Barents Sea. Considerable time would be required for such an effort, however, and significant sediment disturbance would occur during excavation around the caissons to position the cutting equipment as well as during the cutting process itself. [1]

---

[1] Because the submarine may have held unexploded torpedoes, for safety's sake, cutting was done remotely and monitored via ROV-mounted cameras. A suction anchor was placed on each side of the sub, and the "saw"—a cable carrying a series of abrasive-covered drums—was strung across the sub's bow and fastened to a hydraulic cylinder on each anchor. By extending and retracting the cylinders alternately, a sawing motion was created that sliced through the bow. The cutting process clouded the sea with disturbed sand and cutting debris, and every half-hour cutting was suspended to let the sea clear so the ROVs could check progress (Chalmers 2002). The 9,000-ton submarine was recovered intact except for the severed bow, the largest object ever recovered from such depths (van Rooij 2003). (See www.memagazine.org/backissues/may02/features/thekursk/thekursk.html.)

A third method involves positioning an abrasive water jet cutting device around or inside a steel piling. High-pressure water containing an abrasive compound is forced through jets as the tool rotates. Although this method may have been used for some of the Platform Hazel pilings (Howorth 1996), it only works for hollow steel pilings up to 4 feet in diameter and can only penetrate about 8 inches (0.2 meters) (Byrd 2003).

The fourth method involves casing cutters. The casing cutter has a carbide-tipped, three-bladed tool that is lowered into the piling to the desired depth. The blade opens when water pressure is applied to the cutting tool, which is rotated topside by a power swivel. This type of tool requires a stable base for its operation, and is usually deployed from the oil rig platform (Byrd 2003).

The use of only mechanical methods has several major drawbacks:

- *Prolonged Presence:* The Chevron 4H Decommissioning Project MND (CSLC 1994) noted that mechanical cutters require a stable base for operations (i.e., the oil rig deck), and cited estimates by Chevron that mechanical cutters would require 3 to 4 weeks per platform to sever pilings, compared to 3 to 4 days per platform with explosives, a seven-fold increase. The MND found that even if a sufficiently stable floating platform was feasible, vessels and equipment would need to remain in place longer, resulting in potentially greater impacts to air quality, marine life (due to increased risk of oil spills and collisions), noise, and vessel traffic.
- *Ineffectiveness of Mechanical Methods Alone and Related Personnel Safety Concerns:* Mechanical cutting tools are generally used to sever conductors and pilings that are significantly smaller than the 27-foot-diameter concrete-filled Hazel caissons. Removing platforms using only mechanical cutting methods also has a poor record of success and can create hazardous situations; for example, when casing cutters were used to cut pilings during the decommissioning of Texaco's Platforms Helen and Herman west of Gaviota, not all of the cuts could be completed, placing personnel and equipment at risk (Chevron 1994). If mechanical devices malfunction while cutting, a diver may need to descend to determine the cause of failure, to inspect the weakened structure and determine where it may still need to be cut, or to extricate the tool. The weakened structure, which weighs many tons, must be shored up to prevent collapse, resulting in a prolonged presence in the area. In addition, in many cases, a strain is taken on a structure with a topside crane as it is being cut. If the steel member is not cut completely, or if it falls away with a much larger structure still attached, it can cause a sudden dynamic load on the crane, posing unacceptable risks to personnel and equipment. Ultimately, the failure of mechanical methods would require explosives to finish removing the structure; otherwise, portions of the structures may have to be left in place. Given the weight and other uncertainties involved, the comparatively longer duration of operations, and other associated potentially adverse environmental impacts (e.g., oil spills

and increased risk of collision), mechanical cutting operations will likely pose greater risks to both divers and topside personnel.

*Conclusion*

For the reasons stated above, use of mechanical cutting without explosives is not recommended as the sole means of demolishing the caissons, and this methodology is, therefore, not considered for further detailed analysis in this Program EIR/EA. The extent to which mechanical methods are used, however, is analyzed in conjunction with the use of explosives, since mechanical methods may help to reduce the amount of explosives used.

### 2.1.3 Disposal of Removed Materials

Dredging of the 4H shell mounds would produce approximately 45,000 cy of dredged material. A cubic yard of dewatered dredged material weighs approximately 1.5 tons; thus, the total quantity of dredged material requiring disposal is approximately 67,500 tons. The design of a feasible method to remove the shell mound materials must address the different logistical, permitting, and environmental issues that attend disposal of the sediments following their removal. Resolution of these issues depends not only on the amount of material to be disposed of, but also on the physical and chemical characteristics of the materials, which determine where and how their disposal can be permitted. The types of disposal options considered fall into two basic categories: offshore (or overboard) disposal and onshore (or upland) disposal, each at approved locations.

Options for onshore disposal include: 1) use of the material on land (e.g., as construction fill material at a port) that could be accomplished with minimal environmental impact; 2) transport the material to a recycling facility; and 3) transport the material to one or more permitted landfills by truck or other means. Onshore disposal options are constrained by State and local criteria based on the physical and chemical makeup of the sediments, and by the availability and willingness of an onshore facility to accept such materials. The logistics of handling and transporting the materials to an approved location also require analysis.

#### *2.1.3.1 Offshore Disposal*

Subject to approval by the USACE and USEPA, dredged materials can be transported to and disposed of at the LA-2 ocean disposal site offshore Palos Verdes (Figure 1-2). Other than consideration of in-place modification options (e.g., spreading, capping, or reef augmentation), no other alternatives for offshore disposal are available. Disposal at LA-2 requires that the sediments meet criteria for ocean disposal based on rigorous chemical analyses. The requisite sampling and analytical tests to support a determination on the suitability of the shell mounds materials for ocean disposal at LA-2 have been completed (Appendix C). This information is factored into the analysis of potential impacts of disposal at LA-2 in this Program EIR/EA.

#### 2.1.3.2 Onshore Handling and Disposal via Port Hueneme

Port Hueneme is a potential destination for landing the dredged shell mound materials for subsequent transport to an approved onshore disposal site. The Port is not able to accept dredge material for beneficial use on existing local projects, and it does not accept loose construction-related material, such as gravel, cement, and dredge material because of the potential to damage the Port's primary traffic of new cars and closed containers. Dredged materials can be transported via the Port if they are enclosed in leak-proof cargo bins that allow the materials to be off-loaded and transported without requiring onshore dewatering. The Port Hueneme option, therefore, would entail the dewatering and encapsulating of all dredge material in relatively small storage bins at sea before they are brought to the Port. Sediments and cuttings from offshore oil drilling activities have for many years been collected at the platforms, encapsulated in storage bins, transported to Port Hueneme, and carried to licensed disposal facilities in the San Joaquin Valley (MMS 2001). Based on discussions with contractors who have conducted these operations for Chevron and other companies, the same methods could, in principle, be applied to the disposal or recycling of shell mounds materials. A summary of two such discussions is provided below (pers. comm., Dean Poe, T&T Truck and Crane [T&T], and John Webb, Envirocycle).

