

## DRAFT

### ENVIRONMENTAL ASSESSMENT

#### ON THE ISSUANCE OF AN INCIDENTAL HARASSMENT AUTHORIZATION TO FUGRO WEST, INC. TO TAKE MARINE MAMMALS BY HARASSMENT INCIDENTAL TO CONDUCTING SEISMIC SURVEYS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA

##### I. INTRODUCTION

On March 30, 2006, URS Corporation (URS) on behalf of Fugro West, Inc. (Fugro) submitted an application to the National Marine Fisheries Service (NMFS) requesting an Incidental Harassment Authorization (IHA) for the possible harassment of small numbers of California sea lions (*Zalophus californianus*), Pacific harbor seals (*Phoca vitulina richardsi*), harbor porpoises (*Phocoena phocoena*), and gray whales (*Eschrichtius robustus*) incidental to conducting geophysical surveys in the south San Francisco Bay (SFB or the Bay), California. The purpose of the surveys is to aid the San Francisco Public Utility Commission (SFPUC) in the design of an underground water pipeline, the Bay Division Tunnel, in south SFB. The proposed seismic study would span from Newark Slough and Plummer Creek adjacent to the Cargill Salt property in the east, to the Ravenswood Baylands open space on the western shore of SFB. The study would roughly parallel the existing SFPUC trans-bay pipelines, approximately 1 mile (1.6 km) south of the Dumbarton Bridge. Marine seismic surveys would take approximately 8 – 10 days to perform. In the Newark Slough and Plummer Creek areas, work would be restricted to the harbor seal non-pupping seasons (July 1 – November 30). The ideal start date would occur during the summer/fall of 2006.

This Environmental Assessment (EA) is intended to address impacts on the environment that would result from the issuance this IHA.

##### II. PURPOSE AND NEED

Section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361 *et seq.*) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional taking, by harassment, of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made.

An IHA shall be granted if the Secretary finds that the taking will have a negligible impact on the species or stock(s); will not have an unmitigable adverse impact on the availability of the species

or stock(s) for subsistence uses. The IHA must set forth the permissible methods of taking by harassment, other means of effecting the least practicable impact on the species or stock and their habitat, and requirements pertaining to the monitoring and reporting of such taking are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as "...an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not relevant here, the MMPA defines "harassment" as

"...any act of pursuit, torment, or annoyance which (a) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (b) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]."

Section 101(a)(5)(D) establishes a 45-day time limit for NMFS review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny issuance of the authorization.

URS determined that conducting geophysical surveys in the south SFB might potentially disturb marine mammals and, accordingly, submitted an application for an IHA on behalf of Fugro. If the action proposed in the IHA application will result in no more than harassment, have no more than a negligible impact on the species or stocks, will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses, and the permissible methods of taking and required monitoring are set forth, then the NMFS shall issue the authorization.

### **III. DESCRIPTION OF ACTIVITY COVERED BY AUTHORIZATIONS**

The purpose of the surveys is to aid in the design of an underground water pipeline, the Bay Division Tunnel, in south SFB (Figure 1). The proposed seismic study would span from Newark Slough and Plummer Creek adjacent to the Cargill Salt property in the east, to the Ravenswood Baylands open space on the western shore of SFB. The study would roughly parallel the existing SFPUC trans-bay pipelines, approximately 1 mile (1.6 km) south of the Dumbarton Bridge (Figure 2). Marine seismic surveys would take approximately 8 – 10 days to perform. In the Newark Slough and Plummer Creek areas, work would be restricted to the harbor seal non-pupping seasons (July 1 – November 30). The ideal start date would occur during the summer/fall of 2006.

The proposed geophysical (seismic) studies would include 21 seismic sample transects. A total of 25 - 35 linear miles (40 - 56 km) of marine-based geophysical sampling would occur. The marine seismic reflection data would be collected along a series of lines that cross the Bay centered over the projected alignment. A centerline and four wing lines are planned. Cross lines, or tie lines, would be run perpendicular to the centerline and extend 200 - 500 m (656 - 1,640 ft) beyond the alignment parallel lines, unless restricted by water depth or man-made obstructions. The length of time for each survey transect will vary depending on the total distance of the transect. The longest

transects spanning from east to west would take about 1 hour to complete. The shorter north-south transect would generally take less than 30 minutes to complete. Water depths in the survey area range from roughly 14 m (45 ft) in the deeper mid-Bay channel to about 1.8 - 2.4 m (6 - 8 ft) along the shore and in Newark Slough at high tide. Work would be conducted at high tide in the shallow nearshore areas.

Data would be collected from a small boat that tows a seismic energy source and a multichannel hydrophone. Two energy sources would be used, a Squid “minisparker” system and a Geopulse “boomer” system. An onboard generator powers the energy sources. The hydrophone contains multiple sensors that detect the seismic waves reflected from the water bottom and subsea floor sediments and rocks. The hydrophone is filled with inert silicon oil.

The survey boat would travel along predetermined survey lines using a differential global positioning system (DGPS) for navigation. Boat speed during surveys would be at 3 - 4 knots. The energy source would be fired every ½ second (boomer) or 1 second (minisparker). Data received by the hydrophone are recorded with an onboard seismograph and laptop computer. Sound pressure level from a boomer operating at 350 joules is 204 dB re 1 µPa rms at 1 m, and from a minisparker is 209 dB re 1 µPa rms at 1 m. Frequency range for the boomer is at 750 - 3,500 Hz, with pulse duration 0.1 ms; and frequency range for the minisparker is at 150 - 2,500 Hz, with pulse duration 0.8 ms.

Pacific harbor seals are known to utilize portions of the proposed project area for haul-out sites. California sea lions, harbor porpoises, and possibly gray whales rarely occur in the vicinity of the proposed area, however, they have been sighted in other areas of the Bay. The proposed project has the potential to impact these marine mammals during the operations of seismic survey, therefore, an IHA is warranted.

