UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Environmental Assessment
FOR
ISSUANCE OF A PERMIT FOR RESEARCH ON SEA TURTLES IN CALIFORNIA WATERS (FILE NO. 14510)

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Lead Agency: USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service, Office of Protected Resources

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Location: Waters off the coast of California

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a scientific research permit to the NMFS Southwest Fisheries Science Center, 3333 N. Torrey Pines Ct., La Jolla, CA, 92037 under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226). The objective of the research is to initiate a baseline study of the status of sea turtles in the San Gabriel River and Alamitos Bay in Long Beach, California. Researchers would also opportunistically take samples and potentially track sea turtles incidentally taken in coastal power plants off California or salvage dead or injured sea turtles in the marine environment.

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CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

In response to receipt of a request from NMFS Southwest Fisheries Science Center (SWFSC), 3333 N. Torrey Pines Ct., La Jolla CA, 92037 (Principal Investigator: Jeffrey Seminoff, File No. 14510), NMFS proposes to issue a scientific research permit that authorizes "takes"[1] in the wild pursuant to the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

1.1.1 Purpose and Need

The primary purpose of the permit is to provide an exemption from the take prohibitions under the ESA to allow "takes". The need for issuance of the permit is related to NMFS mandates under the ESA. NMFS has a responsibility to implement the ESA to protect, conserve, and recover threatened and endangered species under its jurisdiction. The ESA prohibits takes of threatened and endangered species, with only a few specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require that research activities are consistent with the purposes and policies of the ESA and will not have a significant adverse impact on the species or stock.

1.1.2 Research Objectives

The research would provide managers information on abundance, size ranges, growth, sex ratio, health status, diving behavior, local movements, habitat use, migration routes, and contaminant levels of sea turtles in California.

1.2 SCOPING SUMMARY

The purpose of scoping is to:

- identify the issues to be addressed
- identify the significant issues related to the proposed action
- identify and eliminate from detailed study the non-significant issues
- identify and eliminate issues that have been covered by prior environmental review
- identify the concerns of the affected public and Federal agencies, states, and Indian tribes

Council on Environmental Quality's (CEQ) regulations implementing the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) do not require that a draft EA be made available for public comment as part of the scoping process.

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1 The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."

1.2.1 Comments on application

A Notice of Receipt of the application was published in the *Federal Register*, announcing the availability of File No. 14510 (74 FR 59525, November 18, 2009) for public comment. No comments were received.

1.3 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action, as well as who is responsible for obtaining them. Even when it is the applicant's responsibility to obtain such permissions, NMFS is obligated under NEPA to ascertain whether the applicant is seeking other federal, state, or local approvals for their action.

1.3.1 National Environmental Policy Act

NEPA was enacted in 1969 and is applicable to "major" federal actions significantly affecting the quality of the human environment. A federal action is considered "major" if a federal agency fully or partially funds, regulates, conducts, or approves this action. NMFS issuance of research permits is considered a major federal action. NEPA requires consideration of environmental issues in federal agency planning and decision making. The CEQ's implementing regulations (40 CFR Parts 1500-1508) outline federal agency responsibilities under NEPA.

Through NOAA Administrative Order (NAO) 216-6, NOAA established agency procedures for complying with NEPA and the implementing regulations issued by the CEQ. NAO 216-6 specifies that issuance of scientific research permits under the MMPA and ESA are categorically excluded from further environmental review, except under extraordinary circumstances.

NMFS must prepare an EA or EIS when a proposed action:

- is the subject of public controversy based on potential environmental consequences,
- has uncertain environmental impacts or unknown risks,
- establishes a precedent or decision in principle about future proposals,
- may result in cumulatively significant impacts, or
- may have an adverse effect upon endangered or threatened species or their habitats.

While issuance of scientific research permits is typically subject to a categorical exclusion, as described in NAO 216-6, NMFS is preparing an EA for this action to provide a more detailed analysis of effects to ESA-listed species. This EA is prepared in accordance with NEPA, its implementing regulations, and NAO 216-6.

1.3.2 Endangered Species Act

Section 9 of the ESA, as amended, and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption such as by a permit. Permits to take ESA-listed species for scientific purposes, or for the purpose of enhancing the propagation or survival of the species, may be granted pursuant to Section 10(a)(1)(A) of the ESA.