T&T specializes in transporting offshore well and dredge material associated with the oil and gas industry. They operate a facility at Port Hueneme, where they transfer container bins from barges or cargo ships to trucks to be transported to approved facilities. U.S. Coast Guard-approved storage bins, fabricated for the purpose of containing marine sediment, are rented from T&T and filled at sea with the dredged material. Containers are approximately 8x14x5 feet in size, range from 10 to 15 cy in capacity, weigh approximately 20,000 pounds, and have large side accessible openings with rubber seals to prevent leaking during transport. Eight to 10 bins could fit on a standard barge. The containment of dredge material in bins at sea, rather than directly into the barge, would require the use of a smaller scoop size, and would both slow down the rate of sediment removal and increase the total duration of the dredge process. If all 45,000 cy of shell mounds materials were to be dredged, a minimum of 3,000 to 4,500 bins would be required (based on 10-15 cy of dredged material per bin and not including associated water). With an average 9 bins per barge, a minimum of 333 to 500 barge trips would be required to transport the material to shore.

Material would not need to dewatered prior to containment; de-watering, if necessary, would occur at the Envirocycle recycling facility in McKittrick (southwest Kern County). The contractor would transfer the bins to trucks at their facility in Port Hueneme. Trucks can carry two bins; therefore, approximately 1,500 to 2,250 truck trips would be required to transport the material to the recycling center, a distance of approximately 140 miles each way[2] assuming a travel route from Port Hueneme to McKittrick.

2 The distance from Port Hueneme to the facility in McKittrick is about 155 miles by way of Highway 126 and Interstate 5, whereas by way of Highway 33, a much slower road, the distance is about 125 miles. We have used the average of the two distances.

Onshore disposal via Port Hueneme as the sole onshore landing site does not appear to be feasible at this time since the Port has limited space available for transferring materials, and this type of operation could significantly disrupt the Port's ongoing activities. Although barges may be able to divide their destinations between the POLB and Port Hueneme, this alternative would mean that some dredged materials would be loaded directly into barges (for transport to the POLB), while other dredged materials would need to be loaded into bins, necessitating use of a smaller bucket and a change in project operations. Accordingly, onshore disposal at Port Hueneme is not carried forward for additional analysis as a project component.

#### 2.1.3.3 Onshore Disposal and Handling via the Port of Long Beach or Port of Los Angeles

The Ports of Long Beach and Los Angeles (POLB/POLA) were consulted as to whether or not they would allow either: (1) the disposal of shell mound materials on Port lands as part of each Port's overall development strategy and program for handling its own dredged sediments; or (2) the use of Port facilities for the transfer of materials to an approved disposal facility. The POLB indicated its willingness to entertain either option; accordingly, handling and potential disposal at the POLB is considered feasible and is carried forward for analysis in this Program EIR/EA. Disposal or handling at the POLA is not presently available (pers. comm., K. Curtis, POLA, 2002) and is, therefore, not considered for further analysis.

#### 2.1.3.4 Disposal at an Onshore Recycling Facility

Beneficial Use Recycling Centers use material not acceptable for ocean disposal in the production of road-grade asphalt and other road materials. Envirocycle has indicated that it can accept the dredged material from the Shell Mounds Project (pers. comm., John Webb, Envirocycle, 2002). To conduct such an operation requires the capability to efficiently receive and transfer large quantities of dredged material from barges to trucks for immediate disposal. According to personnel with Manson Construction, their company would be able to provide this type of operation at the POLB (pers. comm., L. Lyles, 2002). Therefore, transport of dredged materials to the POLB, and subsequently to a recycling facility (e.g., Envirocycle) is considered viable and forms the basis for analysis.

#### 2.1.3.5 Disposal in an Onshore Landfill

Two factors to consider in determining the suitability of a specific permitted landfill for disposal of dredged material are the concentration of contaminants in the material and the total quantity of material to be disposed. In addition, the solids content of dredged material disposed at a landfill must be 50 percent or greater. This requirement may necessitate dewatering of the shell mound materials prior to landfill disposal.

### *Concentration of Contaminants*

The concentration of contaminants in dredged material determines the type of landfill that can accept the material. In California, landfills are identified as Class I, II, or III.

- Class I landfills can accept materials that are classified as hazardous wastes. Material that exceeds the chemical criteria listed in Title 22, CCR section 66261.24 is considered a hazardous waste and must be disposed in a Class I landfill.
- Class II landfills are similar in design to Class I landfills, but will accept only designated waste that has been determined to be below hazardous waste criteria concentrations.
- Class III landfills can accept material with some degree of contamination (typically low concentrations of contaminants) depending on the individual landfill design and location. Each Class III site operator determines waste acceptance criteria and testing requirements, in accordance with applicable regulations.

Sediment samples from the 4H shell mound sites were collected and analyzed for chemical contamination levels and for toxicity and bioaccumulation potential (AMEC 2002b). The results indicate that the material that comprises the shell mounds does not exceed the 22 CCR section 66261.24 hazardous waste criteria; hence, disposal at a Class I landfill would not be required.

Dredged material that does not exceed 22 CCR section 66261.24 chemical criteria may be disposed in a Class II or Class III landfill, depending on the results of a Waste Extraction Test (WET). A WET test simulates the acidic conditions that could occur in a landfill, and is typically performed for contaminants whose Total Threshold Limit Concentration (TTLC) exceeds the Soluble Threshold Limit Concentration (STLC) limit by a factor of 10 or greater. Under acidic conditions, heavy metals and other contaminants could become soluble and therefore more “environmentally available.” Material that contains “acceptable” levels of contaminants, based on the WET test, can be disposed of in a Class III landfill.

Under initial testing, TTLCs in sediment samples from the 4H shell mounds exceeded the 10x STLC thresholds for barium, chromium, and lead (AMEC 2002b). However, subsequent WET analyses indicated that the soluble concentrations do not exceed the STLC limits. Dredged material from the 4H shell mounds, therefore, would be considered suitable for disposal at a Class III landfill.

The RWQCBs are responsible for determining if proposed landfill disposal of dredged material would meet State water quality standards. The RWQCBs also issue Waste Discharge Requirements (WDRs) for dredging projects to control potential water quality impacts associated with removal and disposal of dredged materials. The Los Angeles RWQCB issues general WDRs for discharge of up to 100,000 cy dredged material that does not exceed the hazardous criteria of 22 CCR section 66261.24, and an individual WDR for discharges over 100,000 cy.

