MINUTE ITEM

This Calendar Item No. 27 was approved as Minute Item No. 27 by the State Lands Commission by a vote of 3 to 0 at its 4/24/86 meeting.

CALENDAR ITEM
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APPROVAL OF A NON-EXCLUSIVE GEOPHYSICAL SURVEY PERMIT ON TIDE AND SUBMERGED LANDS UNDER THE JURISDICTION OF THE STATE LANDS COMMISSION

APPLICANT: Chevron U.S.A.
Attn: Art Boehm
6001 Bollinger Canyon Road
San Ramon, California 94583

PROPOSED AUTHORIZATION
Approval of a Non-Exclusive Geophysical Permit for three years to conduct geophysical surveys on tide and submerged lands in Suisun and Grizzly Bays under the ownership jurisdiction of the State Lands Commission as depicted on Exhibit "A", attached hereto.

TERM: The term of the Non-Exclusive Geophysical Survey Permit is three years.

PREREQUISITE CONDITIONS, FEES AND EXPENSES:
Fully executed documents and performance bond have been received.

STATUTORY REFERENCES:
A. P.R.C. Section 6826.

B. Cal. Adm. Code, Title 2, Article 2.9, Section 2100.

C. Cal. Adm. Code, Title 2, Section 2905(e)(3).

OTHER PERTINENT INFORMATION:
1. Pursuant to the Commission's delegation of authority and the State CEQA Guidelines (14 Cal. Adm. Code 15025), the staff has

prepared and circulated for public review a Proposed Negative Declaration identified as EIR ND 396, State Clearinghouse 85052814 pursuant to the provisions of the CEQA.

Based upon the Initial Study, the Proposed Negative Declaration, and the comments received in response thereto, there is no substantial evidence that the project will have a significant effect on the environment (14 Cal. Adm. Code 15074(b)).

2. This activity involves lands identified as possessing significant environmental values pursuant to P.R.C. 6370, et seq. Based upon the staff's consultation with the person nominating such lands and through the CEQA review process, it is the staff's opinion that the permit as part of the program for the project, as proposed, is consistent with its use classification.

AB 884: 07/10/86.

EXHIBITS: A. Permit Regions.
B. Negative Declaration.

IT IS RECOMMENDED THAT THE COMMISSION:

1. CERTIFY THAT A NEGATIVE DECLARATION, EIR ND 396, STATE CLEARINGHOUSE #85052814 ATTACHED AS EXHIBIT "B" AND INCORPORATED BY REFERENCE WAS PREPARED FOR THIS PROJECT PURSUANT TO THE PROVISIONS OF THE CEQA AND THAT THE COMMISSION HAS REVIEWED AND CONSIDERED THE INFORMATION CONTAINED THEREIN.

2. DETERMINE THAT THE PROJECT, AS APPROVED, WILL NOT HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT.

3. FIND THAT THIS ACTIVITY, AS APPROVED, IS CONSISTENT WITH THE USE CLASSIFICATIONS DESIGNATED FOR THE LANDS PURSUANT TO P.R.C. 6370. ET SEQ.

4. AUTHORIZE ISSUANCE TO CHEVRON USA OF A NON-EXCLUSIVE GENERAL PERMIT TO CONDUCT GEOPHYSICAL SURVEYS AS DEFINED ON EXHIBIT "A" HERETO, FOR THE PERIOD MARCH 27, 1986 THROUGH MARCH 26, 1989 ON STATE-OWNED LANDS WITHIN SUISUN AND GRIZZLY BAYS.

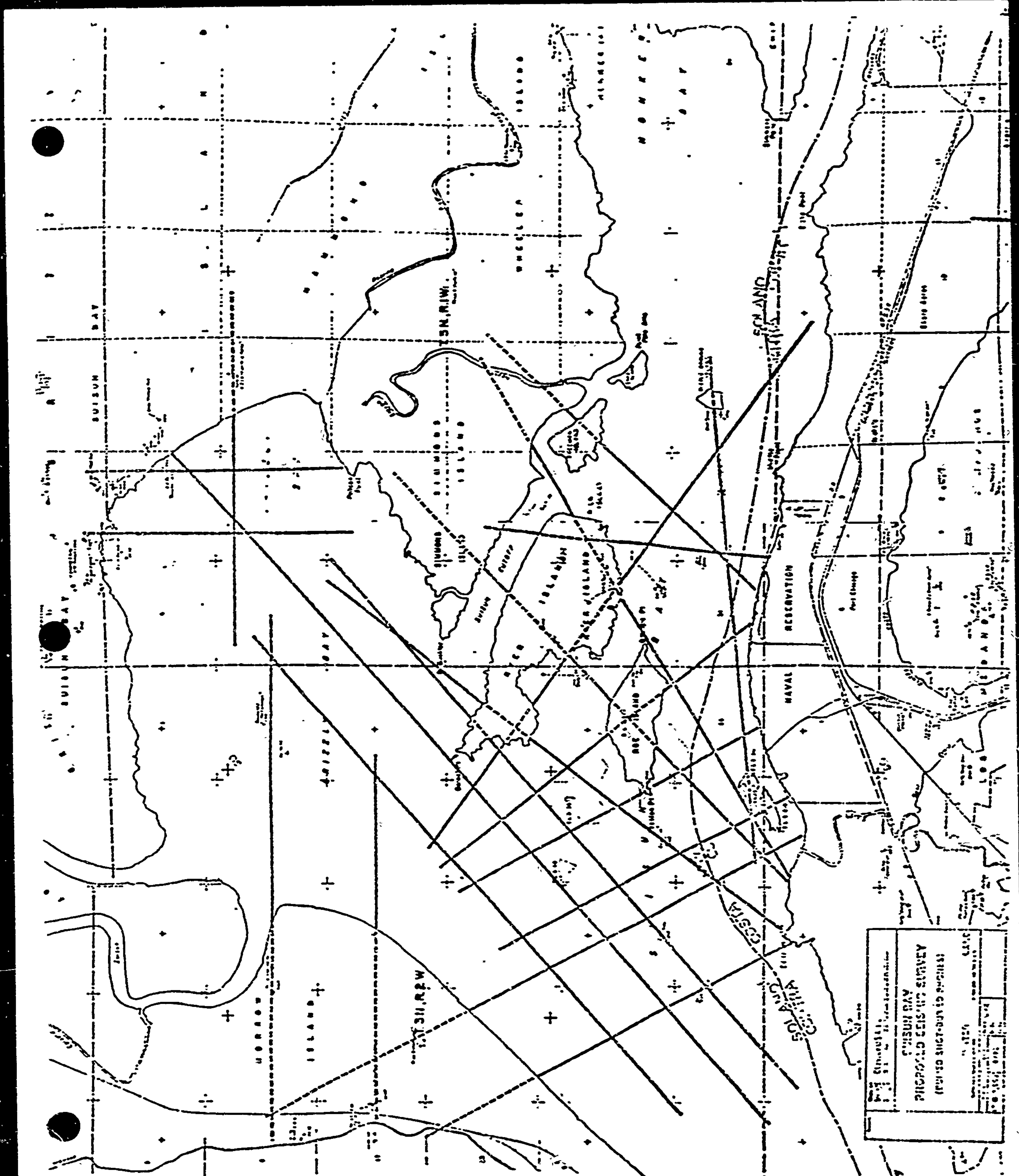

EXHIBIT A

CALENDAR PAGE 142

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EXHIBIT B

STATE OF CALIFORNIA–STATE LANDS COMMISSION

GEORGE DEUKMEJIAN, Governor

STATE LANDS COMMISSION
1807 13TH STREET
SACRAMENTO, CALIFORNIA 95814

PROPOSED NEGATIVE DECLARATION

EIR ND 396

File Ref.: W 40491

SCH#: 85052814

Project Title: Suisun Bay Seismic Survey

Project Proponent: Chevron USA, Inc.

Project Location: Suisun and Grizzly Bays, Solano and Contra Costa Counties.

Project Description: Chevron USA proposes to conduct a seismic survey over state-owned tide and submerged lands. The purpose of the survey is to determine the extent of gas reserves and feasibility of installing more gas producing wells on lands under lease to Chevron. The survey will be conducted by detonating buried explosive charges and recording the travel time of the resulting seismic waves with microphones. 89.3 line miles are involved; 72.7 miles of these are in tidelands. The explosive charges and microphones will be set up along the lines, every 100 feet, and will be detonated singly.

Contact Person: Dwight E. Sanders Telephone: (916)322-7827

This document is prepared pursuant to the requirements of the California Environmental Quality Act(Section 21000 et seq., Public Resources Code), the State CEQA Guidelines(Section 15000 et seq., Title 14, California Administrative Code), and the State Lands Commission regulations(Section 2901 et seq., Title 2, California Administrative Code).

Based upon the attached Initial Study, it has been found that:

[x] the project will not have a significant effect on the environment.

[ ] mitigation measures included in the project will avoid potentially significant effects.