#### **IV. ALTERNATIVES**

##### **A. Alternative 1 – Issuance of IHA with Standard Mitigation Measures**

Under Alternative 1, NMFS will a one-year IHA to Fugro allowing the incidental take by Level B behavioral harassment of a small number of Pacific harbor seals, California sea lions, harbor porpoises, and gray whales during seismic surveys in southern SFB. The mitigation measures and reporting requirements described in Section VII, which include limiting seismic surveys only during daylight hours, no seismic surveys in the vicinity of certain haul-out sites during harbor seal pupping season, establishing and monitoring a safety zone where sound pressure level (SPL) could reach 180 dB re 1 µPa rms or higher, and implementing strict marine mammal monitoring by qualified NMFS-approved observers before, during, and after seismic surveys, will be incorporated into the IHA.

##### **B. Alternative 2 – No Action Alternative**

Under the No Action Alternative, NMFS would not be issuing the IHA. The MMPA prohibits all takings of marine mammals unless authorized by a permit or exemption under the MMPA. If

authorization to incidentally take Pacific harbor seals, California sea lions, harbor porpoises, and gray whales are denied, the applicant could choose to amend the project either to avoid harassing marine mammals or forego the proposed project entirely.

### **C. Alternative 3 (Preferred Alternative) – Issuance of Authorization with Standard Mitigation Measures and Additional Requirements**

Under Alternative 3, NMFS is considering is the issuance of the IHA with standard mitigation measures and additional conditions to require “ramp-up” during the initial startup of the seismic surveys and shutting down the acoustic equipment during the survey if a marine mammal enters the safety zone. Under these conditions, the surveyors must start the acoustic equipment at half capacity and gradually increase the energy level to full capacity in the course of 5 minutes. This practice is to allow marine mammals that might be in the project vicinity to move out of the area and to avoid any startling of marine mammals with sudden intensive sound. In addition, the surveyors must turn off the acoustic equipment if a marine mammal is sighted or believed to have entered the safety zone during the survey transect. The surveyors would not start the acoustic equipment again until the marine mammal leaves the safety zone, or no marine mammals are sighted within the safety zone for 15 minutes.

### **D. Alternative 4 – Preferred Alternative with Additional Passive and Active Acoustic Monitoring**

NMFS has also considered another alternative, which requires the applicant to conduct passive and active acoustic monitoring of marine mammals within the proposed project area, in addition to implementation of standard mitigation measures and ramp-up procedure. However, since the size of the 180 dB re 1  $\mu$ Pa safety zone is small enough to allow for effective visual detection, NMFS does not believe that acoustic monitoring is necessary. Therefore, Alternative 4 is not further analyzed.

## **V. AFFECTED ENVIRONMENT**

### **A. Southern San Francisco Bay**

Located in the central California coast, SFB is about 100 km (62 miles) long and 5 – 21 km (3.1 – 13 miles) wide. The Bay is connected to the Pacific Ocean through the Golden Gate, a narrow strait between two peninsulas. The SFB is a shallow, productive estuary with the size roughly 4,000 km<sup>2</sup> (1,538 square miles). The Bay watershed covers approximately 40% of California drainage through inflows from the Sacramento and San Joaquin rivers. Its waterways, wetlands and bays also form the centerpiece of America’s fourth largest metropolitan region, enabling residents and others to pursue fishing, sailing, shipping, farming, oil refining and a host of other important economic and recreational activities.

Despite massive urban and industrial development in the region, SFB estuary remains California's most important ecological habitats. Many fish and invertebrate species rely on the bay as a

nursery. The estuary's wetlands feed and shelter many waterfowl, shorebirds, and seabirds. As many as half the birds migrating the Pacific Flyway between the Arctic and Baja winter around the estuary. The Bay also supports several marine mammal species such as harbor seals, California sea lions, harbor porpoises, and occasionally gray whales on their migration route (SFEP, 1999).

The proposed project area is limited to southern SFB approximately 1 mile (1.6 km) south of the Dumbarton Bridge, roughly parallel the existing SFPUC trans-bay pipelines (Figure 2). The proposed project area is composed of shallow subtidal and intertidal habitat (shallow bay and channel) and open water/subtidal habitat (deep bay and channel) (URS, 2005).

Shallow bay and channel habitat is important to numerous species including Pacific herring (*Clupea pallasii*), northern anchovy (*Engraulis mordax*), jacksmelt (*Atherinopsis californiensis*), and many species of flatfish. Shallow subtidal and intertidal habitat that includes hard substrate such as pilings, rock outcrops, and riprap provide habitat for various species of fishes, including brown rockfish (*Sebastes auriculatus*) and walleye surfperch (*Hyperprosopona argenteum*) (Goals Project, 2000)

Deep bay and channel habitat within the vicinity of the proposed project generally occurs mid-span of the Dumbarton Bridge (URS, 2005). The channel in the middle southern SFB is about 14 m (45 ft) deep. It is an important habitat for marine fishes such as rockfish as well as many species of flatfish. Channels may also serve as a migratory corridor for adult anadromous fishes (Goal Project, 2000).

No marine protected areas, critical habitat, and Essential Fish Habitat (EFH) is known to exist within the proposed project area.

## **B. Marine Mammal Species**

The SFB is home to several marine mammal species, including Pacific harbor seal, California sea lion, gray whale, and harbor porpoise. None of these species is listed under the Endangered Species Act (ESA). General information on the biology and distribution of these species and others in the region can be found in NMFS' Marine Mammal Stock Assessment Reports, which are available online at [http://www.nmfs.noaa.gov/pr/PR2/Stock\\_Assessment\\_Program/sars.html](http://www.nmfs.noaa.gov/pr/PR2/Stock_Assessment_Program/sars.html).

### **Harbor seal *Phoca vitulina* Linnaeus, 1758**

Also known as the common seal, the harbor seal is widely distributed in warm to temperate waters of the North Pacific and North Atlantic oceans. Four subspecies of harbor seals are recognized, but *P. v. richardsi* is the only one found in the eastern North Pacific from central Baja California, Mexico to the eastern Aleutian Islands (Jefferson *et al.*, 1993). Harbor seals feed on a wide variety of fish, cephalopods, and crustaceans in surface, mid-water, and benthic habitats. This species is generally very shy on land and easily frightened into the water when approached. Under the MMPA, six stocks of *P. v. richardsi* are identified within the U.S. waters (Angliss and Lodge, 2004; Carretta *et al.*, 2005). Only the California stock of harbor seal is found in the proposed project area, and its abundance is estimated to be 27,863 (Carretta *et al.*, 2005).