*Quantity of Dredged Material*

As noted above, the total quantity of dredged material for disposal is approximately 67,500 tons. Assuming a dredging operation of approximately 9 days, about 7,500 tons per day (tpd) of shell mounds would be dredged for each of the 9 days of dredging. (See Section 2.2.1 for estimates of total project duration using a clamshell bucket dredge).

Most Class III landfills operate under permit conditions that restrict the amount of waste material that can be received each day, and some have a limit on the number of days per week that they can operate. Such operating conditions could mean that more material would be dredged each day than could be disposed in a landfill that day. For example, the Simi Valley Landfill (a Class III landfill in Ventura County) has a permit limit of 3,000 tpd, 6 days per week. In 2001, the landfill received an average of almost 2,100 tpd. Assuming that at the time of the dredging the landfill could still accept up to its permitted limits (an additional 900 tpd, 6 days per week), approximately 12.5 weeks (75 landfill operating days) would be necessary to dispose of the dredged shell mound materials at this landfill. Similar limitations exist at other landfills within the region. USACE (2003b) recently reviewed the capacity of Class III upland landfills in Los Angeles County to determine whether a viable option existed for upland disposal of sediments dredged from Marina del Rey and Ballona Creek. The USACE concluded that because of the imminent closure of several landfills and the limited capacity of others, disposal of substantial quantities of dredged sediments at landfills in the region would not be feasible.

The use of a single landfill with limited capacity would require a temporary holding facility for the dredged material (perhaps at a site that could also serve as a dewatering facility) during the period of time necessary to complete the disposal process. In the example cited (Simi Valley Landfill), a holding facility of sufficient size to hold a maximum of approximately 36,000 cy of dredged material on the last day of dredging would be needed. There are no areas available in the POLB, POLA, or Port Hueneme for stockpiling and rehandling shell mound materials over an extended period of time.

The disposal of shell mound materials would diminish the available capacity of local public landfills, potentially affecting other users. However, priority or exclusivity is typically given to local users, such that disposal of the shell mound materials would only be allowed after other users have been accommodated. The most likely scenario for upland landfill disposal is that a combination of landfills would be used, with the mix of disposal sites subject to change on a daily basis depending on available capacity in relation to the rate at which materials are dredged. Accordingly, the use of multiple landfills may be feasible as a secondary or tertiary option for disposal of portions of the materials that are not otherwise recycled, used beneficially, or disposed offshore.

### 2.1.4 In-Place Abandonment Options (Modification of the Shell Mounds)

The purpose of in-place abandonment (modification) options is twofold: 1) to avoid or lessen the impacts of removal and disposal; and 2) to avoid, lessen, or offset any impacts that would be associated with leaving the shell mounds in place. In theory, alternate actions that could accomplish these aims include the following:

1. Leveling and spreading of shell mound materials on the seafloor and removal of the caissons to allow resumption of trawling;
2. Capping of the shell mounds and caissons by placing clean sediments over the exposed shell mound materials and buried caissons to reduce potential disruption to the underlying contaminated materials and snagging of nets; and
3. Creation of an artificial reef around the shell mounds and/or caissons to attract fish and potentially enhance fish productivity.

#### *2.1.4.1 Leveling and Spreading*

The leveling and spreading of the shell mounds material on the seafloor, which would involve using dredging and trawling equipment, was suggested by the USEPA (pers. comm., S. John) as a means of meeting the trawlability requirement. Removal and disposal of the Hazel caissons would be accomplished as described in Sections 2.1.2 and 2.1.3. Leveling and spreading would have fewer operational impacts than several of the other Program Alternatives, as fewer vessel trips would be required; however, it could also result in the dispersal of the contaminants within the mounds. This Program Alternative is described in Section 2.3.

#### *2.1.4.2 Capping*

In-place capping of each of the shell mounds with a uniform layer of clean material to prevent dispersal of contaminants, and smoothing over the existing mound footprints to enable trawling was considered feasible by de Wit (2001). This Program Alternative would be a less complex application of a typical capping project since the site has been delineated and the contaminated materials are consolidated and unlikely to be disturbed by placement of the cap materials.

Water depth and topography are two important considerations in determining the feasibility of capping the shell mounds. The mounds lie on generally gently sloping areas of the seafloor, with surrounding water depths ranging from 90 to 130 feet. Capping projects have been completed in deeper water and in areas with steeper natural slopes (SAIC 1998, Valente et al. 2001). For example, during the Palos Verde Shelf pilot-capping project, a hopper dredge placed fine-grained sand cap material in 250 feet (76.2 meters) water depths onto a seafloor that sloped as much as 10 percent. Use of well-controlled placement techniques should minimize any operational limitations associated with using either split-hull disposal barges or a hopper dredge to spread cap material over the shell mound areas.

The surrounding seafloor is comprised primarily of fine-grained sediments beyond the main shell mound footprints. Both the seafloor topography and the composition of the surrounding sediments suggest that these areas are neither highly dynamic nor likely to be subject to major erosional forces, and thus should be suitable to support in-place capping. However, because the shell mounds rise well above the surrounding seafloor, the potential “side-slope” effects during cap placement need to be evaluated. For example, in order to place a 3-foot thick cap layer, the footprint of the mound after capping would be at least three feet higher vertically and extend wider horizontally, depending on the acceptable side-slopes that are needed to ensure cap stability.

Determining the required composition of the cap material and the minimum required cap thickness depends on many factors including: the physical and chemical properties of the contaminated and capping sediments; hydrodynamic conditions such as currents and waves; potential for bioturbation (disruption of the cap by aquatic organisms); potential for short- and long-term flux of contaminants; potential for consolidation of the cap and underlying sediments; and operational considerations (USACE 1998). The total required thickness may be developed based upon individual thickness estimates needed to satisfy the bioturbation, consolidation, erosion, and chemical isolation concerns. As addressed in USACE (1998), long-term monitoring would help to evaluate the stability of the cap as well as the extent, if any, of contaminant leaching through the cap.

The availability of sufficient material of appropriate consistency and volume to cap the shell mounds is another important consideration. Roughly 1,000,000 cy of clean capping material would be required to cap all four shell mounds. The only feasible sources for this material would be approved dredging projects, producing clean dredged material that is suitable for ocean disposal or beach nourishment. No other potential sources are available, and excavating capping sediments from a borrow site (which would have to be identified and permitted for that use) elsewhere in the ocean is not considered feasible because of the unmitigable impacts it would have on the benthic community at the site and on surrounding water quality and sediment transport.