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Form 13.17 (5/85)

W 40491
SCH # 85052814

Written comments on the project described were received from two agencies: Department of Water Resources, Central District and Bay Area Conservation and Development Commission.

Department of Water Resources, Central District

Comment: Abandonment and destruction of test holes is regulated by Solano and Contra Costa Counties.

Response: None required.

Bay Area Conservation and Development Commission

Comment: The environmental study indicates that the drilling spoils will be brought up to the drill barges through the drill casings and then dumped overboard. The dumping will increase sedimentation of the water column although the environmental study indicates the impact will be insignificant. Given that the volume of spoils is relatively small, and that the operation will require bringing the spoils up to the drill barges anyway, it may not be unreasonable to dispose of the spoils at a dry land site or at a Corps approved Bay disposal site. Therefore, we believe the environmental document should address the feasibility of disposing of the spoils in this manner.

Response: The Initial Study erroneously states that drilling spoils are retrieved. In fact they do not come on board the vessel but are sidecast as they leave the drill hole at the bay floor. To retrieve the spoils would require dredging, increasing the impact of the activity.

Comments: Based on the information contained in the environmental study, none of the direct impacts of Chevron's project appear to be significant. However, the study does not address the cumulative impact of the project in relation to other geophysical survey work that is proposed or could occur in Suisun Bay.

Response: Information available to the SLC suggests that there will be only a limited number of geophysical surveys conducted within Suisun Bay. Two are proposed at this time: The Chevron survey described here and a much smaller survey proposed by Hershey. The SLC doubts there will be substantial additional surveying in the Bay during the next five to ten years for the following reasons:

First, Chevron and Hershey presently operate most of the oil and gas leases in the Suisun Bay region. Secondly, surveys of the type cost here have such high equipment, labor and analytic costs that data is not collected without a compelling need. Although it cannot be stated conclusively that there will be no more surveys of this type in the Bay in addition to those proposed this summer, we do not anticipate further much activity for the next several years.

Suisun Bay Seismic Survey

I INTRODUCTION

This report has been prepared to describe the potential environmental impacts of a seismic survey by Chevron USA, Inc., in Suisun Bay, including Grizzly Bay, California. The report supports Chevron's request for a permit from the California State Lands Commission for the seismic operation. The State Lands Commission requires project approval from agencies such as the San Francisco Bay Conservation and Development Commission (BCDC) before issuing the permit. This report provides the information necessary for BCDC to evaluate the environmental impacts of the seismic operations taking place on open water in the bays. A separate permit has been obtained from BCDC for marsh and upland operations (BCDC Marsh Development Permit No. MS5-56(M), Appendix A).

Approximately 28 gas wells presently are producing in Suisun Bay and the surrounding marsh. Chevron's proposed survey is to determine the extent of the gas reserves and the feasibility of installing more wells. Previous seismic surveys have been attempted in Suisun Bay and marsh from the early 1940s through 1983, including a number of lines using methods very similar to those proposed here. However, the data from these previous studies were not conclusive due to technical problems so Chevron is commissioning a new seismic survey.

II DESCRIPTION OF THE PROPOSED ACTION

The seismic survey is to take place along a number of lines across Suisun Bay, shown on Figure 1. These lines total about 89.3 miles, and approximately 72.7 of these miles are in the water. The first season of the seismic survey is planned for late spring through autumn, 1986 and it is estimated that at least two seasons will be required to complete the work.

The seismic survey will be conducted by detonating buried explosive charges and recording the travel time of the resulting seismic waves with microphones. The explosive charges and microphones will be set up every 100 feet along the lines, for a total of about 3900 charges. Each seismic charge will be detonated individually.

Chevron proposes to bury the explosive charges approximately 100 feet down into the sediment layer, measured from the bottom of the water column, in order to place the charges below the soft, energy-absorbing mud layer. Hole diameters will be 3 7/8 to 4 3/4 inches. Drilling will be done through a casing, so the drilled soil will be brought up through the casing onto the drill barge and then dumped overboard. A disposable downhole hydrophone and an explosive charge will be buried in each hole and the drill casings will be removed. A total of approximately 35 holes will be drilled per day by three crews.

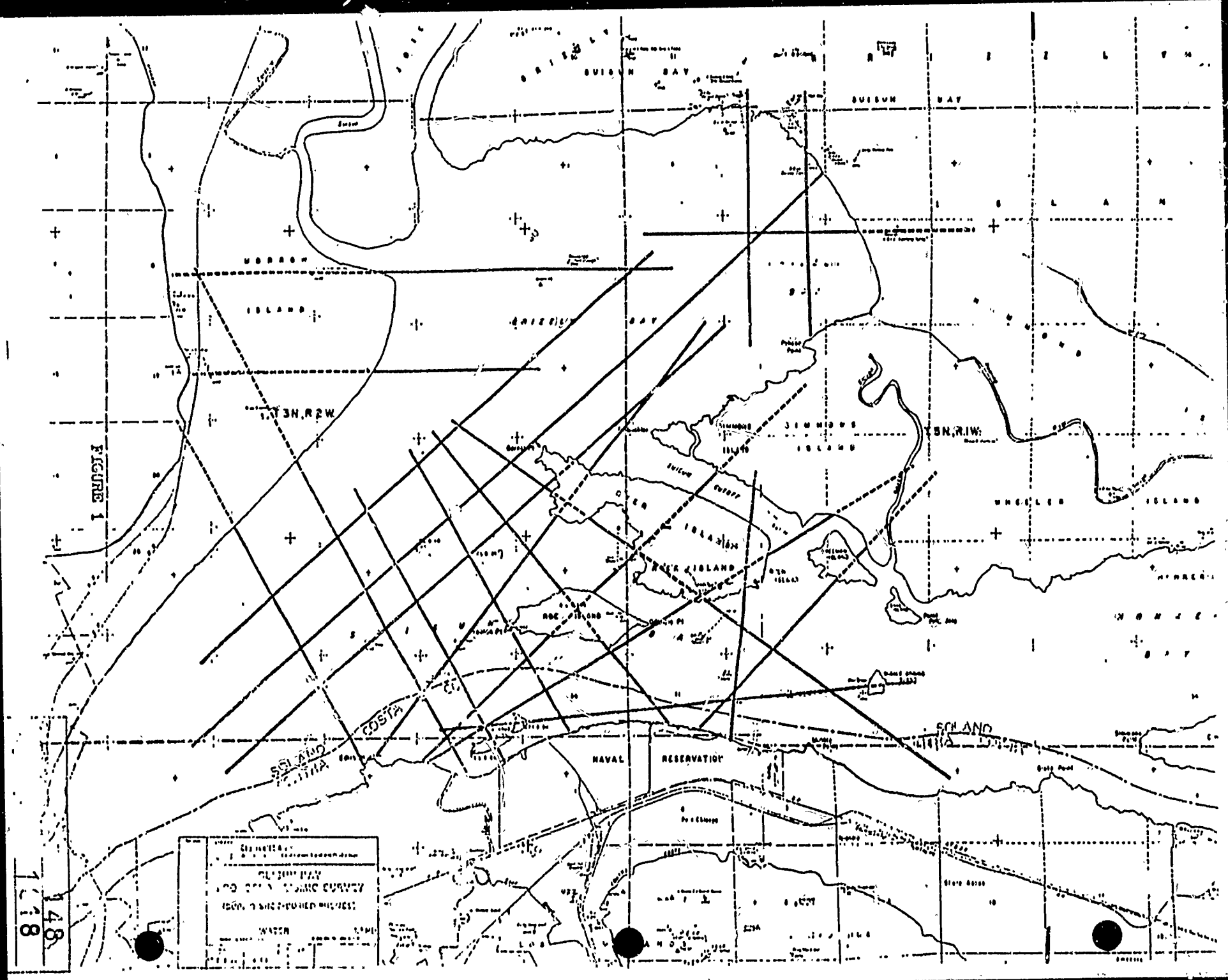
SUISUN BAY
SUISUN BAY
MONROE
ISLAND
3N,R2W.
3N,R1W.
SIMMONS
ISLAND
WHEELER
ISLAND
HONKER
BAY
NAVAL
RESERVATION
SOLANO
COSTA
SOLANO
WATER

FIGURE 1

Chevron expects that 20-pound charges of high-speed seismic dynamite will suffice for high quality seismic data, but a determination will have to be made in the field if larger charges, up to 50 pounds, are needed.

A second hydrophone will be placed on the bottom of the bay next to the top of each hole to measure the travel time of the seismic wave up the hole. The downhole and uphole hydrophones will be attached via cable to data transmitting equipment which will be mounted on floats. A second set of hydrophones will be laid along the seismic line on the bottom of the bay. This second set will consist of a cable about 4,800 feet long, with a spread of 12-18 hydrophones every hundred feet. This cable will be moved along the seismic line as the charges are detonated.