Within the proposed project area, Pacific harbor seals are known to haul-out near the junction of

Newark Slough and Plummer Creek. Newark Slough is a continually used seal haul-out site, although it is used by lower numbers of harbor seals compared with Mowry Slough to the south and Yerba Buena Island and Castro Rocks in the North Bay. Harbor seals are also known to utilize Newark Slough as a pupping site (Harvey and Oates, 2002) and up to 82 individuals have been documented hauling-out at that location on a single day. During a five-year survey period between 2000 and 2005 at Newark Slough, an average of 42 individuals were counted each year during the pupping season, compared to Mowry Slough 2 miles to the south, where an average of 279 animals were counted each year during the pupping season.

**California sea lion** *Zalophus californianus* (Lesson, 1828)

The California sea lion is perhaps the most recognized pinniped due to its popularity in zoos, circuses, and oceanariums. There are three subspecies, but *Z. c. californianus* is the only one found in the eastern North Pacific from central Mexico north to British Columbia, Canada. It frequents bays, harbors, and river mouths and regularly hauls out on buoys and jetties. California sea lions primarily feed on cephalopods and fish. For management purposes under the MMPA, only one stock is recognized within the proposed action area and its population is estimated at between 237,000 to 244,000 (Carretta *et al.*, 2005). Its only natural predator in the eastern North Pacific is the transient killer whale (*Orcinus orca*) population. Mortalities due to human activities are mainly from entanglement in fishing gear. It is estimated that from 1997 – 2001 the minimum total annual takes (mortality and serious injury) of California sea lions in commercial fisheries was 1,476 (Carretta *et al.*, 2005).

California sea lions are often sighted off the central and southern California coastline. Once the pupping season is completed (May - June), male sea lions migrate north and enter the Bay. Although California sea lions are mainly known for haul-out sites off the San Francisco and Marin shorelines within the Bay, it is possible for this species to forage in the south Bay area as well.

**Gray whale** *Eschrichtius robustus* Lilljeborg, 1861

The gray whale is a moderately large whale that reaches about 11 – 12 m (36 – 39 ft) in length. It occurs most frequently in shallow coastal waters within a few tens of kilometers from shore. Gray whales make one of the longest annual migrations of any mammal, traveling some 8,000 km (4,960 miles) from northern summer feeding grounds to tropical/subtropical calving grounds in the winter. Gray whales are bottom feeders and prey mainly on benthic amphipods.

Although gray whales once existed in the North Atlantic Ocean, this population was hunted to extinction by whalers in the 17<sup>th</sup> or 18<sup>th</sup> century (Carlton *et al.*, 1999; Jones and Swartz, 2002). Currently, gray whales are found only in the North Pacific Ocean and adjacent seas. Two populations of gray whale are recognized in the North Pacific: the eastern Northern Pacific stock, which lives along the west coast of North America; and the western North Pacific or Korean-Okhotsk stock, which lives along the coast of eastern Asia (Jones and Swartz, 2002). The former stock may be found within the proposed action area.

Gray whales were historically exploited by coastal whalers. Besides the extinction of gray whale in the North Atlantic, the western North Pacific population of this species is estimated to be very small and is listed as endangered under the ESA. Eastern North Pacific gray whales were also hunted to the brink of extinction in the mid 1800s and again in the early 1900s. Since receiving

IWC protection in 1946 and subsequently under the ESA, this population has increased to a level that equals or exceeds pre-exploitation numbers (Jefferson *et al.*, 1993). In 1994 this stock was removed from the ESA list as it was no longer considered endangered or threatened. Angliss and Lodge (2004) reported the latest abundance estimate of this population is 26,635. Subsistence hunters in Russia harvested an average of 97 gray whales annually from this stock between 1996 and 2000. In the United States, the Makah Tribe hunted and killed 1 whale in 1999, and is proposing to resume take of 20 whales in a period of 5 years (70 FR 10359, 26 February 2005).

In the past, eastern Pacific gray whales have been seen irregularly in SFB. These individuals likely wandered off the migration route. The number of gray whales observed in the Bay increased in 1999 and 2000, and the observed whales apparently feeding in a number of areas in May and June. The increased aberrancies of gray whale sightings in timing and location, along with foraging activities on its migration route in 1999 and 2000, were potentially caused by a significant decline in amphipod density in gray whale's feeding ground in the Bering and Chukchi seas (Le Boeuf *et al.*, 2000). The only natural predator of gray whale is killer whale (Leatherwood and Reeves, 1983).

### **Harbor porpoise *Phocoena phocoena* (Linnaeus, 1758)**

The harbor porpoise is one of the smallest cetaceans in the eastern North Pacific, with maximum length of 1.8 m (5.9 ft). It is widely distributed in coastal waters of the North Pacific, the North Atlantic, and the Black Sea. It usually forms small groups of less than 8 individuals. Harbor porpoises are known to prey on a wide variety of fish and cephalopod species. For management purposes under the MMPA, nine stocks of this species are recognized in eastern North Pacific and Alaskan waters (Angliss and Lodge, 2004; Carretta *et al.*, 2005). The San Francisco-Russian River stock of harbor porpoises is occasionally sighted inside the Bay. Based on Carretta *et al.* (2005), the estimated abundance of this stock is 8,521. The major anthropogenic threat to harbor porpoises throughout its range is incidental capture in fisheries, and in many areas this incidental mortality may exceed sustainable levels (Vinther, 1999; Bjørge and Tolley, 2002).

Year-round surveys in the Gulf of the Farallones area have shown harbor porpoise occurrence within 10 - 20 km (6 - 12 miles) of San Francisco Bay (Calambokidis *et al.*, 1990). High harbor porpoise sightings were also reported just outside the Golden Gate and about 1 km (0.62 mile) inside SFB, however, the occurrence of harbor porpoises in the southern part of Bay is rare (DeAngelis, NMFS/SWRO, personal comm. 2006).