Some potential local sources for capping material include USACE federal channel dredging projects occurring at the Santa Barbara, Ventura, and Channel Islands Harbors, which produce approximately 163,000 cy/year, 700,000 cy/year, and 1.3 million cy every two years, respectively (pers. comm., Aman). However, most of the dredge material from these projects currently goes to supplement local beaches, and the material is in high demand (pers. comm., Wilke-Prior & Aman). Given that local beach nourishment efforts would take precedence over the use of clean sediments to cap the shell mounds, local dredging projects are not considered a viable source of capping material. Dredging projects at the POLA and POLB regularly dispose of clean sediments at the LA-2 ocean disposal site, and barges that would otherwise transport these sediments to the LA-2 site could instead carry the material to the shell mounds sites for use as capping material. Quantities of dredged material disposed at LA-2 vary considerably, depending on port dredging activity. The median annual quantity disposed since 1978 has been approximately 100,000 cy (USACE 2003a).[3] This option appears feasible and is included as part of the capping alternative.

In conclusion, capping the shell mounds appears to minimize short- and long-term effects of dredging and disturbance of contaminated sediments, and it is likely that a sufficient cap layer could be placed to effectively isolate the existing mound material from the surrounding environment. Development of a specific capping plan for the shell mounds may also require the preparation of an Environmental Impact Statement (EIS) if the USEPA deems it necessary to formally designate the shell mounds as ocean disposal sites under the MPRSA (33 USC section 1401 et seq., also known as the "Ocean Dumping Act"). This alternative is analyzed further in Section 2.4.

#### *2.1.4.3 Creation of Artificial Reefs*

Artificial reefs could, in principle, be constructed with minimal disturbance of shell mound materials or dispersal of contaminants, through the deposition of rock around the perimeter of the shell mounds. The placement of rock or concrete materials on top of the shell mounds would disrupt sediments and potentially disturb the encasement of the contaminants, and is, therefore, not considered further. The artificial reef alternative could attract species important to commercial fishers, but whether there would be meaningful benefits to species populations (i.e., creation of habitat) and their recovery is uncertain (Holbrook et al. 2000). The use of any shell mounds "reefs" by these species would need to be assessed in a detailed monitoring program. In any case, the creation of artificial reefs appears to be a feasible action that is described in greater detail in Section 2.5.

An artificial reef could also be created at Platform Hazel following removal of the shell mound materials and abandonment in place of the caissons. Left in place, the caissons would provide vertical relief to the reef structure. This alternative action, which would eliminate the need to use explosives to cut the caissons, is described in Section 2.6.

### 2.1.5 Offsite Mitigation of Fishing Impacts

The purpose of this alternative action would be to mitigate for the loss of fishing opportunity in lieu of shell mounds or caisson removal. Impacts of the removal and disposal, or in-place modification of the materials, would be avoided, whereas any long-term risks of contaminant effects on biota would remain. This component is discussed in Section 2.7.

---

3 The median or middle value is a better indication of regularly occurring disposal activities than is the mean – which is skewed toward a much larger value by the disposal of over 2 million cubic yards concurrent with a major dredging project in 1999.

## 2.2 PROGRAM ALTERNATIVE 1 (PA1): SHELL MOUNDS AND CAISSONS REMOVAL AND DISPOSAL

### 2.2.1 Shell Mounds Removal by Dredging

Based on consideration of the physical and chemical properties of the shell mounds, review of available technologies, and previous research on this subject by de Wit (2001), removal of the shell mounds can best be accomplished using a sealed clamshell bucket (see Section 2.1.1.3). To assist in the removal of materials that surround the Hazel caissons, and elsewhere if large debris is encountered in the mounds, a high-volume submersible dredge (jet) pump could also be used as discussed below.

The closed clamshell is lowered to the seafloor where it opens, bites the sediments, and closes before returning to the ocean surface, thus minimizing spillage of materials through the water column as the bucket is raised. Dredged material lifted out of the water would be dumped into a contained dredge barge which, when filled, would be towed to a disposal site. Decant water would need to be transported to shore unless offshore disposal is authorized by the RWQCB and USACE. Given the results of the sediment testing (Appendix C; AMEC 2002b), permit conditions on discharges of decant water from the shell mound sediments would most likely require settling and/or filtration to limit suspended solids prior to discharge. Hence the dredging operation may need to incorporate a containment or filtration system on the primary barge to handle the decant water.

According to John Karas of Great Lakes Dredging and Dock, who provided specifications for dredging equipment and operations that are applicable to the removal of the shell mounds, the following assumptions apply to the dredging operation:

- Bucket size on the dredge would range from 18 to 30 cy, depending on the substrate. It is reasonable to assume that the smaller and larger buckets would each be used half of the time. Buckets are assumed to be half-full of dredged material each time they are hoisted to the surface. The rate at which materials are removed would average roughly 30 buckets per hour.
- Barge capacities would range from 2,000 to 7,000 cy (an average capacity of 4,500 cy is assumed).
- Dredging would occur on a 24-hour schedule, but a 15-hour daily production cycle is assumed for planning purposes, to account for repair time and waiting.

Based on these assumptions, dredging would proceed at a rate of 360 cy per hour, which, in a 15-hour workday, would yield 5,400 cy per day of sediment. This equates to a dredging operation of approximately 9 days, with approximately 12 barge loads of sediment, to remove 45,000 cy. Allowing one additional day for each relocation of the operation to the next shell mound would result in a dredging project duration of approximately 12 days.

## 2.2.2 Caisson Removal

Caisson removal at the Platform Hazel site would occur after removal of the shell mound material. A considerable amount of preparatory work would need to be done by divers, including the excavation of sediment from around the caissons, cutting openings into the caissons, cutting and removing steel structures, and precisely placing and wiring explosive charges. Following explosive demolition, divers would assist with the removal of debris. The entire operation is estimated to require 7 to 10 days per caisson.

### *2.2.2.1 Caisson Excavation*

The caissons would most likely be excavated to at least 5 feet (1.6 m) below the natural mudline using high-volume submersible water jets, air lifts, or combined air and water lifts. These techniques are described below.

- Air Lift: This consists of a large nozzle fitted with a hose leading to a surface vessel. Inside the nozzle, an air pipe faces toward the surface or simply away from the area to be excavated. Compressed air is forced through the pipe and rises through the hose. As the air rises, it expands, displacing water and creating suction at the nozzle.
- Water Lift: This operates on the same principle, except that a fire hose instead of compressed air is used to create suction. This method is often used to simply excavate a hole rather than to bring objects to the surface.
- Combined Air and Water Lift: This is a relatively new device designed to make a more powerful lift, using the same principles of each of the above methods.

### *2.2.2.2 Caisson Removal*

As discussed in Section 2.1.2, the only feasible method to demolish the caissons is by using a combination of mechanical cutting devices and explosives. The description of the methodology provided below is based on the best available information on the structure and composition of the caissons (see Section 2.1.2.1) and methods that have been used in similar offshore projects by the diving and demolition contractors who were consulted for their expert knowledge. Nevertheless, some uncertainties exist because the buried caissons were built over four decades ago. Some changes in the proposed methods may be necessary to ensure personnel safety if, for example, the caissons are unsound or if they were not built according to plan.