The steps followed by the seismic crew in shooting a seismic line are:

1. A survey boat drops positioning buoys at shot locations every 100 feet along the line.

2. The drill barges move down the line, drilling the holes and loading the charges and hydrophones. Approximately 10-15 holes can be drilled per day by each barge.

3. The 4,800-foot hydrophone cable is laid along the line and remote telemetry units are attached to the downhole hydrophone leads. These telemetry units are float-mounted devices that transmit the hydrophone data to a recording boat. The long hydrophone cable connects directly to the data-recording boat.

4. A shooter moves along the line and detonates each shot and the data is recorded. The shooter recovers the leads from the downhole hydrophone and the blasting cap wires.

5. After the entire line is shot, the buoys, telemetry floats, and all hydrophones and cables are removed.

Field equipment that may be used in the open water, depending on Chevron's seismic contractor, includes:

3 drill rigs mounted on pontoons with 25-foot anchoring spuds
2 drill rigs mounted on tracked amphibious marsh buggies
2 pontoon barges with 25-foot anchoring spuds carrying recording instruments, generator, and explosives magazine
3 tracked amphibious marsh buggies
2 22-passenger crew boats
8 outboard-powered skiffs.

III DESCRIPTION OF THE AFFECTED ENVIRONMENT

The affected environment is the open waters of Suisun Bay, including Grizzly Bay, and the Sacramento River in which the seismic survey will take place (see Figure 1). The marsh and dry-land environments are not included because work in those areas has already been approved by BCDC. A more complete description of this environment is contained in the Suisun Marsh Protection Plan

(California Department of Fish and Game, 1975) from which much of the following was extracted.

A. Geology

The geologic features of interest in this report are the sediment layers underlying Suisun Bay. Beneath the water column in most of the bay lies a layer of soft silt known as bay mud, approximately 100 feet thick. Underneath the mud lies a harder layer of sand and sandy clay. It is because the bay mud absorbs seismic shock very well that Chevron will drill through the mud and place the seismic charges and hydrophones in the harder underlying layer. In the ship channels and in some of the deeper parts of the bay where tidal currents are strong, the bottom consists of sand (US Fish and Wildlife Service and California Department of Fish and Game, 1979).

B. Hydrology and Water Quality

The hydrologic features in which this project will take place are Suisun Bay including Grizzly Bay and the ship channel, Suisun Cutoff, and 5 miles of the Sacramento River upstream from Honker Bay. These waters are part of a tidally influenced estuarine system. Depths vary from 30 to 50 feet in the river and ship channel, from 1 to 5 feet in Grizzly Bay, and from 1 to 20 feet in Suisun Bay. There are strong tidal currents in Suisun Bay, so the system is well mixed. Average (root mean squared) current velocities in the bay range from about 0.7 feet per second in the perimeter of the bay to about 1.6 feet per

second in the channels (Cheng and Gartner, 1984). Peak current velocities range from 1.3 to 4.3 feet per second. Waves from the frequent winds across the bay are also important causes of turbulent mixing.

Important water quality issues in this estuary include suspended solids and turbidity, and salinity. This region is within the gradient between saltwater and freshwater, and maintenance of the gradient is very important for aquatic life. The location of the gradient varies seasonally due to fluctuations in the discharge of freshwater from the Sacramento and San Joaquin rivers (California Department of Water Resources, 1984b).

The frequently high turbidity of these waters is a limiting factor on the primary productivity in the Suisun Bay, since the availability of sunlight to algae for photosynthesis is reduced. Data collected at several stations within Suisun Bay and the Sacramento River by the California Department of Water Resources (California Department of Water Resources, 1983, 1984a) show that turbidity and suspended solids levels vary over a wide range and can change significantly at one location during one day due to tidal and wind mixing. Seasonal fluctuations in suspended loads are caused by changes in the water and sediment discharges of the Sacramento and San Joaquin rivers, and by the location of the 'entrapment zone', the zone where the salinity gradient causes small suspended particles to settle out. Turbidity and suspended solids are normally lowest in summer due to low river flows and because the entrapment zone is upstream of Suisun Bay. Turbidity is normally higher in the marsh sloughs than in the open bay waters.

Suspended solids concentrations have been measured from 4 to 120 milligrams per liter in the bay. Turbidity in Suisun Marsh ranges from 2 to 1,500 Formazin turbidity units, with a mean of 52 (California Department of Water Resources, 1984b). The depth of the euphotic zone (depth where 1% of surface light penetrates) ranges from approximately 1 to 6 feet (California Department of Water Resources, 1983 and 1984a).

To estimate the sediment yield to the region, data from the Sacramento River at Freeport and the San Joaquin River at Vernalis (the two sampling stations closest to the delta) were combined to calculate an approximate average sediment yield to the Delta region of 1880 tons per day (raw data from: US Geological Survey, 1984).

C. Air Quality

Air quality in the Suisun Bay region is affected by vehicle emissions, nearby industrial sources, grass fires and intentional burning, and by emissions from the more highly developed San Francisco Bay areas that are often upwind. However, Suisun Bay is normally very well ventilated by steady winds in the summer.

D. Aquatic Life

The waters examined in this report are extremely important for the spawning, incubation, an migration of a number of fish species (California Department of Fish and Game, 1968). There are three annual runs of adult King salmon that pass through Suisun Bay and up

the Sacramento River- the fall, winter, and spring runs. The spring upstream run peaks in May and June, so will be present during this seismic program. Downstream migration of smolts peaks in April through June, with a smaller peak in the late fall, but are at an annual minimum during July and August (California Department of Fish and Game, 1968; Stevens, 1985). The California Department of Fish and Game presently stocks salmon smolts downstream of Suisun Bay so those smolts will not be in the study area. The spring upstream run and the peak downstream smolt migration will be in Suisun Bay during May and June, but otherwise there will be relatively few salmon in the bay during the seismic survey.

Steelhead trout also migrate through the bay and Sacramento River. Migration begins in July and peaks in September and October as adults move up through the bay into the Sacramento River in order to spawn in winter and early spring. Migrations of young smolts moving back towards the ocean take place in March through May, with another small peak in September.

Striped bass reproduce in the sloughs of Suisun Bay, in the delta, and in the Sacramento River; the peak migration and spawning season is in April through June, though there is considerable variation between and during years. The young reside in the bay and Sacramento River until big enough to move out to open water, usually in the following autumn. Many adult striped bass also remain as residents in the bay and river. Although striped bass populations in Suisun Bay are at an annual minimum in the summer, this remains an important sports fishery.

Large numbers of American shad migrate through the bay annually on the way to spawning grounds in the Sacramento River system. The adult shad migrate upstream in spring and remain in the bay through June. Young shad migrating back downstream start through Suisun Bay in August, so shad will be present during the seismic study.

White and Green sturgeon are bottom-feeding fish that are now an important sport fishery in Suisun Marsh and adjacent waters, though more populous in San Pablo Bay where there are more benthic invertebrates available for food. Little is known about sturgeon migration patterns or population cycles.

White catfish are an important non-migratory resident species, though their numbers in Suisun Bay appear to be small and the fishery is concentrated in the Sacramento-San Joaquin delta.

Threadfin shad, delta smelt, and longfin smelt are important smaller fish which serve as a food base for the game fish in Suisun Bay. The only flatfish known to inhabit the bay is the starry flounder, and there are numerous other bottom-dwelling fish.

The fisheries of Suisun Bay are supported by abundant plankton and epibenthic invertebrates. The most important food resources for fish appear to be the oppossum shrimp (Neomysis mercedis) and copepods (California Department of Fish and Game, 1968; California Department of Fish and Game, 1975). Neomysis populations and reproductive rates peak in mid-summer (California Department of Fish and Game, 1972). The amphipod Corophium spp. is also an important food source. On the whole, benthic invertebrates do not appear to be an important food resource in the project area due to their relatively low populations in Suisun Bay (California Department of Fish and Game, 1972, p. 33).

Zooplankton such as Neomysis and copepods depend on phytoplankton for a food base. Suisun Bay and the Sacramento Rivers are important sources of phytoplankton, and production of phytoplankton is at a peak during the summer months when this project will take place. It is believed that the factors limiting this production are the amount of nitrogen available and the amount of sunlight available to plankters. The availability of sunlight is controlled by the turbidity of the water. Sufficient light for photosynthesis is frequently available only in the top 2-6 feet of water in the project area.

No rare, threatened, or endangered aquatic species are known to inhabit Suisun Bay. There is a sensitive reptile, the western pond turtle, that inhabits the sloughs in Suisun Bay and dives into the water when disturbed, so it could be in the aquatic environment during seismic work. This species is currently a candidate for Federal legal protection.

There are no marine mammals that regularly inhabit the project area, except an occasional harbor seal.