### **C. ESA-listed Species**

Coho salmon (*Oncorhynchus kisutch*) historically had runs inside the Bay including South Bay tributaries such as Newark Slough, but are not currently present in the South Bay as a breeding population. Coho are known to continue to spawn and rear in a few tributaries to the North Bay in the Marin County area and along the coast near the Golden Gate Bridge and thus may individually occur as transitory and incidental visitors to the South Bay (URS, 2005). The proposed seismic surveys will not adversely affect coho salmon, since salmonids have very low hearing sensitivity for sounds above 150 Hz (Hawkins, 1993). In addition, the proposed project would be limited to relatively small areas, temporary in duration, would not block fish passage, and would not contribute towards Bay water turbidity.

## VI. ENVIRONMENTAL CONSEQUENCES

The impact of Federal actions must be considered prior to implementation to determine whether the action will significantly affect the quality of the human environment. In this section, an analysis of the environmental impacts of issuing an IHA to Fugro and the alternatives to that proposed action is presented.

### A. Alternative 1 – Issuance of IHA with Standard Mitigation Measures

#### 1. Impacts on Marine Mammals

The proposed seismic surveys would use acoustic energy source level at 204 dB re 1  $\mu$ Pa rms at 1 m (boomer) and 209 dB re 1  $\mu$ Pa rms at 1 m (minisparker) to conduct seismic surveys. The frequency ranges of these acoustic devices are 750 – 3,500 kHz for the boomer and 150 – 2,500 Hz for the minisparker. Seismic surveys using acoustic energy may have the potential to adversely impact marine mammals in the vicinity of the activities (Gordon *et al.*, 2004). Intense acoustic signals from seismic surveys have been known to cause behavioral alteration such as reduced vocalization rates (Goold, 1996), avoidance (Malme *et al.*, 1986, 1988; Richardson *et al.*, 1995; Harris *et al.*, 2001), and changing in blow rates (Richardson *et al.*, 1995) in several marine mammal species.

Exposure to high intensity sound may also result in auditory effects such as hearing threshold shifts (TSs). If the TS recovers after a few minutes, hours, or days it is known as a temporary threshold shift (TTS); if the TS becomes a permanent condition, it is known as a permanent threshold shift (PTS). Little research has been done on marine mammal TTS impacted by underwater noise. A masked-TTS study done by Finneran *et al.* (2002) on a captive bottlenose dolphin (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) exposed to 0.4, 4, and 30 kHz single underwater impulses from a seismic watergun showed that no TTS was observed in the dolphins at the highest exposure condition of 228 dB re 1  $\mu$ Pa peak-to-peak (p-p) pressure (or 219 dB re 1  $\mu$ Pa rms). However, masked TTSs of 6 dB were observed on the beluga whale after exposure to 0.4 and 30 kHz impulses at 226 dB re 1  $\mu$ Pa p-p (or 217 dB re 1  $\mu$ Pa rms). When exposed to intense 1-s tones at 0.4, 3, 10, and 20 kHz sound, masked TTSs were observed at sound pressure levels (SPLs) of 192 – 201 dB re 1  $\mu$ Pa rms for captive dolphins and beluga whales (Schlundt *et al.*, 2000). Kastak *et al.* (1999) reported TTS in a California sea lion, harbor seal, and northern elephant seal (*Mirounga angustirostris*) exposed to underwater octave band noise at 65 – 75 dB sensation level (above baseline threshold, which is between approximately 78 – 90 dB re 1  $\mu$ Pa rms on average) for 20 – 22 min. To the contrary, in another study, no masked TTS was observed when 2 California sea lions were exposed to single underwater impulses of approximately 178 and 183 dB re 1  $\mu$ Pa rms (Finneran *et al.*, 2003). Therefore, it is also important to note that the effects of the different sound exposures do not depend on the sound pressure alone, but also depend on the duration of exposure. The sound exposure level (SEL), which is the function of sound pressure levels and exposure time, is thus used to measure the TTS effects. Based on several recent studies (e.g., Schlundt *et al.*, 2000; Nachtigall *et al.*, 2004; Finneran *et al.*, 2005), it is suggested that a SEL of 195 dB re 1  $\mu$ Pa<sup>2</sup>s be considered as the onset of a TTS

(Finneran *et al.*, 2005).

Although the source levels of the acoustic equipment to be used in the proposed seismic surveys may potentially be high enough to cause TTS if exposed for a sufficient duration, it is unlikely that any marine mammals in the vicinity would be exposed at such SPLs due to transmission loss of the acoustic energy in the water column and the brief period the animal could be exposed. Assuming that the acoustic energy spreading in the open water and channel of the Bay follows an intermediate spreading condition between spherical and cylindrical spreading (Richardson *et al.*, 1995) for transmission loss (TL) due to the shallow water (about 14 m deep) in the proposed project area, the following spreading equation can be used to predict the TL:

$$TL = 15 \log (R), \quad (1)$$

where R is the distance from the sound source. Therefore, the SPL at distance R can be calculated from the following equation:

$$SPL_R = SL - TL, \quad (2)$$

where SL is the source level. At 100 m (328 ft) from the minisparker or at 45 m (148 ft) from the boomer, the SPL is calculated to be at 179 dB re 1  $\mu$ Pa rms. This level is below NMFS criteria of 180 dB re 1  $\mu$ Pa rms for avoiding Level A harassment for cetaceans and 190 dB re 1  $\mu$ Pa rms for pinnipeds (e.g., 71 FR 26750, May 8, 2006). In addition, the shallow bay channel of the proposed project area may further reduce acoustic energy due to bottom absorption. The actual SPLs tested for these acoustic sources off Hawaiian Islands at 160 dB were 100 m (328 ft) for a minisparker, and 30 m (98 ft) for a boomer (Barnhardt, 2001).

Additionally, the impulses produced by the acoustic equipment are extremely short, last for only 0.1 ms for the boomer and 0.8 ms for the minisparker with intervals at  $\frac{1}{2}$  s and 1 s, respectively. Therefore, the SELs that marine mammals would be exposed to are expected to be much lower (Finneran *et al.*, 2005), and the onset of TTS is believed to be extremely unlikely. Therefore, the only effect to marine mammals from an acoustic energy would be short-term behavior alteration by a small number of marine mammals in the vicinity of the proposed project area.