NMFS has promulgated regulations to implement the permit provisions of the ESA (50 CFR Part 222) and has produced OMB-approved application instructions that prescribe the procedures necessary to apply for permits. Applicants must comply with these regulations and application instructions in addition to the provisions of the ESA.

Section 10(d) of the ESA stipulates that, for NMFS to issue permits under section 10(a)(1)(A) of the ESA, the Agency must find that the permit: was applied for in good faith; if granted and exercised will not operate to the disadvantage of the species; and will be consistent with the purposes and policy set forth in Section 2 of the ESA.

Section 2 of the ESA sets forth the purposes and policy of the Act. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. It is the policy of the ESA that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. In consideration of the ESA definition of conserve, which indicates an ultimate goal of bringing a species to the point where listing under the ESA is no longer necessary for its continued existence (i.e., the species is recovered), exemption permits issued pursuant to section 10 of the ESA are for activities that are likely to further the conservation of the affected species.

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or adversely modify critical habitat. NMFS issuance of a permit affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these Section 7 consultation requirements. Section 7 requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402).

1.3.3 Magnuson-Stevens Fishery Conservation and Management Act

Under the MSFCMA Congress defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). The EFH provisions of the MSFCMA offer resource managers means to accomplish the goal of giving heightened consideration to fish habitat in resource management. NMFS Office of Protected Resources is required to consult with NMFS Office of Habitat Conservation for any action it authorizes (e.g., research permits), funds, or undertakes, or proposes to authorize, fund, or undertake that may adversely affect EFH. This includes renewals, reviews or substantial revisions of actions.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objective, as well as alternatives eliminated from detailed study. This chapter also summarizes the expected outputs and any related mitigation of each alternative. One alternative is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for rest of the analyses. The Proposed Action alternative represents the research proposed in the submitted application for a permit, with standard permit terms and conditions specified by NMFS.

2.1 ALTERNATIVE 1 – NO ACTION

An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, it would not allow the research to be conducted, and the opportunity would be lost to collect information that would contribute to understanding of sea turtles in their foraging grounds.

2.2 ALTERNATIVE 2 – PROPOSED ACTION (ISSUANCE OF PERMIT WITH STANDARD CONDITIONS)

Under the Proposed Action alternative, a permit would be issued for activities as proposed by the applicant, with the permit terms and conditions standard to such permits as issued by NMFS. These include conditions required by the ESA and NMFS regulations for research permits, and special conditions common to permits for research on sea turtles. The special conditions related to research on sea turtles are intended to mitigate potential adverse effects on animals caused by specific research methods. The permit conditions, including these mitigation measures that are part of the proposed permit alternative are listed in Appendix A. The permit would be valid for five years from the date of issuance.

The Proposed Action is issuance of a scientific research permit to the SWFSC, pursuant to the ESA. The purpose of the proposed action is to initiate a baseline study of the status of green sea turtles in the San Gabriel River and Alamitos Bay in Long Beach, California. Green turtles have been documented in the San Gabriel River since the late 1980s. The applicant would study the species present at this temperate foraging area to determine their abundance, size ranges, growth, sex ratio, health status, diving behavior, local movements, habitat use, migration routes, and contaminant levels. A primary goal is to integrate data from genetic analysis, flipper tagging, and satellite telemetry to identify nesting beach origins of turtles occurring in this area and how they contribute to the overall understanding of sea turtle stock structure in the Pacific Ocean and potentially more local movements between waterways within nearshore California. If turtles originally tagged in San Diego Bay (the nearest authorized green turtle study site to the San Gabriel River and Los Alamitos Bay) are found in this area during this study, researchers would compare current data with those collected in San Diego Bay to determine growth rates of juveniles and adults and determine tag retention rates. Genetic studies based on blood and tissue samples are part of an international collaboration to define stock structure of sea turtles in the Pacific. Finally, researchers would investigate how contaminants in the environment accumulate, if any, in turtle tissues.

The secondary purpose of this research is to opportunistically take samples and potentially track sea turtles incidentally taken in coastal power plants off California and that strand live in the marine environment. This information would be used to complement the directed studies in San Diego Bay and in the Long Beach area to better understand the ecology of sea turtles along the California coast. If satellite tags are available, researchers would track the movements of healthy turtles released off the coast of California to determine their movements locally and/or offshore.