E. Terrestrial Wildlife

The waters of Suisun Bay are very important to annual waterfowl migrations. However, migratory birds are not present during the summer and the year-round resident population of waterfowl is relatively small, so few birds will be present when this project occurs. Approximately 10 per cent of the migratory birds are diving ducks which feed on benthic invertebrates such as clams, worms, and snails from open waters (California Department of Fish and [illegible],

1968). Piscivorous birds such as herons and cormorants, and mammals such as raccoons depend at least partly on fish for food.

There are a number of threatened and endangered terrestrial species that inhabit Suisun Marsh or migrate through it (California Department of Water Resources, 1984b). These species and their status (California Department of Fish and Game, 1985) include:

Species	State-listed endangered	State-listed threatened	Federal endangered	Federal threatened
Saltmarsh harvest mouse	X		X	
Aleutian Canada goose			X	
Bald eagle	X		X	
California clapper rail	X		X	
California black rail		X		
California least tern	X		X	
Peregrine falcon	X		X	
Swainson's hawk		X		
Alameda striped racer		X		

Some of these species, such as the least tern and the rails, make frequent use of near-shore habitats, but only the least tern uses the open waters that are in question here.

F. Solid Waste

Solid waste problems on these waters include litter and debris from recreationalists and vessels, and dredge spoils from channel maintenance activities that have been deposited in the bay waters. Approximately ten million cubic yards of material is annually dredged from the San Francisco Bay (Fong et al, 1982) and the proposed Suisun Bay marsh protection facilities proposed by California Department of Water Resources will require the disposal or reuse of approximately 1.1 million yards of material (California Department of Water Resources, 1984b).

G. Hazardous Materials

Hazardous materials and toxicants that have impacted the project waters in the past have included agricultural pesticides, fuel spilled from vessels and aircraft, and heavy metals from wastewater discharges and runoff. The most probable sources of hazardous material spills affecting Suisun Bay include fuel spills from commercial or recreational boats and from dropped Air Force fuel pods, and cargo spills from commercial vessels and loading docks. According to California Regional Water Quality Control Board staff, fuel or chemical spills have not been a frequent problem in the area. MacFarlane and Whipple (1982) state that chemical pollution from petroleum, pesticides, and heavy metals may be having serious effects on aquatic life in the entire San Francisco Bay and delta region, with the most important toxins being monocyclic aromatic hydrocarbons and zinc.

H. Noise

Existing sources of noise in the project area include recreational and commercial boats and aircraft from Travis Air Force Base. The impact of such noise on the aquatic environment is unknown, but probably insignificant. The most important impact of such noise on the waters examined here is probably annoyance to recreationalists.

I. Socioeconomics

There are two main human uses of the project waters, recreation and shipping. The Suisun Bay and Sacramento River/Delta area is heavily used by recreational boats, barg · and deep draft ships. This area is the thoroughfare for all ships bound for Sacramento and Stockton. In the 1983 edition of the Army Corps of Engineers "Waterborn Commerce in the US" 1260 cargo-carrying vessels ranging in draft from 1 foot to 36 feet were counted in the ship channel through Suisun Bay. The types of vessels counted and number of round trips through the channel are: self-propelled passenger and dry cargo, 293 trips; self-propelled tanker, 112 trips; tow/tug, 106 trips; barge, 632 trips; non-self-propelled tanker, 117 trips.

The number of vessels expected during the project is less than 1260 because the number of vessel calls on the ports of Stockton and Sacramento has decreased. The combined number of deep draft vessels through these two ports was reduced in 1984 to less than half of the number of vessels in 1980.

Shipping terminals within Suisun Bay include Landsea (undergoing sale negotiations), Tosco, PG&E, Diablo Terminal Service, US Steel, Dow Chemical, Dontar, and Crown Zellerbach. Most industrial users have several weeks lead time in their scheduling of port calls. Local terminals all have at least 48 hours notice before ship arrivals and departures.

There is also significant recreational use of the bay's waters. There are approximately 2500 recreational boats in marinas in Contra Costa and Solano counties, and a total of 33,000 boats are registered in these two counties. Fishing activity is lowest during the summer months, since bass run in the winter and spring, and sturgeon are less active in mid-summer. Summer fishing is concentrated on catfish. Fishing activity is also concentrated during the early mornings and evenings during summer.

Water skiers tend to prefer the Middle River, Orwood, and Old River areas, which are not within the project area.

Waterfowl hunting is a very important use of Suisun Marsh where there are approximately 140 hunting clubs. Duck hunters do not use the open waters much, and the hunting season starts in fall.

J. Cultural Resources

Cultural resources are prehistoric and historic archeological sites, historic architectural and engineering properties, and sites of traditional Native American importance. In the Suisun Bay vicinity, known cultural resources include prehistoric and historic Native American village sites, food processing sites, religious places and

sites used for other unknown reasons. All presently known cultural resources in the project area are onshore.

A record search was conducted at the Northwest Information Center of the California Archaeological Survey to assess the cultural resource sensitivity of the seismic survey. The search indicated that no underwater cultural resource surveys have been conducted, and not all of the onshore locations of the seismic lines have been surveyed. However, in the areas that have been surveyed, no sites were recorded within one-half mile of any of the proposed lines.

A complete report on the cultural resources of the project area is in Appendix E.

K. Aesthetics

The major aesthetic resource of the Suisun Bay region is the large expanse of open water surrounded by relatively undisturbed marshlands. The natural setting and abundance of wildlife makes the bay a favorite recreation site. Horizons are low so views of the surrounding hills are extensive. Existing aesthetic impacts include the frequent intrusion of aircraft from Travis Air Force Base and the visibility of numerous industrial sites bordering the bay.

IV POTENTIAL ENVIRONMENTAL IMPACTS

A. Geology

Because of the limited scope of the activities proposed, no significant impacts on the region's geology will occur. Approximately 1180-1780 cubic yards of drilled material (from 3900 holes, 3 7/8 to 4 3/4 inches in diameter and 100 feet deep) will be redeposited along the 73 miles of seismic lines in the water. Assuming 35 holes per day are drilled, this is approximately equal to 15 cubic yards per day, or 20 tons of material, a very minor amount compared to the 1880 tons of natural sedimentation entering the delta region daily. In most cases much of the deposited material will be dispersed by currents and deposited over an area of tens to hundreds of square yards, depending on current velocity and direction, the duration of tidal currents, water depth, and the type of material deposited.

B. Hydrology and Water Quality

The drilling and blasting activities proposed will have negligible impacts on flows, temperature, natural sediment movement, and salinity. Suspended solids concentrations will be temporarily and locally increased as drilled materials are released to the water column. Anchoring and blasting will also resuspend minor amounts of bottom sediments. As natural suspended solids concentrations are frequently very high and natural mixing rates are high, the impact of additional sediment will be very local and insignificant.

In order to roughly estimate the additional sediment load from drilling, we assumed half the drill cuttings from a hole are resuspended (instead of falling out as clods) within a 25-foot radius and no significant mixing or settling occurs, in water 10 feet deep. Using a typical value of 100 lbs dry weight per cubic foot for silt, the average additional suspended sediment load within the affected radius is 400 milligrams per liter. This level is high enough to eliminate most light penetration and is higher than average, but is within the natural levels.

Silt settles fairly rapidly so if the natural mixing rate is low at the time of drilling the material should settle out within minutes to hours. If the natural mixing rate is high at the time of drilling due to currents or wind-induced waves, the sediments raised by drilling will be rapidly mixed with the naturally suspended materials.

The daily sediment load from drilling 35 holes is only 15 cubic feet, or 20 tons, only one per cent of the 1880 tons daily carried into the region by the Sacramento and San Joaquin rivers.

Bottom sediments resuspended by anchoring and by the dynamite blasts are expected to cause even less impact than the drilling.

C. Air Quality

Air pollution impacts from this project will be limited to engine exhausts from boats, drill rigs, and vehicles. These emissions will be negligible compared to emissions from the vehicles on the highways surrounding Suisun Bay. The California Air Quality Control Board has

indicated that no air quality permits are needed for this seismic survey (see Appendix B).

D. Aquatic Life

The most direct effects the seismic work will have on aquatic life will be the impact of pressure waves caused by the dynamite. The nature and impact of these waves have been described by Chevron (1985). According to literature cited by Chevron, a pressure wave with a peak of approximately 40 pounds per square inch is expected to propagate from the bottom of the water column from a blast of 25 pounds of dynamite buried 100 feet below the surface, and a peak of approximately 52 pounds per square inch is expected from a similar blast of 50 pounds of dynamite.

The impact of such a pressure wave on fish depends on how many fish are present, how far away they are from the blast site, and whether or not the fish have swim bladders. Fish kills by underwater blasts are normally the result of fish's swim bladders being ruptured. Of the important fish species in the bay, the sturgeon do not have functioning swim bladders and so are at much less risk. Flatfish such as flounder also do not have functional swim bladders. Salmon and trout have bladders that can be rapidly deflated, so may be at less risk from pressure waves that have been attenuated. The other game and forage fish, including striped bass, have fully-developed swim bladders and consequently are at the greatest risk from the blasting.