Marine mammals could also be disturbed by the presence of vessels and humans that are involved in the geographical surveys. These disturbances could cause hauled-out harbor seals or California sea lions to flush and possibly result in temporary use of alternate haul-out sites in the Bay. However, long term abandonment of the sites is not likely because existing traffic noise, recreational boaters, and other human activities already occur in the area, and it is likely that these animals have become habituated to these disturbances.

Furthermore, marine mammal densities within the proposed project are typically very low. California sea lions, harbor porpoises and gray whales are not known to regularly visit the proposed project area which is located in southern SFB. Although harbor seals use portions of the proposed project area as haul-out sites, their density is low. Within the last 5 years, individual harbor seals counted while hauling-out at the Newark Slough haul-out site during the post-pupping season have fluctuated between a maximum of 34 animals in 2001 to a minimum of 10 animals in

2005 (DeAngelis, NMFS/SWRO, personal comm. 2006). Numbers of harbor seals counted at the Newark Slough haul-out site during May 2001 and May 2002 (pupping season) ranged from 26 - 65 individuals.

Lastly, the entire geophysical survey would only last for 8 - 10 days, which excludes any possible long term chronic noise exposure to marine mammals in the vicinity of the proposed action area.

Therefore, NMFS concludes that only small numbers of Pacific harbor seals, California sea lions, harbor porpoises, and possibly gray whales that may be swimming, foraging, or resting in the project vicinity would be potentially taken by Level B behavioral harassment due to the proposed activity. In addition, proposed mitigation measures discussed below would greatly reduce the potential takes of marine mammals due to the proposed geophysical surveys.

## **2. Impacts on Marine Environment**

The proposed project area is limited to the southern SFB approximately 1 mile (1.6 km) south of the Dumbarton Bridge, roughly parallel the existing SFPUC trans-bay pipelines (Figure 2). The proposed project area is composed of shallow subtidal and intertidal habitat (shallow bay and channel) and open water/subtidal habitat (deep bay and channel) (URS, 2005). There are no marine protected areas, designated critical habitat, and/or essential fish habitat in the proposed project area.

Given that the seismic surveys activities contained under the proposed action would 1) use only acoustic energy to study the substrate of the bottom of the Bay; 2) be limited in a very small area for only 8 – 10 days; 3) involve only a slow-moving (3 – 4 knots) survey vessel and a chase boat for monitoring; and 4) not have objects being released into the water column, NMFS has determined that the proposed action would result in no measurable impact on the physical environment. NMFS also concludes that none of the proposed techniques employed for the seismic surveys has a measurable potential to alter any substrate, water column, or the marine environment in general.

## **3. Cumulative Impacts**

Cumulative effects are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions” (40 CFR §1508.7).

The SFB area contains America’s fourth largest metropolitan region and supports a wide range of industrial, shipping, farming, fishing, and recreational activities. The proposed project would add yet another industrial activity in the southern SFB by conducting seismic surveys from a vessel. However, the proposed seismic activity is limited in a very small area (along the existing bay tunnel) of the Bay for a short period (8 – 10 days), and there would be no objects released into the water column. Therefore, NMFS has determined that the proposed action would not have a significant cumulative effect on either the human or marine environment. In addition, NMFS has determined that the proposed action would not be likely to have significant cumulative effects on

Pacific harbor seals, California seal lions, gray whales, and harbor porpoises. Particularly as the current population status of these species is close to carrying capacity and, therefore, are not of concern. None of these species are ESA-listed or MMPA-depleted. The following analysis of cumulative effects on these four marine mammal species that could be found in the proposed project area supports NMFS' determination. This analysis provides a brief summary of the present human-related activities affecting these species in the proposed action area.

#### *Anthropogenic Noise*

Marine mammals rely on underwater sound for communication, foraging, navigation, and predator avoidance, therefore, acoustic cues are vital to their survival and reproductive success. However, the amount of anthropogenic sound introduced into the sea by human activities has substantially increased the ambient level of sound in the ocean over the last 100 years. Much of this increase is due to the increased size of ships and shipping fleets. In addition, coastal industrial activities and active sonars such as fishfinders and echosounders used by both fishing and recreational vessels also introduce certain amount of anthropogenic sound into the marine environment (Hildebrand, 2005).

The impacts of these anthropogenic sounds on marine mammal populations are not fully understood at this time. However, pervasive underwater sound from commercial shipping increases levels of background noise, which may mask acoustic signals that are important for marine mammal communication, foraging, predator avoidance, and navigation (Kruse, 1991; Miller *et al.*, 2000; Croll *et al.*, 2001; Foote *et al.*, 2004). Noise may affect developmental, reproductive, or immune functions, and cause more generalized stress. Some studies show that long-term exposure to anthropogenic noise may cause marine mammals to abandon their essential habitat (e.g., Bryant *et al.*, 1984; Morton and Symonds, 2002).

#### *Commercial Whaling, Subsistence Hunting, and Other Intentional Take*

No commercial whaling and subsistence hunting of marine mammals are known to currently exist in the proposed project area. However, illegal intentional lethal takes are suspected to occur. Live strandings and dead beach-cast California sea lions and harbor seals have been observed with gunshot wounds in California (Lowry and Folk, 1987, Deiter, 1991; Goldstein *et al.*, 1999; Carretta *et al.*, 2005), and were recorded by the California Marine Mammal Stranding Network (CMMSN).

Several Pacific Northwest treaty Indian tribes have promulgated tribal regulations allowing tribal members to exercise treaty rights for subsistence harvest of sea lions, current estimated annual take are 0 – 2 animals per year (Carretta *et al.*, 2005). Subsistence hunters in Alaska and Russia have traditionally harvested gray whales in their summer feeding grounds in the Chukchi and Bering seas. The only reported recent takes by subsistence hunters in Alaska occurred in 1995, with the take of two gray whales (IWC, 1997). In 1997, the IWC approved a 5-year quota (1998 – 2002) of 620 gray whales, with an annual cap of 140, for Russian and U.S. Makah Indian Tribe aboriginals (IWC, 1998). Russian aboriginals harvested 113 in 2000 (Borodin, 2001), 112 in 2001 (Borodin *et al.*, 2002), 131 in 2002 (Borodin, 2003), and 126 in 2003 (Borodin, 2004), while the Makah Tribe harvested 1 whale in 1999 (IWC, 2001). Based on this information, the annual subsistence take averaged 122 whales during the 5-year period from 1999 to 2003.