The action area includes the areas around and including the San Gabriel River and Los Alamitos Bay, California, as well as power plant entrainment areas along the coast of California. Researchers would also access stranded animals in the marine environment along the entire coast of California.

The proposed research is to handle, measure, weigh, tag, photograph, attach transmitters to, sample, assess, and salvage green, olive ridley, loggerhead, and leatherback sea turtles. See Appendix B (Tables 1, 2, and 3) for a table outlining the proposed numbers of animals, research activities, etc.

The following is a description of the proposed methods.

Capture

Sea turtles would be captured using specialized sea turtle entanglement net (100 m x 6 m, 30 cm mesh knot-to-knot), dipnet, seine net, or SCUBA. The entanglement nets would be monitored continuously, and would be examined to check for submerged turtles at least one time every 30 minutes. When a turtle is caught it would be immediately brought on board one of the research vessels and disentangled. Turtles would be promptly transported to the shore which is approximately 100 – 200 m from capture sites via the research vessel. During periods of low tide, researchers would use alternative means of capturing turtles, employing a seine net that would be hand-held and deployed from shore. Alternatively, they may manually capture turtles using a dip net or SCUBA. A diver who has successfully captured a turtle would carefully ascend to the surface and transport the animal to shore. In the event of any difficulties with the transport, the turtle would be released immediately.

Power plant entrainments/marine strandings

In addition, turtles incidentally taken in coastal power plants off of California would be opportunistically sampled. The capture of entrained turtles is authorized under a condition of incidental take permits (ESA Section 10a1b) or Incidental Take Statements (Section 7). These authorizations allow for the take of sea turtles by coastal power plants under the Endangered Species Act. Individuals from many of these facilities are required to receive training in tagging and sampling techniques and would collect much of the data the researchers need as part of their reporting requirements. If circumstances allow, NMFS SWR and SWFSC staff would determine if any additional biotelemetry tagging and sampling covered under this permit is appropriate.

Sea turtle entrainments are reported every year to NMFS from several power plants in California, mostly occurring in the southern part of the state. The majority of the entrained turtles reported to NMFS have been alive and ultimately returned back to the marine environment. If a carcass is found in the intake system this mortality would be covered under the Biological Opinion written

by NMFS SWR (NMFS 2006 and NFMS in review). The proposed action would not authorize mortality of sea turtles.

The proposed action would authorize opportunistic sampling of marine stranded turtles. Sampling of live entrained turtles in power plants and marine stranded turtles could occur at any power plant facility along the coast of California, although most are expected to occur in the southern half of the state.

The condition of each entrained or stranded turtle would be recorded. Animals that are documented in poor condition (non-responsive, injured) and in need of rehabilitation would be transported to either SeaWorld or the Aquarium of the Pacific. Dr. Lance Adams, a veterinarian from the Aquarium of the Pacific, would be on call in the event veterinary consultation is required.

Handling and Care

Sea turtles would be temporarily held to conduct research activities. During transportation, captured turtles would be covered with a shade tarp for sun protection if necessary. Front flippers would be immobilized so as to prevent injury to the turtle and researchers within the vessel. Once on shore, to prevent injury to turtles and researchers, turtles would be placed in a specialized restraint harness prior to being unloaded onto the shore. Animals would be held between 20 minutes and 2.5 hours under a shade tent and inside a restraining container specially designed to hold turtles. The container would be a box (approx. 5 ft by 5 ft) without the bottom and top, allowing the turtle inside to move and breathe in the container without additional restraint.

All measurements, sample collection and telemetry attachment would take place on shore. Turtles would be released into the water directly adjacent to this location. The entire process from the time the turtle is brought on board the boat until its release would take a maximum of 2.5 hours. During all research efforts, a veterinarian (Dr. Lance Adams, Veterinarian, Aquarium of the Pacific) would be on call to assist if needed.

Measuring, Weighing, Ultrasound, and Photographing

Turtles would be measured using a soft measuring tape to collect curved carapace, plastron, and tail lengths. Calipers would be used to measure straight carapace lengths and body depth. Turtles would be weighed using a specially designed tri-pod for lifting the animals and a digital scale would be used to record weight. Animals would be restrained in a harness designed specifically for lifting turtles during the weighing process.