The spring adult salmon run and the peak of the downstream smolt run will pass through Suisun Bay during the first two months of the seismic program.

The upstream migrant steelheads will also be present during the second half of the program. Steelhead smolts will be present during May and September, but the largest downstream peak will be avoided.

At least part of the upstream spawning migration of striped bass will occur after the seismic program starts in May. Some resident adult striped bass will also be present but populations are at a minimum in summer. However, large numbers of juvenile striped bass will probably be in Suisun Bay during the summer.

Adult American shad will be present until about June and juveniles will be migrating downstream starting in August.

Catfish, sturgeon, and forage species are non-migratory, so should be at their normal numbers.

The literature cited by Chevron (1985) indicates that the 40 pounds per square inch pressure wave that is expected from the blasting done on this project is about at the lethal threshold for fish. This means that if fish are close by when a seismic charge is detonated, a few but not all of the fish are expected to be killed. This prediction is backed by past experience with very similar seismic work done in Suisun Bay in 1962 and 1965 when it was observed that for many blasts no fish were killed, and occasionally several fish were killed (Chevron, 1985).

Marine invertebrates do not appear to be very susceptible to injury from pressure waves, so impacts to the plankton community are expected to be minimal. Shrimp, though not the opposum shrimp, have

been shown to be susceptible only to very close blasts, and undamaged by the kinds of pressure waves expected from Chevron's blasting (Kemp, 1956; Spears, 1980).

The direct effects of increased turbidity on zooplankton should be minimal, and in fact Neomysis may benefit from the hiding cover that turbidity provides during the day.

Benthic organisms will be disturbed by the drilling, anchoring, and blasting, but these organisms are relatively scarce in the project area and are not an important food resource. Burial of benthic organisms could occur only in proximity to the drill rigs. Even if all the drill cuttings from a hole settle out within a 15 foot radius, the average depth of the sediment deposit is 0.02 feet. The impacts of anchoring will be comparable to the impacts of the numerous fishermen who daily anchor in the bay.

Primary productivity (photosynthesis by algae) will be impacted by the locally increased turbidity resulting from drilling the holes, and to a lesser extent by anchoring, and blasting. Primary productivity appears to be limited by light penetration in Suisun Bay and increased turbidity will further reduce the ability of light to penetrate the water and become available to algae. A significant reduction in primary productivity would impact the rest of the aquatic life in the bay by reducing the available food base. However, the amount of additional turbidity caused by the seismic program is expected to be minor so the impact on algal production should also be minor. Under normal conditions the bay is turbid enough that the additional suspended load from drilling may be insignificant even in the immediate vicinity of the drill. Under conditions when the water

in the bay is relatively clear, the surface area that will have reduced light penetration caused by drilling is very small compared to the surface area of the bay, even considering that Chevron expects to drill up to 35 holes a day.

The only sensitive species that may be impacted by the open-water drilling program is the western pond turtle, which likes to bask on the mud flats along the sloughs. When disturbed from its tidal flat habitat, it tends to dive into the water. This tendency could cause it to be susceptible to near-shore blasting. The susceptibility of turtles to pressure waves has not been investigated in the literature.

E. Terrestrial Wildlife

Little or no impacts to terrestrial wildlife should result from this open-water seismic work. Diving ducks and piscivorous birds and animals will not be directly or indirectly affected since impacts to both the benthic and fish communities, their food resources, are expected to be minor, as discussed above, and full recovery should take place before migratory waterfowl arrive in the fall.

Most sensitive or endangered terrestrial species should not be impacted by the open-water seismic activities. Least terns may be less likely to forage in areas where the drilling is actually occurring, but the size of the affected area is very small compared to their foraging area. Their feeding activities will probably not be affected adversely.

F. Solid Waste

There should be no significant problems with solid waste generation and disposal caused by this project. Potential impacts are limited to litter, cables and wires, and any other equipment that may be abandoned in the bay, though every effort will be made to retrieve all equipment used in the survey and remove it from the area.

G. Hazardous Materials

The seismic crews will be handling dynamite and fuel for boats, generators, and drill rigs. The potential for spills always exists when fuels are handled on the water, but the amount of fuel expected to be used is low. Light fuels such as gasoline are fairly toxic to aquatic life but if spilled much of the fuel will evaporate quickly. The risk of spillage is comparable to that of recreational users. Fuel spills present a fire hazard, but the expected impacts to the environment are insignificant.

H. Noise

Noise will be generated by the seismic crew's boats, drills, and blasting. This noise may temporarily disturb fish in the immediate vicinity, and will disturb any nearby fishermen. It is not expected that households will be disturbed by the noise because of the distance between the work area and residential areas. One possible exception is a neighborhood in Pittsburg which is less than a half mile from one

of the seismic lines in the Sacramento River. Since Chevron does not plan to work at night in the river, the potential disturbance to this neighborhood is minor. There will be no long-term noise impacts.

I. Socioeconomics

Impacts to human users of the bay could result from interference with boat traffic and with fishing activity. Commercial traffic should not be impeded by work in the shipping channel because of the mitigative measures Chevron has agreed to (see V.I, below). The small number of commercial craft and the long notification time available before their arrival should make all conflicts preventable.

Conflicts with fishing may occur, but should be minor. Fishing activity is low during mid-summer and is concentrated at the beginning and end of the day, when the seismic crews will not be working. Recreational boaters will have to avoid the buoys and drill crews when present. Secondary impacts on fishing by reduction in the number of fish available in the bay will not occur because of this project.

J. Public Health and Safety

Dynamite, used as the energy source for the proposed survey work could have potential impacts to public health and safety if not handled properly. Risk of explosion of dynamite while stored on the barges is mitigated by several procedures: First, the barge carries only one day's supply of dynamite at a time, and is resupplied daily at the time of crew change. Secondly, the dynamite being transported to the drilling barge is carried in U.S. Coast Guard approved portable magazines which are designed to prevent accidental detonation and at the barge, dynamite is stored in another U.S. Coast Guard-approved

magazine. Thirdly, the storage of dynamite is subject to approval not only by the U.S. Coast Guard, but also under State law approval by Solano or Contra Costa counties. Potential impacts to health or human safety are mitigated to the maximum extent feasible under these procedures.

K. Consistency with Existing Zoning and General Plan Designation

Although not formally so designated, Solano and Contra Costs counties, BCDC and the State Lands Commission generally recognize the project area (Suisun Bay) as a multiple use area. The purpose of the proposed project, which is to explore for commercial quantities of hydrocarbon, is not considered inconsistent with the present or historic use of the bay: in fact Suisun Bay and the Suisun Marsh area are presently sources of natural gas supplies.

L Cultural Resources

Potential impacts to cultural resources include disturbance of sites by boreholes, and disturbance of onshore sites by vehicles. None of the known cultural resource site types would be disturbed by several passes over their surface by the kind of vehicles to be used in this work. Damage caused by drilling, even if holes penetrated sites, would be minimal due to the small size and wide spacing of the

holes. The lack of known sites within the project area also indicates a very low probability of impacts to cultural resources.

A complete report on cultural resources and potential impacts of this project is at Appendix E.

M. Aesthetics

The aesthetic impacts of this seismic work will be felt most by the recreational users of Suisun and Grizzly bays. Quiet fishing spots may be temporarily interrupted by machinery noise, the sight of drill rigs, and possibly locally increased turbidity. The magnitude of these impacts depends on the number of recreationalists in the bay during the project. These impacts are short-term and can often be avoided by boaters by moving to undisturbed areas.

V MITIGATION

* Mitigation measures proposed by Chevron, not presently required by permits or law.

A. Geology

No mitigative measures are needed for geologic impacts.

B. Hydrology and Water Quality

No mitigative measures are needed for water quality impacts.

C. Air Quality

Chevron applied to the California Air Quality Control Board for any air quality permits required for the seismic program and was informed that none were needed (see Appendix B). No further mitigative measures are needed.

D. Aquatic life

Chevron will bury the explosive charges approximately 100 feet into the bottom sediments. Although this is being done to improve the quality of the seismic data, it will also greatly reduce fish mortality.

The choice of seasons for the seismic program will also reduce impacts to fish, because many of the anadromous fish runs will be avoided.

Chevron will not use an explosive "warning shot" to attempt to scare fish away before detonating the seismic blasts. Such warning shots are believed to be ineffective and may in fact attract fish to sediments stirred up and to any fish killed by the warning blast (Chevron 1985).

Chevron has obtained an explosives permit from California Department of Fish and Game (Appendix C), which includes among other stipulations: the minimum charge necessary will be used, and no charges shall be greater than 50 lbs.; no blasting will be done near large accumulations of fish; and a Fish and Game observer will be present during blasting operations to monitor fish kills.

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E. Terrestrial Wildlife

A number of mitigative measures for terrestrial wildlife have been specified in the BCDC marsh permit (Appendix A). No other mitigative measures are needed.