### *Entrapment and Entanglement in Commercial Fishing Gear*

Entrapment and entanglement in commercial fishing gear is one of the most frequently documented sources of human-caused mortality in marine mammals (Read, 2005). Although there are no commercial fisheries known to exist within the proposed project area, commercial fisheries operating elsewhere may potentially impact these marine mammal species/stocks. All of the four species are killed incidentally in set and drift gillnet fisheries (Angliss and Lodge, 2004; Carretta *et al.*, 2005). The incidental mortality due to fisheries is especially high for harbor seal and California sea lion. For example, an estimated annual average of 433 harbor seals from the California stock are estimated to have been killed or seriously injured by commercial fisheries in recent years (Carretta *et al.*, 2005). The exact impact of mortality from entanglement in fishing gear is difficult to accurately determine, however, as many marine mammals that die from entanglement in commercial fishing gear tend to sink rather than strand ashore.

### *Marine Pollution*

Marine mammals are exposed to contaminants via the food they consume, the water in which they swim, and the air they breathe. The exposure is complex, and varies in each of these external compartments as a function of many factors. Point and non-point source pollutants from coastal runoff, offshore mineral and gravel mining, at-sea disposal of dredged materials and sewage effluent, marine debris, and organic compounds from aquaculture are all lasting threats to marine mammals in the proposed project area.

The impacts of these pollutants are difficult to measure. The persistent organic pollutants (POPs) tend to bioaccumulate through the food chain, therefore, the chronic exposure of POPs in the environment is perhaps of the most concern to high trophic level predators such as harbor seals, California sea lions, and harbor porpoises. During pregnancy and nursing, these contaminants can be passed from the mother to the developing offspring. Studies of captive harbor seals have demonstrated a link between exposure to POPs like organochlorines (e.g., DDT, PCBs, and polyaromatic hydrocarbons) and immunosuppression (Ross *et al.*, 1995; Harder *et al.*, 1992; De Swart *et al.*, 1996). One study shows that fish-eating marine mammals (bottlenose dolphins, *Tursiops truncatus*, and harbor porpoises) in certain locations on the West Coast of the United States showed extremely high organochlorine concentrations (Aguilar *et al.*, 2002).

### *Vessel Collision*

Collisions with commercial ships are an increasing threat to many large whale species. The near shore migration route used by gray whales makes ship strikes another potential source of mortality. Between 1999 and 2003, the CMMSN reported 4 serious injuries or mortalities of gray whales caused by ship strikes: 1 each in 1999, 2000, 2001, and 2003 (Angliss and Lodge, 2004). Additional mortality from ship strikes probably goes unreported because the whales either do not strand or do not have obvious signs of trauma. Harbor seal and California sea lion mortalities by vessel collision have also been observed, though the impacts are difficult to measure (Angliss and Lodge, 2004; Carretta *et al.*, 2005).

### *Overfishing and Decline of Prey Species*

Commercial fisheries may affect marine mammals indirectly by altering the quality and reducing the quantity of their prey species. The removal of large numbers of fish (both target and non-target or bycatch species) from a marine ecosystem can change the composition of the fish community,

altering the abundance and distribution of prey available for marine mammals. In addition, by removing large amounts of biomass, commercial fisheries compete with other consumers that depend on the target species for food, which can, in turn, increase competition between different piscivorous predators. Changes in the abundance and distribution of prey can then have cascading effects on predators, including increased susceptibility to predation and reduced productivity. Although there is no commercial fisheries exist within the proposed project area, fisheries elsewhere off Californian coast may contribute to the depletion of prey species for these marine mammal species.

#### *Other Human Activity Related Mortality*

Harbor seal and California sea lion mortalities caused by entrainment in power plants, marine debris, or gaffs, are also recorded by CMNSN. However, there are currently no estimates of these mortalities.

#### *Conclusions*

All of the issues noted above are likely to have some level of impact on marine mammal populations in the proposed action area. Although commercial harvest no longer takes place and existing subsistence harvest is set by quotas, entanglement in fishing gear, contaminants and pollution, anthropogenic noise, overfishing and decline in prey species, ship collisions, and illegal shooting continue to result in some level of impact to marine mammal populations in the proposed action area. However, the proposed localized, short-term seismic surveys would contribute only a negligible increase over and above the effects of the baseline activities currently occurring in the marine environment of the proposed action area, and even then for only its limited duration.

### **B. Alternative 2 – No Action Alternative**

If an IHA were not issued, any takes of marine mammals resulting from the proposed seismic surveys would not be authorized and any incidental take of marine mammals would be a violation of the MMPA. If Fugro does not conduct seismic surveys in the southern SFB, the previously described potential impacts to marine mammals would be eliminated. Fugro would thus be unable to complete its work, which would prevent the SFPUC from constructing an underground trans-bay water pipeline south of the Dumbarton Bridge in South SFB.

### **C. Alternative 3 (Preferred Alternative) – Issuance of IHA with Standard Mitigation Measures and Additional Requirements**

Under this Alternative, NMFS would issue the IHA with standard mitigation measures discussed on pages 8 – 13, and with additional conditions being required. These additional conditions are “ramp-up” of acoustic equipment during the initial startup of the seismic surveys, and shut-down of acoustic equipment if a marine mammal enters the safety zone during the survey transect. The ramp-up condition of this alternative would further reduce the takes by allowing marine mammals that might be in the project vicinity to move out of the area and avoiding any startling of marine mammals with sudden intensive sound. The shut-down condition would ensure that no marine mammal would be exposed to any potential Level A harassment by intensive sound from the proposed geophysical surveys. Therefore, NMFS considers this to be the Preferred Alternative for the proposed seismic surveys. Under these conditions, the surveyors would be required start the

acoustic equipment at half capacity and gradually increase the energy level to full capacity in the course of 5 minutes, and to shut down the acoustic equipment if a marine mammal is believed to have entered the safety zone during the survey transect. Furthermore, the surveyors would not start the acoustic equipment until the marine mammal leaves the safety zone, or no marine mammal is sighted within the safety zone for 15 minutes after the last sighting.