Non-invasive ultrasound would be used to monitor the reproductive status of captured animals. Animals would be placed on their dorsal side. No anesthesia and minimal restraint are required for this procedure. A water based lubricant would be used as the coupling gel. The transducer would be positioned in the inguinal region cranial to the hind limb for an accurate reading of the ovaries. Both sides would be scanned (Rostal et al. 1990).

All animals would be photographed to catalogue carapace, head, and plastron coloring, and any distinguishing marks, old wounds, and/or lesions.

Buccal (Oral) and Cloacal Swab

Non-invasive buccal and cloacal swabs for comparative genetic analysis may also be taken. Swabs would be collected with a wooden stick with rounded ends by lightly brushing the interior cheek without levering open the jaw (Miller 2006). Swabs from the cloaca would be collected by inserting the stick approximately 5 mm into the cloaca (Miller 2006). Buccal and cloacal swabs would be taken from the same animal. Samples would be analyzed in the genetics lab to determine which is a more reliable source of DNA from sea turtles.

Flipper Tagging and PIT Tagging

Researchers would tag the turtles with metal inconel tags (Style 681, National Band and Tag Company) issued by the NMFS – SWFSC using the standard technique described in the Marine Turtle Specialist Group Manual on Research Techniques (Eckert et al. 1999). Researchers have used these tags on captive sea turtles at Sea World as well as wild green, hawksbill, olive ridley, Kemp's ridley, and leatherback turtles worldwide, and are experienced in their application. The tag would be attached to the soft skin along the trailing edge of the left or right front flipper near the carapace. The applicator is similar to that used to ear-tag livestock; the pointed end of the tag goes through the flipper and connects on the underside. Tag retention for these tags varies; although some tags are retained for up to 20 years, many are lost after 2 - 4 years. Researchers would also inject a PIT tag, a small (14 mm length x 2 mm diameter) electromagnetically-coded glass-encased "microchip," either into the muscle between the first two phalanges in the front flipper, or within the triceps muscle on the anterior arm. PIT tags would be read with a scanner, and are designed to last the life of the turtle.

Tetracycline Injection

A portion of turtles captured would be injected with the antibiotic tetracycline. The purpose of the injection is to mark the bones of the sea turtle at the time of the injection so they can be used in the calibration of bone growth if the turtle strands dead. This information is necessary for the validation of skeletochronological studies. The quantity of tetracycline, injected into the shoulder muscle, would be based on the weight of the animal. The skin would be disinfected prior to injection. Currently, growth patterns of bones (humerus or scleral ossicles; Zug and Parham 1996, Avens and Goshe 2007) and age determination through skeletochronology, are not well validated for wild turtles. The difficulty in determining the age of a particular individual often comes from the intricacy in counting the growth lines (or lines of arrested growth, LAGs). Zug and Glor (1999) stated that "although the humerus retains more growth layers than most other bones, it is still profoundly influenced by skeletal remodeling." By marking the bones of a turtle with the antibiotic at the time of capture, there will be a reference line for counting the growth layers when the animal is found dead. The reference line would help determine the pattern of bone growth, therefore providing more precise age estimates from the skeletochronological analysis. Such information is essential in estimating various age-specific life history parameters, such as age at first reproduction, fecundity, and survival rates.

Blood Sampling

Researchers would take a blood sample (approximately 10 – 30 cc's) from each turtle. The sampling location would be thoroughly cleaned with betadine prior to and after each sample is taken. Once clean, a sterile needle (approximately 20 gage/1.5" long), attached to a vacuum

syringe (BD Vactuatiner®), would be inserted into the dorsal cervicle sinus on the lateral dorsal region of the neck, using the technique described in Bentley and Dunbar-Cooper (1980) and Owens and Ruiz (1980).

Tissue, Skin, and Scute Sampling

The sample location would depend on the species of turtle and whether the turtle is brought aboard the vessel or brought to shore, which is likely the case in all situations for the purpose of the proposed permit. If the turtle is brought aboard the vessel or brought to shore (expected), the turtle would have a tissue sample collected from the fleshy neck area between the head and carapace. In rare cases where a turtle is too large to bring aboard a vessel or to shore (unexpected), the sample would be collected from a location most easily accessed by the researcher (usually the flipper or neck). Samples would be collected from anywhere on the limbs or neck, avoiding the head. For all tissue sample collections, a sterile 6 mm punch sampler or sterile razor blade and forceps would be used. If the animal is able to be landed, the sample site will be swabbed with alcohol to clean it before the sample is collected.