F. Solid Waste

A cleanup of drill sites is required in the BCDC marsh permit. A similar cleanup of any litter, cables, and equipment in the water will be conducted by the seismic crew.

G. Hazardous Materials

The seismic crews will follow their normal fuel spill prevention procedures. Fuel absorbent pads will be carried on the barges in case of minor spills. In case of a spill, the proper cleanup and regulatory authorities will be notified as soon as possible.

Only certified blasters will handle explosive materials.

H. Noise

No mitigative measures for noise are required.

I. Socioeconomics

In order to prevent disruptions to boat traffic, Chevron has agreed to a number of measures which are contained in a letter to the US Coast Guard (Appendix D). These measures include maintaining communication with the vessel traffic control office on Yerba Buena Island to determine when sufficient time between vessels will occur for drilling; avoiding the use of floats or buoys in the ship channel; minimizing the time that cables and buoys will be placed in the vicinity of the channel; avoiding night operations and placing lights on buoys left out at night; avoiding operations during fog or reduced visibility; and providing the Coast Guard advanced information on when and where work will be conducted.

J. Public Health and Safety

The permitting procedures of the U.S. Coast Guard, supplemented by those of the State of California as enforced in the permitting authorities of local counties are regarded as adequate and feasible mitigation measures which will fully protect the public from any adverse impacts resulting from accidental explosion of dynamite. No further mitigative measures are believed necessary.

K. Consistency with Existing Zoning and General Plan Designation

No mitigation measures are needed.

Executed at San Francisco, California, on behalf of the San Francisco Bay Conservation and Development Commission on the date first above written.

ALAN R. PENDLETON
Executive Director

Enc.

ARP/RSM/xx

cc: U. S. Army Corps of Engineers, Attn: Regulatory Functions Branch
San Francisco Bay Regional Water Quality Control Board,
Attn: Certification Section
California Department of Fish and Game, Attn: Brian Hunter
Solano County Envirnomental Management Department, Attn: Tim Calkins
Suisun Resource Conservation District, Attn: Mike Lewis
State Lands Commission, Attn: Fred Sledd
State Lands Commission, Attn: Susan Levnick

* * * * * * * * * *

Receipt acknowledged, contents understood and agreed to:

Executed at _____ _____
Applicant

On _____ By: _____

_____
Title

I. Except as otherwise noted, violation of any of the terms of this marsh development permit shall be grounds for revocation. The Commission may revoke any marsh development permit for such violation after a public hearing held on reasonable notice to the permittee or its assignee if the marsh development permit has been effectively assigned. If the marsh development permit is revoked, the Commission may determine, if it deems appropriate, that all or part of any fill or structure placed pursuant to this marsh development permit shall be removed by the permittee or its assignee if the marsh development permit has been assigned.

J. This marsh development permit shall not take effect unless the permittee executes the original of this marsh development permit and returns it to the Commission within ten days after the date of the issuance of the marsh development permit. No work shall be done until the acknowledgment is duly executed and returned to the Commission.

K. Any area subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission under either the McAteer-Petris Act or the Suisun Marsh Preservation Act at the time the marsh development permit is granted or thereafter shall remain subject to that jurisdiction notwithstanding the placement of any fill or the implementation of any substantial change in use authorized by this marsh development permit.

L. Any area not subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission that becomes, as a result of any work or project authorized in this marsh development permit, subject to tidal action shall become subject to the Commission's "bay" jurisdiction up to the line of highest tidal action.

M. Unless the Commission directs otherwise, this marsh development permit shall become null and void, if any term, standard condition, or special condition of this marsh development permit shall be found illegal or unenforceable through the application of statute, administrative ruling, or court determination. If this marsh development permit becomes null and void, any fill or structures placed in reliance on this marsh development permit shall be subject to removal by the permittee or its assignee if the marsh development permit has been assigned to the extent that the Commission determines that such removal is appropriate. Any uses authorized shall be terminated to the extent that the Commission determines that such uses should be terminated.

L. Cultural Resources

In the unlikely event that cultural resource sites such as archeological remains are discovered during the seismic program, the California State Historic Preservation office will be notified. No other mitigative measures are needed for cultural resources.

M. Aesthetics

No mitigative actions are needed for aesthetic impacts.

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Appendix A

BCDC Marsh Permit

STATE OF CALIFORNIA
GEORGE DEUKMEJIAN, Governor

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
30 VAN NESS AVENUE
SAN FRANCISCO, CALIFORNIA 94102-6080
PHONE (415) 557-3686

Permittees' Copy

MARSH DEVELOPMENT PERMIT NO. M85-56(M)

June 28, 1985

Chevron U.S.A., Inc.
Land Department
P. O. Box 5050
San Ramon, California 94583-0905

ATTENTION: Arthur P. Boehm

Gentlemen:

1. Authorization

A. Subject to the conditions stated below, the permittee, Chevron U.S.A., Inc., is hereby authorized to do the following:

Location: In the primary management area of the Suisun Marsh, on portions of Morrow, Grizzly, Hammond, Simmons, Wheeler, Freeman, and Middle Ground Islands, Solano County.

Description: Perform a geophysical survey in non-tidal areas of the managed wetlands for potential natural gas deposits involving the drilling of approximately 880 holes, approximately four inches in diameter and 100 feet deep, within which explosives will be detonated to generate seismic data.

B. This authority is generally pursuant and limited by your application dated May 15, 1985, including all accompanying and subsequent correspondence and exhibits, and all conditions of this marsh development permit.

C. Work authorized herein must be performed only during the time periods specified in Special Conditions II-A. This marsh development permit expires on October 15, 1987, unless an extension of time is granted by an amendment of the marsh development permit.

II. Special Conditions

The authorization made herein shall be subject to the following special conditions, in addition to the standard conditions in Part IV:

A. Scheduling of Work. All work shall be performed only between April 15 and October 15. Work within managed wetlands that are involved in the Departments of Fish and Game's early flooding program shall be further limited to the period between July 15 and August 30, unless written permission to perform work at other times between April 15 and October 15 is secured from the Department of Fish and Game and the affected landowners and evidence of such permission is submitted to the Commission prior to performing the work during such time periods

B. Consent of Private Landowners. Prior to commencing work on any parcel of land, the permittee shall discuss the work with the landowner of the parcel and obtain all necessary permission to do the work

C. Vehicle Use. The permittee shall use either helicopters or marsh vehicles equipped with wide terra or flotation tires to transport drilling and survey equipment, materials, and personnel to the drilling sites to minimize disturbance of wetlands vegetation. Survey work shall be organized to minimize the number of trips through the Marsh.

D. Restoration of Disturbed Areas. At the completion of testing at each drill site and prior to the time limits specified in Special Condition II-A, the permittee shall restore each drilling site to its original condition to the extent feasible by (1) backfilling and capping the shot hole with the excavated material; (2) spreading any excess excavated material that cannot be backfilled into the shot hole over the surrounding ground surface; and (3) removing all debris and litter from the site to an upland location outside of the Commission's jurisdiction. Any significant tire depression left by marsh vehicles used in the survey shall be backfilled or otherwise repaired so as to restore the ground surface to its original grade. All restoration work shall be completed by the time limits specified in Special Condition II-A

III. Findings and Declarations

On behalf of the Commission, I find and declare that:

A. The project authorized by this march development permit involves performing geophysical surveys in the primary mangement area of the Suisun Marsh and, therefore, is a similar activity that would have no greater adverse impact on the Bay, as defined in Regulation Section 10122(e)(2), than the grading of any materials, as defined in Regulation Section 10122(d)(4), and

thus is a "minor repair of improvement" for which the Executive Director may issue a marsh development permit, pursuant to Government Code Section 66632(f) and Regulation Section 10530(a).

B. The project authorized by this marsh development permit is consistent with the McAteer-Petris Act, the San Francisco Bay Plan, and with the Suisun Marsh Protection Plan in that it will not adversely affect the Bay and Marsh nor public access to and enjoyent of the Bay and Marsh. Special Condition II-A is necessary to assure that all work within managed wetlands and surrounding areas will occur when such activities will least disturb wintering waterfowl. Special Condition II-B will assure that the project is reviewed by each property owner for consistency with the landowner's managment plan and that the owner has given permission to enter the property. Special Conditions II-C and II-D are necessary to assure that the authorized activity has minimal impact on habitat in the Suisun Marsh.

C. The project authorized by this marsh development permit is within the primary management area of the Suisun Marsh Preservation Act of 1977, as defined in Section 29102 of Chapter 2, Division 19, of the Public Resources Code. This project is consistent with the findings and declarations of Public Resources Sections 29002, 29004, and 29005, the Suisun Marsh Protection Plan, and Solano County's Local Protection Program.

D. The Commission further finds, declares, and certifies that the activity or activities authorized herein are consistent with the Commission's Amended Management Program for San Francisco Bay, as approved by the Department of Commerce under the Federal Coastal Zone Management Act of 1972, as amended.