## **VII. MITIGATION MONITORING AND REPORTING**

### **A. Mitigation**

Under the Preferred Alternative, the following mitigation measures would be required under the proposed IHA to be issued to Fugro for conducting geophysical surveys in southern SFB. The implementation of these mitigation measures would reduce impacts to marine mammals to the lowest extent practicable.

#### *Time and Location*

Geophysical studies would only be conducted during daylight hours from 7 am - 7 pm, when marine mammal monitoring prior and during the surveys can be effectively implemented.

Seismic studies would not occur in the vicinity of Newark Slough or Plummer Creek during the harbor seal pupping season (March 1 - June 30). Seismic studies would only occur over open water transects during that period.

#### *Establishment of Safety Zones*

Safety zones would be established and monitored during the seismic surveys. The applicant proposes to establish a 45-m (148-ft) radius safety zone for the boomer system and a 100-m (328-ft) radius for the minisparker system. At such distances, the SPL would be reduced to 179 dB re 1  $\mu$ Pa rms, which is lower than NMFS standards for avoiding marine mammal Level A harassment (180 dB re 1  $\mu$ Pa rms for cetaceans and 190 dB re 1  $\mu$ Pa rms for pinnipeds).

Marine mammal observers (MMOs) on boats will survey the safety zone for 15 minutes to ensure that no marine mammals are seen within the zone before a seismic survey begins. If marine mammals are found within the safety zone, seismic surveys will be delayed until they move out of the area. If a marine mammal is seen above water and then dives below, the surveyor will wait 15 minutes and if no marine mammals are seen by the observer in that time it will be assumed that the animal has moved beyond the safety zone. This 15-minute criterion is based on scientific evidence that harbor seals in SFB dive for a mean time of 0.50 minutes to 3.33 minutes (Harvey and Torok, 1994), the mean diving duration for harbor porpoises ranges from 44 to 103 seconds (Westgate *et al.*, 1995), and the mean diving duration for gray whales is approximately 1.83 minutes (Würsig *et al.*, 2003). However, due to the limitations of monitoring from a moving vessel and the curiosity of some individual marine mammals, there can be no assurance that the zone will be devoid of all marine mammals at all times.

#### *Soft Start*

It should be recognized that although marine mammals will be protected from Level A harassment

(injury) by establishment of a safety zone of SPL level below 180 dB re 1  $\mu$ Pa rms, mitigation may not be 100 percent effective at all times in locating marine mammals. In order to provide additional protection to marine mammals near the project area by allowing marine mammals to vacate the area prior to receiving a potential injury, and to further reduce Level B harassment by startling marine mammals with a sudden intensive sound, Fugro will implement “soft start” practice when startup acoustic equipment. By implementing “soft start” practice, acoustic equipment will be initiated at an energy level less than full capacity (i.e., approximately 40-60 percent energy levels) for at least 5 minutes before gradually escalating to full capacity. Similar levels of noise reduction are expected underwater. This would help ensure that, although not expected, any pinnipeds and cetaceans that are overlooked during safety zone monitoring will not be injured.

#### *Equipment Shut-down If Marine Mammal Enters Safety Zone*

With all the aforementioned mitigation measures in place, marine mammals may still enter the safety zone when geophysical surveys are underway. As a result, there is a possibility that Level A harassment may occur to these animals when exposed to intensive sounds. In order to prevent any potential Level A harassment to marine mammals from occurring, the surveyors will shut down the acoustic equipment if a marine mammal is sighted or believed to have entered within the safety zone during the survey transect. The surveyors would not start the acoustic equipment again until the marine mammal leaves the safety zone, or no marine mammals are sighted within the safety zone for 15 minutes after the last sighting.

## **B. Monitoring**

URS would develop a monitoring plan that would collect data for each marine mammal species observed in the south Bay proposed project area during the period of the seismic surveys. Marine mammal behavior, overall numbers of individuals observed, frequency of observation, the time corresponding to the daily tidal cycle, and any behavioral changes due to the geophysical surveys will be recorded on daily observation sheets.

Monitoring would be conducted by qualified NMFS approved biologists. Binoculars and optical or digital laser range finders that are accurate to +/- 3 feet (0.9 m) would be standard equipment for the monitors.

Monitoring would start prior to the first day of the survey to establish baseline data, and would take place from a chase boat during the 8 - 10 day survey period. Post-survey monitoring would occur for a period of one day upon completion of the seismic studies.

Before the startup of the survey equipment, a MMO would visually survey the area to confirm the safety zone is clear of any marine mammals. Seismic surveys will not begin until the safety zone is clear of marine mammals. Two MMOs would be present when surveys start onboard a separate boat and scan different sections of the overall survey area, particularly the safety zone.

## **C. Reporting**

URS would submit a final report to NMFS 90 days after completion of the proposed project. The final report would include data collected for each distinct marine mammal species observed in the south Bay proposed project area during the period of the seismic surveys. Marine mammal behavior, overall numbers of individuals observed, frequency of observation, and any behavioral changes due to the geophysical surveys would also be included in the final report.

### **VIII. COMPLIANCE WITH ENDANGERED SPECIES ACT**

Based on a review conducted by NMFS biologists, no ESA-listed species are expected to be effected in the proposed action area; therefore, NMFS believes that a section 7 consultation is not warranted.

### **IX. COMPLIANCE WITH STATE REGULATIONS**

URS has consulted with the San Francisco Bay Conservation and Development Commission (BCDC). Since the seismic surveys do not consist of development, no permit is needed from BCDC. URS is currently coordinating with the California State Land Commission to obtain certain permit for seismic operations.