After excavation, divers would cut the supporting members connecting the caissons with underwater torches. The members would be lifted to a barge and transported to an approved disposal site. Next, vertical cuts would be made in the caisson jackets so they could later be separated from the concrete. The caisson jackets would then be cut around the circumference at least 5 feet (1.6 m) below the natural mudline (underwater torches are now available that can cut through the 1.75-inch wall thickness of the caisson jackets [pers. comm., Roche, Divecon Services LP, 2002]). The jackets would be temporarily left in place after cutting to help contain the energy of explosive detonations and reduce disturbance of the seafloor sediments, except that a small opening may be cut in one area to allow room for the expansion of the concrete when the detonations occur. The caisson jackets must be pre-cut to allow a “free face” for the energy from the explosives to travel. If explosives are not used, cutting away the caisson jackets would still be necessary to allow the use of a mechanical cutting device to cut the concrete section into pieces.

Next, the top of the caissons would be removed. Sand inside the caissons would be removed with a lift device. The vertical steel structures inside the caisson (which include 12 water vent pipes, a high-pressure water jet pipe, an air lift pipe, 12 pipes enclosing the low-pressure water jets around the outside of each caisson, five tremie pipes that go through four manholes, and the central piling) could be cut by divers if the diving contractor decided that this was safe (or removed following demolition using explosives). Once the vertical structures had been removed, holes would be drilled into the concrete in a pattern, size and depth determined by the demolitions contractor. Charges would be placed in the concrete, then covered with sand, sandbags or other inert material selected by the demolition contractor (pers. comm., Kenny, Demex, 2002). This material would help contain the energy of the detonations, reduce the amount of explosives required (because the release of energy would be more efficient), and result in lower sound pressure levels (Section 3.3.2). Next, a berm would be built up around the outside of each caisson, using alternating bags of gravel and sand. This would also help contain the energy of the detonations, particularly in front of the opening made in the caisson jacket (see Appendix D for additional details).

The detonations would be timed so that the energy ripples through the concrete, shattering it into removable pieces (pers. comm., Kenny, Demex, 2002). A delay between sets of charges would keep sound pressure levels created by the detonations to a minimum. The work vessel would move off the detonation site on its moorings when the charges are about to be fired to minimize the post-detonation fumes causing a health risk to divers, other workers, or the general public on vessels in the vicinity of the former Platform Hazel site. The demolition contractor would determine the number and amount of charges required to safely and effectively perform the work and minimize adverse impacts to marine resources to the maximum extent feasible. After the detonations, the pre-cut caisson jackets would be removed. A small amount of excavation would be necessary to remove all temporary berm and inert packing materials.

Any vertical structures that are not removed before the detonations would be cut 5 feet (1.6 meters) below the natural mudline by divers and removed. Torches or mechanical cutting devices would be used to the maximum extent feasible to minimize the use of explosives. All materials would be lifted to the surface for placement on the work barge and taken to an approved onshore disposal site. The sections of the caissons remaining beneath the mudline, which do not contain toxic residues, would be left in place to avoid the extensive excavation that would be required to remove them.

### 2.2.3 Final Smoothing

Dredging would continue until the mounds are reduced to approximately the grade of the surrounding seafloor. The clamshell dredge would not be able to pick up all of the shell mounds materials without excavating additional volumes of native sediments. Upon completion, the seafloor would have an irregular topography caused by the action of the clamshell with some of shell mounds materials and pieces of debris mixed in with native sediments. In order to meet permit requirements, a “gorilla net” or similar heavy-duty net with a mesh size of 7.5 inches (23 cm), consistent with what has historically been allowed for commercial halibut trawling in State waters, would be used to remove remaining debris and obstructions, and smooth the seafloor. Debris captured in the net would be hauled to the surface and deposited on the vessel for subsequent disposal onshore. It is assumed that this debris would consist of relatively small volumes of concrete and metal rubble that would be off-loaded in port at the end of each day by the trawler and hauled to a permitted landfill or recycling facility by a licensed waste-disposal contractor. Trawling would systematically traverse each mound in a grid pattern until repeated passes resulted in no snags or further capture of debris. It is estimated that this final smoothing operation would require 2-3 days per mound, or 8-12 days total.

### 2.2.4 Transport and Disposal Options

Options for the transport and disposal of shell mound materials and caissons include offshore disposal at the LA-2 site (Figure 1-2), transport to and disposal at the POLB, and transport to POLB with subsequent trucking to a waste recycling facility in the southern San Joaquin Valley or to various landfills. Any large pieces of concrete caisson material remaining that could not be lifted with the clamshell bucket or with a crane could be shattered with additional charges. This was done during the Mobil Seacliff Pier Decommissioning Project (Howorth 1998). All bags of sand and gravel used to form the sound-attenuating berm would be removed after demolition activities had been completed. An alternative to additional blasting would be to excavate around the pieces, and then allow them to settle into the hollow, where they would be buried at least 5 feet (1.6 m) below the natural mudline.

#### *2.2.4.1 Offshore Disposal at LA-2*

Offshore disposal at the LA-2 site would be accomplished using bottom-dump barges. It is estimated that disposal of the 45,000 cy of material would require approximately 12 barge loads, transported from the shell mounds sites to LA-2 over a 12-day period.

#### *2.2.4.2 Beneficial Use of Dredged Material at POLB*

Beneficial use of the dredged material as construction fill may be possible at POLB, since the concentration of contaminants in the shell mounds dredge material would not likely affect the Port’s ability to accept the material (see Appendix E). Contingent upon the structural quality of the dredged material, as well as the timing of the project components, POLB has agreed to consider accepting the material for upland development projects planned at the Port. Dredged material would be transported to the POLB in approximately 12 barge loads over a 12-day dredging period. Dewatering of the materials at sea before bringing into the POLB would most likely need to occur in conjunction with implementation of this option, with the decant water discharged in accordance with applicable State and federal permit requirements. As discussed in Section 2.2.1, permit conditions on discharges of decant water from the shell mound sediments would most likely require some degree of settling and/or filtration to limit suspended solids prior to discharge. If approved, the Port would be able to accept all, or a portion of, the 45,000 cy of material. Any materials not accepted would be transported to an onshore recycling facility as discussed below or disposed of at the LA-2 site.

#### *2.2.4.3 Transport from POLB to an Onshore Recycling Facility or Landfill*

If POLB is not able to accept the dredged material for beneficial use, the material could be transferred from barge to container at the Port. As identified under the beneficial use option, material would be transported from the project site to POLB in approximately 12 barge loads over a 12-day dredging period. Based on information from Manson Construction, the material could be transferred to approved, rubber sealed “roll off” bins suitable for transportation. Bins would then be hauled to an approved recycling facility such as Envirocycle, in Taft, California (see Section 2.1.3.4), or an approved landfill (see Section 2.1.3.5). Bins with a capacity of 10 to 15 cy each could be transported two per truck, meeting highway weight requirements. This would entail approximately 2,000 truck trips of approximately 140 miles each way if all of the shell mound materials were to be transported to an onshore recycling facility or landfill.