E. Pursuant to Regulation Section 10910, the project authorized by this marsh development permit is categorically exempt from the requirement to prepare an environmental impact report.

F. Pursuant to Regulation Section 10582, this project was listed with the Commission on June 20, 1985.

IV. Standard Conditions

A. All required permissions from governmental bodies must be obtained before the commencement of work; these bodies include, but are not limited to, the U. S. Army Corps of Engineers, the State Lands Commission, the Regional Water Quality Control Board, and the city and/or county in which the work is to be performed, whenever any of these may be required. This marsh development permit does not relieve the permittee of any obligations imposed by State or Federal law, either statutory or otherwise.

B. The attached Notice of Completion shall be returned to the Commission within 30 days following completion of the work.

C. Work must be performed in the precise manner and at the precise locations indicated in your application as such may have been modified by the terms of the marsh development permit and any plans approved in writing by or on behalf of the Commission.

D. Work must be performed in a manner so as to minimize muddying of waters, and if diking is involved, dikes shall be waterproof. If any seepage returns to the Bay, the permittee will be subject to the regulations of the Regional Water Quality Control Board in that region.

E. The rights derived from this marsh development permit are assignable as provided herein. An assignment shall not be effective until the assignee shall have executed and the Commission shall have received an acknowledgment that the assignee has read and understood the application for this marsh development permit and the marsh development permit itself and agrees to be bound by all terms and conditions of the marsh development permit, and the assignee is accepted by the Executive Director as being reasonably capable of complying with the terms of the marsh development permit.

F. Unless otherwise provided in this marsh development permit, all the terms and conditions of this marsh development permit shall remain effective for so long as the marsh development permit remains in effect or for so long as any use or construction authorized by this marsh development permit exists, whichever is longer.

G. Unless otherwise provided in this marsh development permit, the terms and conditions of this marsh development permit shall bind all future owners and future possessors of any legal interest in the land and shall run with the land.

H. Unless otherwise provided in this marsh development permit, any work authorized herein shall be completed within the time limits specified in this marsh development permit, or, if no time limits are specified, within three years. If the work is not completed by the date specified in the marsh development permit, or, if no date is specified, within three years from the date of the marsh development permit, the marsh development permit shall become null and void. If a marsh development permit becomes null and void for a failure to comply with these time limitations, any fill placed in reliance on this marsh development permit shall be removed by the permittee or its assignee upon receiving written notification by or on behalf of the Commission to remove the fill.

I. Except as otherwise noted, violation of any of the terms of this marsh development permit shall be grounds for revocation. The Commission may revoke any marsh development permit for such violation after a public hearing held on reasonable notice to the permittee or its assignee if the marsh development permit has been effectively assigned. If the marsh development permit is revoked, the Commission may determine, if it deems appropriate, that all or part of any fill or structure placed pursuant to this marsh development permit shall be removed by the permittee or its assignee if the marsh development permit has been assigned.

J. This marsh development permit shall not take effect unless the permittee executes the original of this marsh development permit and returns it to the Commission within ten days after the date of the issuance of the marsh development permit. No work shall be done until the acknowledgment is duly executed and returned to the Commission.

K. Any area subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission under either the McAteer-Petris Act or the Suisun Marsh Preservation Act at the time the marsh development permit is granted or thereafter shall remain subject to that jurisdiction notwithstanding the placement of any fill or the implementation of any substantial change in use authorized by this marsh development permit.

L. Any area not subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission that becomes, as a result of any work or project authorized in this marsh development permit, subject to tidal action shall become subject to the Commission's "bay" jurisdiction up to the line of highest tidal action.

M. Unless the Commission directs otherwise, this marsh development permit shall become null and void, if any term, standard condition, or special condition of this marsh development permit shall be found illegal or unenforceable through the application of statute, administrative ruling, or court determination. If this marsh development permit becomes null and void, any fill or structures placed in reliance on this marsh development permit shall be subject to removal by the permittee or its assignee if the marsh development permit has been assigned to the extent that the Commission determines that such removal is appropriate. Any uses authorized shall be terminated to the extent that the Commission determines that such uses should be terminated.

Executed at San Francisco, California, on behalf of the San Francisco Bay Conservation and Development Commission on the date first above written.

ALAN R. PENDLETON
Executive Director

Enc.

ARP/RSM/xx

cc: U. S. Army Corps of Engineers, Attn: Regulatory Functions Branch
San Francisco Bay Regional Water Quality Control Board,
Attn: Certification Section
California Department of Fish and Game, Attn: Brian Hunter
Solano County Envirnomental Management Department, Attn: Tim Calkins
Suisun Resource Conservation District, Attn: Mike Lewis
State Lands Commission, Attn: Fred Sledd
State Lands Commission, Attn: Susan Levnick

* * * * * * * * * *

Receipt acknowledged, contents understood and agreed to:

Executed at _____

_____
Applicant

On _____. By: _____

_____
Title

Appendix B

Air Quality Control Board Letter

BAY AREA AIR QUALITY
MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CALIFORNIA 94109
(415) 771-6000

June 3, 1985

Chevron USA, Inc.
P.O. Box 5050
San Ramon, CA 94583

Attention: Arthur R. Boehm Jr.

Re: Application No. 30738

Gentlemen:

We have received your application for:

Portable Drilling Units

An evaluation of this application indicates that permits are not required for these units per District Regulation 2-1-128.1 which exempts:

"exploratory drilling activities for natural gas or for oil. Production wells for the above operations are not exempt."

Permits are therefore not required.

If you have any questions regarding this matter, please call Ellen Linder at (415) 71-6000, extension 255.

Very truly yours,

W deBoisblanc

William deBoisblanc
Manager, New Source Review
Permit Services Division

WdB:EGL:lmm

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MINUTE PAGE 1056

Appendix C

Department of Fish and Game Explosives Permit

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
SACRAMENTO, CALIFORNIA 95814
(916) 324-7102

April 3, 1985

Explosives Permit
No. B-2-85

TO WHOM IT MAY CONCERN:

In accordance with approval granted by the Fish and Game Commission on March 1, 1985, permission is hereby granted to:

Chevron U.S.A., Inc.
P.O. Box 8000
Concord, CA 94524-8000

to use explosives in the Suisun-Grizzly Bay-Sacramento River Delta for seismic exploration purposes.

Chevron, U.S.A., Inc., hereinafter referred to as the permittee, may use explosives only in accordance with the following conditions and requirements:

1. The permittee may detonate explosives only if a Department of Fish and Game representative is present to observe the effects of the explosives upon fish and other aquatic life.

2. The permittee shall, at the request of the observer, collect any fish which may be killed or injured by the explosives, and shall dispose of such fish as requested by the observer.

3. The permittee shall provide the use of a suitable and acceptable boat, with operator, for use by the observer for the purpose of inspecting the shot point immediately following the detonation of explosives. The permittee shall afford the observer full use of the boat to inspect for a sufficient period of time for dead or injured fish in the vicinity of the shot point, or any area where such fish may drift. The suitability of the boat for the necessary observation work shall be determined by the observer.

4. The permittee shall give at least 72 hours prior notice of the proposed use of explosives to Patrol Inspector J. Wictum, Department of Fish and Game, P.O. Box 47, Yountville, California, 94599, telephone (707) 944-2011, so that a Department of Fish and Game representative may be assigned to observe the effects of the explosives.

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5. The permittee shall only detonate the minimum explosives necessary to accomplish the purpose of this permit.

6. This permit does not authorize the permittee to possess or use explosives in a manner contrary to any other State law or regulation, or in violation of any rule, regulation, ordinance or condition imposed by any local agency, or in violation of any Federal law or regulation.

7. The permittee shall reimburse the Department for observer and administrative costs at the rate of $170.00 for each eight hour day or portion thereof, and $21.25 per hour for any time in excess of eight hours in any one day, that a Department observer is required to travel, standby, or be present to observe the effects of the explosives upon fish and other aquatic life.

8. The permittee shall not detonate explosives whenever it appears that an appreciable number of fish will be killed or injured by the explosives.

9. No December or January shots will be made due to resting waterfowl.

10. Each underwater shot to be a maximum of 50 pounds of seismic dynamite.

11. Permittee shall make all shots at slack high tide unless permission is granted by the Department's observer at the scene to do otherwise.

This permit shall expire March 31, 1986, except that it may be cancelled by the Department of Fish and Game if the permittee fails to comply with the forgoing conditions and requirements.

DEPARTMENT OF FISH AND GAME
Jack C. Parnell, Director

DeWayne Johnston

DeWayne Johnston, Chief
Wildlife Protection Branch

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Appendix D

Coast Guard Letter

Chevron U.S.A. Inc.
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Mail Address: P O Box 5050, San Ramon, CA 94583 0905

Land Department
Western Region

December 3, 1985

Seismic Program
Suisun/Grizzly Bay Area
Solano/Contra Costa County, CA

Lt. Commander Don Montoro
U.S. Coast Guard
Marine Safety Office
Building 14
Government Island
Alameda, CA 94501

Dear Mr. Montoro:

Relative to the discussions which Chevron and the U.S. Coast Guard had during the summer of 1985 concerning the proposed seismic programs which Chevron plans to initiate in the Solano/Contra Costa County area of Suisun/Grizzly Bay, I would like to reiterate Chevron's proposed method of operations in light of the concerns which were raised by the Coast Guard in your letter of April 22, 1985.