Researchers would also collect scute samples from each turtle using either a sterile biopsy punch or forceps and a razor blade. Scute samples would be taken from one or more of the eight posterior marginal scutes of the carapace and would be used to determine contaminant levels in the tissue. Collection locales would be thoroughly cleaned with a plastic scrubbing pad, clean room wipes, high purity water, and 2-propanol. Keratin would be scraped from the radial edge, where the dorsal and ventral surfaces form a thin edge and the keratin and underlying tissue can be discriminated. A disposable stainless steel biopsy tool would be used to obtain 0.2 to 0.5 g of the scute by moving the tool parallel to the edge. This process would yield splinters of keratin approx. 1 mm in thickness representing the entire depth of scute deposition.

Lavage

Researchers would lavage animals immediately after capture in order to collect stomach samples for analysis. This procedure involves inserting a length of 3/4 inch diameter soft plastic tubing down the esophagus to the "pre-stomach" and flushing it with clean seawater poured into the tubing. Contents would be caught in a separate basin.

Transmitter Attachments

Researchers would track movements within and outside of the Alamitos Bay area. A combination of multiple transmitters would be used to monitor short-range and long-range movements, diving behavior, and habitat use. The transmitters for this effort include ultrasonic tags, time-depth recorders (TDRs), video-time-depth recorders, and satellite transmitters (PTTs). Satellite transmitter applications requested for stranded or entrained animals would only be applied to animals deemed healthy.

Description and Attachment of ultrasonic transmitters:
Researchers would use Sonotronics™ ultrasonic transmitters (CHP-87-L, dimensions = 90 mm long x 18 mm diameter, weight = 11.5 g) to learn about the movements and residency patterns of turtles within the study area. Tags would be programmed to transmit signals in 35.0 to 40.0 kHz, a frequency range that is outside the hearing capacity of green turtles (30 Hz – 1kHz, Ridgeway et al. 1969). Each ‘ping’ from the transmitter lasts between 528 and 942 milliseconds, depending

on the transmitter configuration. Transmissions are 145 dB (ref 1μPas) and have a transmission range of up to 1 km, although transmissions typically attenuate to 0% within 250 meters of the tagged animal, due to the extreme shallow depths within the study area (max depth = 6 m) coupled with the presence of seagrass and other benthic features. The decibel level is extremely low out of water, with pings indistinguishable to the human ear. The transmitters would have a battery life of 12 months.

Transmitters would be attached to either the left or right rear-side of the carapace with thin coats of fiberglass resin as described in Balazs et al. (1996). The attachment area, roughly 8" x 6", on the carapace would be lightly sanded to remove algae. A non-toxic elastomer compound or plumbers putty would be used to "cushion" the transmitter and hold it in place during the attachment procedure. A thin coat of laminating resin would be applied to the carapace and transmitter and 4 strips of fiberglass cloth would be pasted over the transmitter to attach it. Based on the recaptures of sonic transmitter-equipped turtles, researchers report that these transmitters generally fall off the turtle within 6 months, although two turtles have been encountered in San Diego Bay where transmitters remained attached for up to 1 year. The recapture of these turtles was opportunistic as it is virtually impossible to target specific turtles for removing sonic transmitters.

In the event a turtle bearing a non-functional sonic tag is re-captured, all fiberglass resin as well as the tag would be carefully removed from the turtle using a scraper tool and fine grit sand paper. To date, adverse effects from tag attachment have not been observed on any recaptured turtles in San Diego Bay (Seminoff and Dutton, NMFS-SWFSC, pers. comm., 2009).

Researchers would track ultrasonic transmitter-equipped turtles using one of two techniques. First, they would carry out boat-based tracking with a hand-held sonic receiver (Sonotronics, Tucson, AZ) with a directional hydrophone. In order to minimize disturbance to the turtles, each re-sighting position would be determined by maneuvering the tracking vessel to within 10–20 m of the turtle and recording the location of the tracking vessel with a Global Positioning System (Garmin, England; error range = ± 3 m to ± 12 m). Distances from telemetered turtles would be determined from direct observation of surfacing turtles or estimated from the strength of the sonic signal at one-tenth gain with a directional hydrophone. For manual tracking, researchers would use a 17 ft. Boston Whaler (w/Honda 75 hp outboard motor).