### 2.2.5 Required Agency Approvals: Dredging

#### *2.2.5.1 Federal Authorizations*

Dredging is defined as “work” in navigable waters (33 CFR section 322.2(c)), and requires authorization from the USACE pursuant to section 10 of the Rivers and Harbors Act. The USACE would need to coordinate its approval with numerous agencies, including:

- NOAA Fisheries to ensure that the activity would not adversely affect federally listed threatened or endangered species, marine mammals, or Essential Fish Habitat of ground fish or managed fish species;
- the USFWS for onshore activities to ensure that the activity would not adversely affect federally listed threatened or endangered species; and
- the U.S. Coast Guard concerning potential impacts to other vessels that may operate in the vicinity of the shell mounds. To address this issue, a Notice to Mariners would need to be published and/or posted in advance of project activities.

Clean Water Act authorization would be required for all Program Alternatives (see Appendix E).

#### 2.2.5.2 State Authorizations

Dredging in State waters requires authorization from the CSLC and a coastal development permit (CDP) from the CCC. Dredging pursuant to a federal permit could also require a determination by the CCC that the federally permitted activities are consistent with the provisions of the California Coastal Management Program (CCMP). A section 2081 permit from the CDFG would be required if State-listed threatened or endangered species could be adversely affected by project activities. The CDFG may also require a permit if project activities could affect fisheries. Discharge of decant water from barges would require authorization from the RWQCB pursuant to CWA section 402 and/or the Porter-Cologne Water Quality Control Act.

### 2.2.6 Required Agency Approvals: Disposal of Materials

#### 2.2.6.1 Federal Authorizations

Ocean disposal of dredged material requires authorization from the USACE under CWA section 404, section 10 of the Rivers and Harbors Act, and MPRSA section 103. For ocean disposal to be approved, the USEPA and the USACE must certify that the dredged material has been tested and that it does not exceed contamination thresholds developed by the USACE and the USEPA.[4] A section 401 water quality certification would be required to validate the section 404 permit, and a section 402 waste discharge permit may be required for upland disposal of dredged material and debris. Other federal approvals are similar to those discussed in Section 2.2.5.1.

Upland disposal could be authorized if the dredged material tests results show that contamination in the dredge material exceeds the thresholds for ocean disposal, but is below the thresholds developed by the RWQCB (see Section 2.1.3.2) at 22 CCR section 66261.24. The USACE would likely require a public interest evaluation of factors such as air quality and transportation since trucks or other land-based hauling methods would be used to move material from a handling location at POLB to the designated disposal site; this would occur during the USACE's section 10 permit evaluation process.

#### 2.2.6.2 State Authorizations

State authorizations would be similar to the federal requirements described in Section 2.2.6.1 and to the State requirements discussed in Section 2.2.5.2. Rather than a section 402 pollutant discharge permit from the RWQCB, ocean disposal of dredged material would require a section 401 certification from the RWQCB to validate the section 404 discharge permit issued by the USACE (CWA section 401 provides for State certification of federal permits allowing discharge of dredged or fill material into waters of the United States).

---

[4] Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual. 503/8-91/001. Office of Water 4504F. U.S. EPA and U.S. Army Corps of Engineers. 1991.

## 2.3 PROGRAM ALTERNATIVE 2 (PA2): LEVELING AND SPREADING OF SHELL MOUNDS WITH CAISSONS REMOVAL AND DISPOSAL

### 2.3.1 Project Description

This Program Alternative is intended to make the CLSC lease areas "trawlable" by flattening out each shell mound and removing large debris and caissons that would obstruct trawling.

The leveling/spreading operation is estimated to have operating parameters similar to those of Program Alternative 1, but to require less time to complete (approximately 7 days total). A clamshell dredge, operated from a derrick barge moored near the center of each shell mound with a 3- or 4-point anchor system, would excavate and disperse loose material around each of the existing mounds. At the Hazel site, the mounds would first be excavated in order to facilitate mechanical cutting and for the placement of explosive charges, and the caissons would be cut, demolished, and removed as described in Section 2.2. Large debris and caisson materials would be hauled to the surface and transported by barge and tug for disposal as described under Program Alternative 1. Shell mound materials and pieces of debris would be dispersed within an approximately 100 m (330 foot) radius of each platform site which is well within the 300 m (1,000 foot) area previously cleared of debris by Chevron during the 4H abandonment process. This would result in an average thickness of approximately 1 foot (0.3 m) of sediment.

Final smoothing of the seafloor and removal of small debris would be conducted by trawling as described for Program Alternative 1, using a "gorilla net" or similar heavy-duty net with a mesh size of 7.5 inches (23 cm), consistent with what has historically been used for commercial halibut trawling in State waters. Debris captured in the net would be hauled to the surface for subsequent disposal onshore. It is assumed that this debris would consist of relatively small volumes of concrete and metal rubble that would be off-loaded in port at the end of each day by the trawler and hauled to a permitted landfill or recycling facility by a licensed waste-disposal contractor. Trawling would systematically traverse each mound in a grid pattern until repeated passes resulted in no snags or further capture of debris. It is estimated that this final smoothing operation would require 2-3 days per mound, 8-12 days total.

### 2.3.2 Required Agency Approvals

Federal requirements would be similar to those described in Section 2.2.6.1 for ocean disposal of dredged material. Ocean disposal would only be authorized if test results show that any contamination in the dredge material is below the thresholds developed by the USACE and the USEPA. Other coordination responsibilities of the USACE would be required, as described in Section 2.2.5.1. State agency approvals would be similar to the requirements identified in Sections 2.2.5.2 and 2.2.6.2.

## 2.4 PROGRAM ALTERNATIVE 3 (PA3): CAPPING

### 2.4.1 Project Description

The goal of in-place capping would be to meet the trawlability requirement while preventing the release of contaminants from the shell mounds. Requirements for the design, implementation, and long-term monitoring of a subaqueous capping project are described by the USACE (1998). The present conceptual design of Program Alternative 3 (PA3) involves the use of clean sediments dredged from POLA/POLB that would otherwise be disposed of at the LA-2 disposal site. Local sources in the Santa Barbara-Ventura area are not considered feasible because local beach nourishment needs would take precedence. Sufficient suitable material would, therefore, need to be obtained from the POLA/POLB and “diverted” from LA-2 to the shell mounds, or acquired from other approved sources. PA3 requires the use of an existing approved source of clean, dredged sediment for capping. The use of a borrow site – which does not currently exist – as a source of sediment is not considered under PA3.