Chevron's position relative to the areas of concern would be as follows:

1) Main Shipping Channels: Our contractor would be in communication with the vessel traffic service on Yerba Buena Island. By contacting the Coast Guard, they would be able to determine a two to three hour period of time when the drilling barges could be working within the shipping channel area drilling the necessary shot holes across that portion of the shot line. As discussed at our meeting, we would therefore run the seismic leads and the shorted dynamite leads off to remote bouys located several hundred feet outside of the main deep water channel through the area. In this manner, there would not be any bouys or remote telemetry units within the general area. We felt that this would be the safest way since it would not require the closure of the shipping channel for any extended period of time while we continued our seismic operations.

   Once the entire line was drilled, we would then commence the shooting of the line by shooting the area around the shipping channel first. In this manner, the remote telemetry units and the seismic cable on the bay as well as the dynamite leads would be in the water the least amount of time and pose the least amount of hazard for major vessel traffic. This would also aid in removing all of our equipment from areas of high visibility for the pleasure boater.

Should it become necessary that the channel would have to be closed for an extended period of time, we would work the Coast Guard personnel to determine when they anticipated long periods of nonuse by major vessel traffic.

2) Night Operations: Chevron does not plan to have any night operations by the drilling barges for the seismic crew vessels. As we had discussed at the meeting, Chevron and its contractors shall put lights upon the bouys for nighttime navigational purposes. The Coast Guard was to provide Chevron with the information relative to the type of light that the Coast Guard would either require or recommend be placed on each RTU Unit along the seismic line for proper nighttime identification. Additionally, Chevron now plans to have 24-hour security patroling the seismic lines while the bouys and lights are in the water. The location of these bouys and patrols would change with each individual seismic line that the crews would be working on.

3) Reduced Visibility: there are no operations planned during heavy fog at this time.

4) Time Line: The actual time line will depend on the contractor that is selected to do this seismic work. Currently, Chevron does not anticipate the letting of this size of contract until approximately April of 1986. At that time, Chevron will instruct its contractor to provide the Coast Guard with a time line and map evidencing the lines that would be shot, in what sequence the lines would be shot and the approximately number of days required to shoot each line.

5) Communications: As discussed at our meeting, Chevron's contractor would be in touch at least on a daily basis with the Coast Guard's vessel traffic service on Yerba Buena Island for updates as to any major vessel movement up or down the main shipping channel to Sacramento and Stockton. Our contractor would work with the Coast Guard in determining when appropriate periods of nonuse would be available for Chevron's drilling of the seismic holes across the shipping channel.

As a result of the meeting, we requested information of any permit that Chevron or its contractor would be required to obtain from the Coast Guard for the handling of explosives from its onshore magazine to the barges in the Suisun/Grizzly Bay. At that time you indicated that a Coast Guard permit would be required for the boats to carry the charges used that day out to the drilling barges. We would appreciate copies of the permit form or if you do not have a permit form per se, a copy of any letter or agreement notifying the Coast Guard of such use.

The contractor will be required to obtain a Contra Costa County or Solano County explosives permit pursuant to the California law. While there is a state law requiring an explosives permit for the storage of dynamite, it is up to the individual counties to implement and enforce the state law. When the contractor is selected, they shall select the appropriate staging area for its land-based facilities. Once it has identified the site, they will bring in its own portable magazine, which would

have to be approved by the county. They would then be in a position to make its application to the Coast Guard. We request a copy of your application form so that the contractor will have it available to them and can proceed with the paperwork at their earliest possible convenience.

After you have had a chance to review this information should you feel that there is anything else that should be discussed please feel free to contact me at either the address on the letterhead above or (415) 842-3262.

Very truly yours,

ARBike
cc: C. L. Mrozowski

bcc: Ms. Susan Landon
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Appendix E

Cultural Resources Report

ENVIRONMENTAL REPORT FOR CHEVRON
SUISUN AND GRIZZLY BAYS SEISMIC SURVEY

Cultural Resources (prepared by Polly Quick, Woodward-Clyde Consultants)

Cultural resources are prehistoric and historic archeological sites, historic architectural and engineering properties, and sites of traditional Native American importance. In the area of Suisun and Grizzly Bays, cultural resources include prehistoric and historic archeological sites which were used by Native American people as villages, food processing sites, [illegible]ous places, or for other unknown reasons. Present evidence indic[illegible] a history of at least 5000 years of occupation of the area. There are also historic archeological sites, architectural and engineering properties which have resulted from use and settlement of the area by non-Native people from the 1770s to the present.

Evidence for Native American cultural resources in the general vicinity include chipped and ground stone artifacts, obsidian or chert chipping debris, fire-cracked rock, locally darkened soil, mortar holes or engravings carved in outcropping rock, shell remains of Bay species such as clam, mussel, and oyster. Commonly recognized site types include:

- Habitation sites (villages or camps), characterized by shell midden deposits, i.e., soils altered by cultural use with added components of charcoal, bone, crushed shell, and sometimes plant remains, as well as tools or other artifacts of human manufacture

- Bedrock mortar sites, containing one to several hundred mortar holes worked into outcropping rock

- Possible rock art sites, with apparent engravings (petroglyphs) in boulders

- Lithic scatters, with flaking debris indicating stone tool manufacture or maintenance

Ethnographic and historical sources indicate that three Native American villages were inhabited in the project area in the 1700s, Suisun, north of Grizzly Bay; Chupcan, in the vicinity of present day Antioch; and Ompin, northwest across the river from Antioch (Bennyhoff 1977). As far as is presently known, there are no living descendants of people from these villages or vicinity who have knowledge of other historically used Native American places in the area.

Known non-Native cultural resources include buildings, bridges, mineshafts, railroad grades and other architectural and engineering structures, as well as trash deposits, fieldstone walls, buried cisterns, cellarholes and other such remains of historic use of the area.

All presently known cultural resources in the project vicinity are onshore. It is unlikely that any will be found underwater, with the exception of possible sunken ships or very old prehistoric habitation sites which were flooded in the past in response to rising sea level. Bickel (1978) describes the course of sea level rise along the California coast over the past 15000 years, with special attention to the greater San Francisco Bay area. After a rapid rise of nearly 100 meters in 7-8000 years, sea level began to stabilize after 7000 to 5000 years ago, permitting the establishment and expansion of bayshore marshlands. The very productive marsh ecosystems were attractive to human users. Boreholes in some portions of the Sacramento delta area, east of the project area, indicate that some marshlands were established in that area by 5000 years ago, while Bickel describes an apparent population explosion further west and south in the San Francisco Bay area about 2500 years ago, when substantial marshlands were present. Archeologists have

recorded a dozen sites in the bay area with bases submerged below present sea level by as much as 6 meters. The oldest submerged sites are approximately 3000 years in age, and the depth of their bases below sea level reflects a sea level rise of 2 meters per thousand years. Shallow sites of only a meter or so depth, or sites occupied 5000 years ago or more might be encountered shallowly buried in offshore sediments.

In order to assess the cultural resource sensitivity of the project area, a record search was conducted at the Northwest Information Center of the California Archeological Survey. The search indicated that no underwater surveys have been conducted, and not all of the onshore locations of proposed seismic lines have been surveyed. However, in the areas which have been surveyed, no sites were recorded within one-half mile of any of the proposed seismic testing lines. Only two sites were within a mile of any lines, a habitation site along Pacheco Creek, and a bedrock mortar site southwest of the town of Bahia. The ethnographic village sites mentioned above are all several miles or more distant from proposed seismic testing lines. Likewise, no historic architectural or engineering structures were recorded within one-half mile of any of the proposed seismic testing lines.

Potential Impacts

Project-related impacts to cultural resources might take two forms: disturbance of site deposits by boreholes, and disturbance of site deposits by passage of vehicles used on land to transport equipment and people in conduct of the testing; underwater cultural resources would only be subject to borehole disturbance. None of the known cultural resource site types would be seriously disturbed by two or three passes over their surface by the kinds of vehicles which are proposed for use in testing. Likewise, the damage which would be caused by boreholes, even if they should penetrate archeological site deposits, is minimal, because of their small size and spacing. A small site would contain at most one borehole, and a larger site might contain two or three, but borcholes would cause no more disturbance than the abundant rodent tunnels which

are to be found in most midden sites in the area. cause the charge will be placed so deep, there is no danger of explosives impacting site deposits, for maximum depth of cultural resource sites in the area is less than 20 meters, with the exception of mines, and none of those are to be found in the project area..

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