Second, researchers would track turtles remotely with an array of submersible stationary sonic receiving stations (SUR-1, Sonotronics, Tucson, Arizona) that are already located strategically throughout the study area.

Description and Attachment of TDRs, to determine movement and behavior patterns:

TDRs (MK-9, Wildlife Computers, Redmond, Washington, Dimensions = 67 x 17 x 17 mm, 30g) would be seated in tubular-shaped syntactic foam drogue (20 cm length, 7 cm diameter) that has a hydrodynamically optimized dome and conical tail portion composed of incompressible syntactic foam. For tracking and retrieval, each TDR drogue has an internally mounted very-high-frequency (VHF) radio transmitter (MOD 050, Telonics, Inc. Mesa, Arizona; dimensions = 55 mm long x 17 mm diameter; transmission range = 148.0 - 140.0 mHz) and ultrasonic sonic

tag (CHP-87-L, Sonotronics, Tucson, Arizona; see above for specifications). TDRs would log time-of-day, depth (resolution = 0.5 m), temperature, and light levels (lumens). Data collection intervals would be set at 10 sec (depth) and 1 min (temperature and light levels) and initiated by a salt-water switch.

To ensure prompt recovery of the TDRs, researchers would use an automatic release mechanism consisting of two interlocking plates; one fixed to the turtle's carapace with a nylon mesh apron and a 5-minute quickset epoxy and the second attached to the TDR drogue with hose clamps. To offset the slight positive buoyancy of TDR drogues, researchers would counterweight the bottom plate to achieve neutral buoyancy. A screw-and-groove assembly would link the anterior portion of these plates; the rear portion would be connected with a galvanic (Mg) link that, upon immersion in seawater, dissolves at a constant rate. Upon dissolving, a spring mechanism would force the rear of the top plate upwards, thereby disengaging the front portion. The slight buoyancy would cause the units to float to the surface. Captive trials and one recapture of a wild turtle demonstrated that base plates are shed from the carapace within 10 days of TDR detachment (Seminoff et al. 2006). The attachment location does not interfere with flipper or head movements. Units weigh 0.8 kg out of water, but would be neutrally buoyant in water due to a counterweighing system described above.

Description and Attachment of video camera:
The video camera would consist of a Hi-8 video camera integrated with a time-depth recorder and on-board microcomputer (up to 512 Kbytes of memory) for data collection. These components would be housed in a tubular shaped aluminum cylinder (10.1 cm diameter, 31.7 cm in length) that has a hydrodynamically optimized dome and conical tail portion composed of incompressible syntactic foam. For retrieval after detachment, each camera would have an internally mounted very-high-frequency (VHF) radio transmitter (MOD 050, Telonics, Inc. Mesa, Arizona; dimensions = 55 mm long x 17 mm diameter; transmission range = 148.0 - 140.0 mHz) and ultrasonic sonic tag (CHP-87-L, Sonotronics, Tucson, Arizona). Units would weigh 2.0 kg out of water, but be neutrally buoyant in water due to a counter-weighting system described below. Only large turtles would be equipped so that the camera system weighs no more than 3% of the body weight. Researchers would program cameras to collect video in both short-play (3 h) and long-play (6 h) modes and to record continuously or at a 5-minute on / 5-minute off duty cycle. Water depth and temperature information would be collected at 2-7 s intervals for the entire duration of each deployment, irrespective of camera function.

Researchers would attach video cameras to the crown of each turtle's carapace with a two-plate mechanism: the top plate would be linked to the video cameras with two 10-cm diameter hose clamps; the bottom plate would be attached to the carapace with a nylon mesh apron and a 5-minute quick-set epoxy. The front of these plates would be connected by an interlocking assembly and the back connected with the burn-wire connector and backup corrosive (Mg) link. To offset the slight positive buoyancy of video cameras, researchers would counterweight the bottom plate to achieve neutral buoyancy. Cameras would be programmed to detach at 4-20 h after deployment, at which time a charge from a 9V battery housed internally within the video camera would be sent to the burn-wire, causing the wire to corrode and break, thereby disengaging the plates. Once detached from the baseplate, the slight positive buoyancy of the camera would float the unit to the surface. Captive trials and one recapture of a wild turtle

demonstrated that base plates are shed from the carapace within 10 d of camera detachment. The attachment location would not interfere with flipper or head movements.