### **X. CONCLUSION**

Based on the information contained in the application and the *Biological Assessment SFPUC Bay Tunnel Geologic Exploration* prepared by URS Corporation, the best available scientific information, and information contained in this document, NMFS has determined that the impact of seismic surveys in the southern SFB will result, at most, in Level B behavioral harassment of small numbers of Pacific harbour seals, California sea lions, harbor porpoises, and possibly gray whales. In addition, no take by injury or death is anticipated or authorized, and harassment takes will be at the lowest level practicable due to incorporation of the mitigation measures mentioned previously in this document. While the number of potential incidental harassment takes will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity and the distance between the marine mammals and the survey vessel, NMFS anticipates that the number of potential harassment takings will be small relative to the species stock sizes and will have no more than a negligible impact on the affected species or stocks and their habitats. The project is not expected to interfere with any subsistence hunting of marine mammals. NMFS has therefore preliminarily determined that the requirements of section 101(a)(5)(D) of the MMPA have been met and the authorization can be issued.

**XI. RECOMMENDATION**

It is recommended that the proposed actions be preliminarily determined not to have a significant impact on the quality of the human environment and that the preparation of an environmental impact statement not be required.

**Prepared by:**

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\_\_\_\_\_

Shane Guan  
Fishery Biologist  
Permits, Conservation and  
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Date

**Recommended by:**

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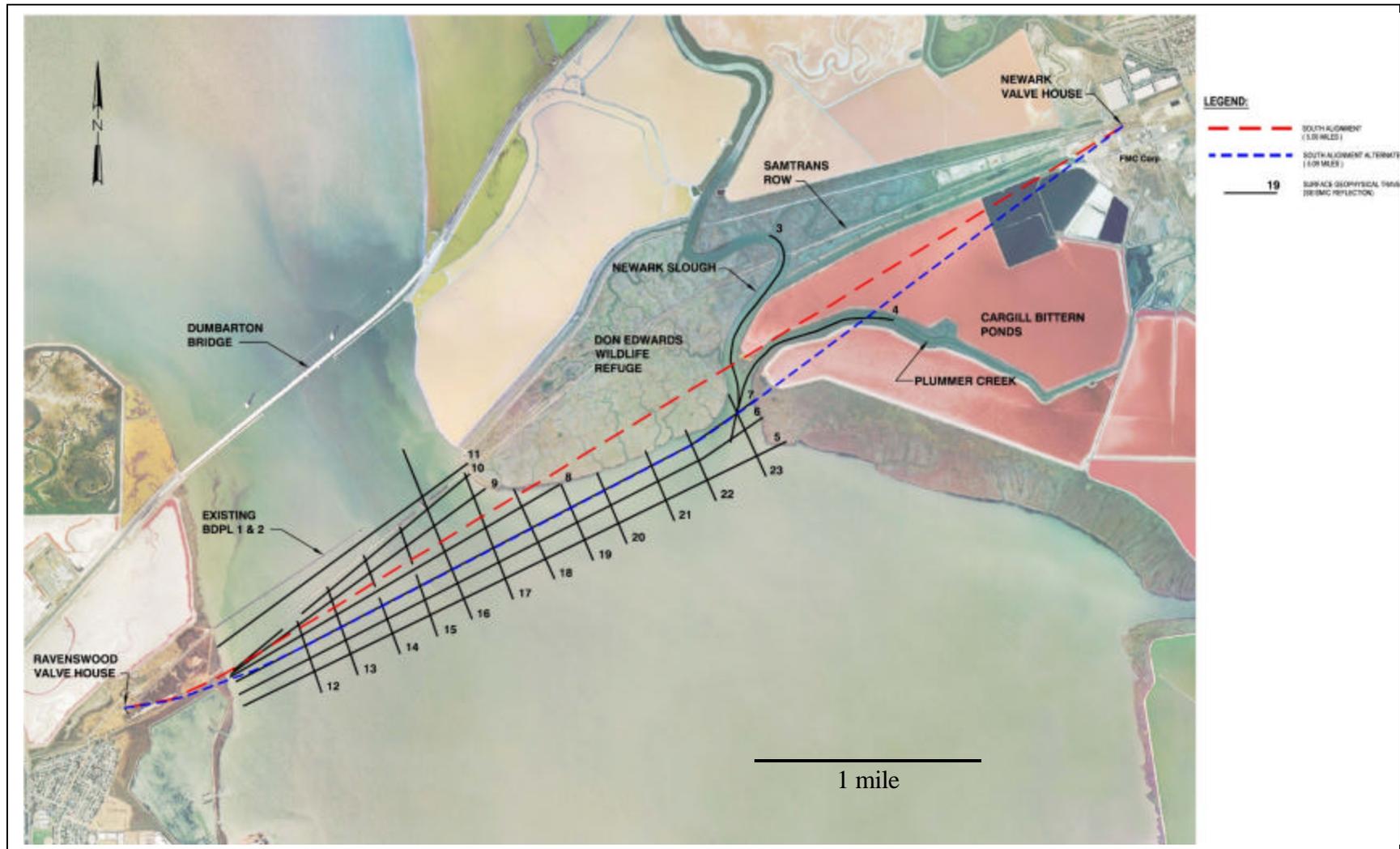
P. Michael Payne, Chief  
Permits, Conservation and  
Education Division  
Office of Protected Resources

Date

FIGURE 1. MAP OF THE SAN FRANCISCO BAY



**FIGURE 2. MAP OF THE PROPOSED ACTION AREA**



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Acronyms and abbreviations

<b>Acronym</b>	<b>Definition</b>
BCDC	San Francisco Bay Conservation and Development Commission
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMMSN	California Marine Mammal Stranding Network
dB	Decibel
DGPS	Differential Global Positioning System
EA	Environmental assessment
EFH	Essential Fish Habitat
EIS	Environmental impact statement
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	<i>Federal Register</i>
Ft	Foot (feet)
Fugro	Fugro West, Inc.
Hz	Hertz
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
kHz	Kilohertz
km	Kilometer(s)
M	Meter(s)
min	Minute(s)
MMPA	Marine Mammal Protection Act
MMO	Marine mammal observer
ms	Milisecond
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
POP	Persistent organic pollutant
p-p	Peak-to-peak
PTS	Permanent threshold shift
rms	Root mean square
s	Second(s)
SEL	Sound exposure level
SFB	San Francisco Bay
SFPUC	San Francisco Public Utility Commission
SPL	Sound pressure level
TS	Threshold shift
TTS	Temporary threshold shift
URS	URS Corporation
μPa	Micropascal