The design (i.e., thickness and composition) of each cap depends on a variety of considerations, including bottom-current conditions and data on potential contaminant leaching. The Mussel Study indicates that bottom currents have relatively low velocities. Scouring of the mounds by bottom currents has not been apparent in the years since platform removals; the outer layer of shells and natural sediments appears to function as a cap that should, as long as it remains intact, prevent the escape of contaminants from the deeper layers. As a result, the main purpose of capping would be to protect the mounds from erosive forces, including trawling, that would cause the release of contaminants. Accordingly, clean, fine-sandy material obtained from navigational dredging projects, with a nominal thickness of 3 feet (0.9 m), is considered a reasonable design for this Program Alternative. In any case, capping the shell mounds sites would be somewhat experimental, and would require long-term monitoring, as addressed in USACE (1998), to evaluate the stability of the cap and the extent, if any, of contaminant leaching through the cap. Provisions would need to be established for periodic replenishment of the cap should the monitoring program indicate that the cap itself were eroding.

Capping operations would start with the collection and transport of the cap material to the site. The material would be deposited on and near the shell mounds through either a bottom-dump barge or a down-pipe (the latter would more directly deposit the cap material onto the shell mound itself). The volume of material required would be determined through engineering design studies that would specify the slope angle required to maintain the material in place. Assuming a 4 to 6 percent slope, 611,505 to 1,432,386 cy of capping material would be required to cover the four mounds. A 3,600-cy barge could transport 2,160 cy of capping material, since 40 percent of the barge’s capacity would be water due to the nature of hydraulically dredged sediments. With an effective capacity of 2,160 cy, between 284 and 664 barge trips would be required to transport cover material to the mound sites. The estimated time for capping operations, assuming an adequate supply of sediment, ranges from 71 to 166 days for creation of a

6 percent and 4 percent slope, respectively. Capping could be phased based on availability of capping material.

### 2.4.2 Required Agency Approvals

Valente (2002) and USACE (1998) address many of the permitting and monitoring requirements associated with the designation of an ocean disposal site. At the federal level, capping the shell mounds sites may require preparation of an EIS prior to an USEPA and/or USACE designation of the mounds as disposal sites under MPRSA section 103. Section 404/10 authorizations from the USACE would be required for discharge of fill material. Other coordination responsibilities of the USACE are also required, as described in Section 2.2.5.1. At the State level, a section 401 water quality certification would be required from the RWQCB to certify that the fill material is "clean" and would not affect water quality. Other State agency approvals would be similar to those identified in Sections 2.2.5.2 and 2.2.6.2.

## 2.5 PROGRAM ALTERNATIVE 4 (PA4): ARTIFICIAL REEFS AT ALL FOUR SHELL MOUNDS

### 2.5.1 Project Description

Consistent with State policies on artificial reef construction (CDFG 2001b) and based on the increased diversity and abundance of epifauna and fish found at nearby rock features (de Wit 1999), the high-relief habitat of the existing shell mounds could be enhanced by placing armor rock or concrete structures around the perimeter of each mound.[5] The reef materials would be 2 to 3 feet in diameter and would be placed in a continuous "ring" around each mound. The exposed concrete platform legs atop the caissons at the Hazel site, and the caissons themselves, would remain in place. The diameters of the exposed portions of the shell mounds range from 170 to 250 feet (51.8 to 76.2 m), averaging 677 feet (206 m) in circumference (de Wit 2001). Based on those calculations, and assuming three layers of 3-foot-diameter rock would be needed to encircle each mound, approximately 10,000, 1.0-ton to 1.5-ton rocks would be needed to completely surround the four mounds. Rock would be obtained from an existing quarry at Santa Catalina Island and transported to the sites via barge.

The "reef" would be comprised of a base layer of one to three rocks wide topped by a one-rock layer; vertical relief would be up to 6 feet around the shell mound perimeter. Previous research suggests that shell material extends beyond the area depicted in side scan sonar records by at least 100 feet (de Wit 1996 and 1999); thus, the reef could be placed close to the exposed shell material, but not directly on the mound. Placing the rock immediately around the exposed shell areas of the mounds would not significantly

5 The CDFG specifies that artificial reef material should be: (1) persistent; (2) of a specific gravity twice that of seawater; (3) free of potentially toxic materials; and (4) constructed of either rock or concrete pieces with no exposed metal and between 2 and 6 feet in diameter. The use of quarried armor rock would meet all of these specifications.

increase the footprint of the mounds; and it would reduce the chance of exposing or resuspending drill muds and cuttings within the mounds as placement would not occur on the mounds.

A 60-foot-wide by 200-foot-long rock barge could transport approximately 2,200 tons (1,500 to 2,200 rocks), with five to seven barge trips required for all four sites. An average of two barge loads per mound is expected. A derrick barge of similar size would be used to place the rock around the shell mounds. One or two tugs (for towing the rock barges and placing anchors) and a diver-support vessel would also be needed. A bucket capable of holding up to five rocks each would be used to place the rock. The bucket would be lowered from the deck of the rock barge to the seafloor and then tipped to create a base layer. A second "drop" would place the top layer of rock on the base. The rock barge and derrick barge would be moored near the center of the shell mound with a three- or four-point anchor system and would move around the perimeter of the mound during the construction process. Operations would be conducted during daylight hours, and rock placement would take approximately 4 days per shell mound site. The total time needed to select a contractor, mobilize the construction effort, and place the rock at the four mounds is expected to be approximately 20 weeks.

The United Anglers of Southern California (UASC) has suggested that the artificial reefs could be enhanced by the placement of structures manufactured from recycled concrete (e.g., light standards or hollow reef balls manufactured from recycled concrete) over the tops of the mounds (letter from UASC, October 14, 2002; pers. comm., T. Raftican, UASC 2002). This would increase the amount of vertical relief, surface area of hard structures, and potential habitat complexity, and would have the additional benefit of armoring the exposed tops of the shell mounds.

This Program Alternative would include a long-term monitoring program to assess the development of hard-bottom habitat and its use by fishes and invertebrates, focusing on species of recreational, commercial, or scientific interest, including white abalone *(Haliotis sorenseni)*, giant (black) sea bass (*Stereolepis gigas*), and bocaccio (*Sebastes paucispinis*) and other depleted species of rockfish. It is also recommended that this Program Alternative be combined with funding in support of habitat enhancement for juvenile halibut (*Paralichthys californicus*) in Carpinteria Marsh (as discussed in Section 2.7).

### 2.5.2 Required Agency Approvals

Section 404/10 authorizations from the USACE would be required for this discharge of fill material. The USACE would also evaluate the design of the proposed reef in accordance with 33 CFR section 322.5(b)(1)(2) to ensure that the project is consistent with the National Artificial Reef Plan developed pursuant to the National Fishing Enhancement Act (1984). Other coordination responsibilities of the USACE would be required, as described in Section 2.2.5.1.

At the State level, the CDFG policy on artificial reef construction requires review and approval of artificial reef designs and potential effects on fisheries. In addition, a section

401 water quality certification would be required from the RWQCB to certify that the fill material would not affect water quality, and is "clean." Other State agency approvals would be similar to those identified in Sections 2.2.5.2 and 2.2.6.2.

## 2.6 PROGRAM ALTERNATIVE 5 (PA5): ARTIFICIAL REEF AT HAZEL AFTER REMOVING OR SPREADING SHELL MOUNDS

### 2.6.1 Project Description

An artificial reef could also be constructed at the Hazel Platform site only following removal of the shell mounds as an alternative to demolishing the caissons with explosives. The vertical relief afforded by the caissons minus the shell mound materials could provide the cornerstones for a reef of approximately 1 acre. Quarry rock would be used to fill in the area between and around the caissons. A 1-acre reef at the Hazel site, in 90-100 (27-30 m) feet of water would be within the range of size, depth, and materials construction of other artificial reefs constructed in southern California waters (CDFG 2001b), but have much higher relief, extending 20-25 feet above the bottom, owing to the caissons. The same quantity of rock that would be used to encircle the four shell mounds under Program Alternative 4 would be used to provide the 1-acre boulder matrix for an artificial reef at the Hazel site.

Program Alternative 5 has two sub-alternatives as described below.

1. **5a: Artificial Reef at Hazel Site plus Removal and Disposal of Shell Mounds**. This alternative would employ the same methods of dredging and materials disposal as Program Alternative 1. Following the completion of dredging, disposal, and final site smoothing, quarry rock or other approved reef materials would be brought to the Hazel site by barge as described in Program Alternative 4. The rocks would be placed between and around the four caissons in one to two layers to cover the seafloor and provide 3-6 feet of vertical relief that would supplement the vertical relief provided by the caissons.
2. **5b: Artificial Reef at Hazel Site plus Leveling and Spreading Shell Mounds**. This alternative would employ the same methods of leveling and spreading as Program Alternative 2. Following the completion of spreading, quarry rock would be brought to the site and used to augment the reef as in Program Alternative 5a above.

### 2.6.2 Required Agency Approvals

For sub-alternative 5a, the same approvals as are required for Program Alternative 1 would be required for the dredging and disposal of shell mound materials. For sub-alternative 5b, the same approvals as are required for Program Alternative 2 would be required for the leveling and spreading of shell mound materials. Both sub-alternatives would require section 404/10 authorizations from the USACE for discharge of fill material. The USACE would also evaluate the design of the proposed reef in accordance with 33 CFR section 322.5(b)(1)(2) to ensure that the project is consistent with the National Artificial Reef Plan developed pursuant to the National Fishing

Enhancement Act (1984). Other coordination responsibilities of the USACE are as described in Section 2.2.5.1.

At the State level, the CDFG policy on artificial reef construction requires review and approval of artificial reef designs and potential effects on fisheries. In addition, a section 401 water quality certification would be required from the RWQCB to certify that the fill material would not affect water quality, and is "clean." Other State agency approvals would be similar to those identified in Sections 2.2.5.2 and 2.2.6.2.

## 2.7 PROGRAM ALTERNATIVE 6 (PA6): OFFSITE MITIGATION

### 2.7.1 Project Description

Under Program Alternative 6, the shell mounds and caissons at the Hazel location would be left in their current condition. Under this Program Alternative, ChevronTexaco proposed, in its comments on the NOP, to provide state-of-the-art global positioning system (GPS) equipment to assist local fishers to avoid the shell mounds while still allowing them to navigate closer to the mounds and nearby associated fishing areas. ChevronTexaco has also suggested consideration of onsite or offsite habitat enhancements to mitigate the effects of the shell mounds on local fishing interests.

The UASC has suggested several possible onsite and offsite fisheries enhancement measures (letter from UASC, October 14, 2002; pers. comm., T. Raftican, UASC 2002). These include: 1) support for a program of habitat enhancement for juvenile halibut (*Paralichthys californicus*) in Carpinteria Marsh (the shell mounds occupy soft-bottom substrate that historically supported halibut, and Carpinteria Marsh is an important nursery site for juveniles); 2) support for research on giant (black) sea bass (*Stereolepis gigas*) habitat use and migration; and 3) support for research on bocaccio (*Sebastes paucispinis*) and other depleted species of rockfish.

The recently completed *Carpinteria Salt Marsh Enhancement Plan* includes subtidal habitat restoration measures that would be appropriate as offsite mitigation for the shell mounds. The relevant measures involve the removal (by dredging) of accumulated sediment to restore subtidal habitat and improve tidal circulation throughout the marsh. This component of the enhancement plan is not presently funded or earmarked as mitigation for other programs, and would restore and enhance habitat that supports juvenile halibut, as well as starry flounder, kelp bass, and other fishes. According to Andy Brooks (pers. comm., Reserve Manager, 2003), sediment removal would restore/enhance 100 to 150 acres of subtidal habitat, and would benefit the marsh ecosystem as a whole. The Santa Barbara County Flood Control and Water Conservation District (SBCFCWCD 2003, SCH 2003021016) has completed a Final EIR on the enhancement plan, including this component. The accumulated sediment derives from erosion in the watershed, and would probably be suitable for use in local beach nourishment.

### 2.7.2 Required Agency Approvals

No federal approvals would be necessary to leave the mounds and caissons in place. The existing CSLC approval and CCC's CDP for the 4H Decommissioning Project would need to be amended to authorize abandonment of the mounds and caissons. State and federal approvals would likely be required for any mitigation projects selected. The restoration and enhancement of subtidal habitat at Carpinteria Salt Marsh by removal of accumulated sediment has been evaluated under the CEQA (SBCFCWCD 2003, SCH 2003021016), and that document would serve as the basis for permitting.

## 2.8 NO PROJECT ALTERNATIVE

### 2.8.1 Project Description

The No Project Alternative would maintain the status quo, leaving the shell mounds in place and unmodified. This alternative (State CEQA Guidelines section 15126.6[e]) is equivalent to the NEPA No Action Alternative.

In their present configuration, the shell mounds would continue to impede bottom trawling in the vicinity. Whether the shell mounds would remain stable, be eroded by natural or human causes, or be very gradually covered by sedimentation, in the long term cannot be accurately predicted.

### 2.8.2 Required Agency Approvals

The existing CSLC approval and CCC's CDP for the 4H Decommissioning Project would need to be amended to authorize abandonment of the mounds and caissons.