Researchers would use a VHF receiver (TR-4, Telonics Inc., Mesa, Arizona) with a 3-element Yagi antenna and a sonic receiver (VR60, VEMCO Ltd., Nova Scotia, Canada) with a directional hydrophone to recover floating video cameras.

Researchers would also use a video camera system that was developed by Dr. James Harvey (Moss Landing Marine Laboratories, California State Universities). The unit consists of a video camera, solid state hard drive, and VHF transmitter, encased in a hydrodynamically optimized flotation. When it is detached from a turtle, it floats upright with the VHF antenna out of the water for prompt recovery. The unit would be attached to a turtle via a suction cup. Consequently, no glue or fiberglass adhesive is required for the deployment. The unit would fall within a few days of deployment. The system has been used successfully for leatherback turtles along the central coast of California by the applicant under Permit No. 1596.

Satellite Transmitters:
Satellite transmitters would be attached using a polyester resin to the uppermost vertebral scute of the carapace. The area where the adhesive is placed would be cleaned of barnacles, algae and any other foreign materials, wiped with alcohol, and scrubbed with sandpaper. The turtles would be held for a short period of time to ensure that the adhesive has cured sufficiently.

Description of attachment of satellite transmitters:
These transmitters would be either one of the following: 1) Telonics A-1010, formerly called the ST-20, dimensions = 6.0 x 12.3 x 2.8 cm, 276 g; 2) Telonics A-2025, dimensions = 13.97 x 7.6 x 4.1, 595 g; 3) Wildlife Computers 'Splash' Tag, variable dimensions based on configuration; 4) Wildlife Computers 'Spot 5' Tag, variable dimensions based on configuration; and 5) Wildlife Computers MK-10 GPS tag. The A-1010 is a location only tag (see attached specifications). The A-2025, Splash, and Spot-5 tags record location and depth data. The MK-10 GPS tag records location, depth, temperature, and constant light levels. A maximum of one satellite tag will be deployed on any single turtle.

Transmitters would be attached to the carapace with thin coats of fiberglass resin as described in Balazs et al. (1996). The attachment area on the carapace would be lightly sanded to remove algae, then wiped with alcohol to remove dust particles and thoroughly clean the surface. A non-toxic elastomer compound or plumbers putty would be used to "cushion" the transmitter and hold it in place during the attachment procedure. A thin coat of laminating resin would be applied to the carapace and transmitter, and 6-8 strips of fiberglass cloth would be pasted over the transmitter to attach it. The turtles would be held on the shore for up to 2.5 hours until resin has cured and then released back into the Bay at the point of capture. A subset of satellite transmitter-equipped turtles would also be fitted with an ultrasonic transmitter (see attachment procedure above) to track short range movements.

Necropsy and Salvage

As these activities would not be conducted on live animals, they would have no effects necessary to analyze and are not considered further.

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter presents baseline information necessary for consideration of the alternatives, and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. The effects of the alternatives on the environment are discussed in Chapter 4.

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

There are a variety of human activities that may occur in the action area such as commercial fishing, shipping, military activities, recreational uses (such as fishing and boating), and ecotourism. The social and economic effects of the proposed action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as suppliers of equipment needed to accomplish the research. Permitting the proposed research could result in a low level of economic benefit to local economies in the action area. However, such impacts would be negligible on a national or regional level and therefore are not considered significant. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects. Thus, the EA does not include any further analysis of social or economic effects of the proposed action.

3.2 PHYSICAL ENVIRONMENT

Researchers would be working primarily in the San Gabriel River (33° 45' N, 188° 7' W), which is located on the border between Los Angeles and Orange counties in southern California. While the headwaters originate in the San Gabriel Mountains, many miles of the urbanized lower reaches of the river, where researchers would be working, are lined with concrete in an effort to reduce flooding and property damage. This eventually becomes a soft-bottom channel again in the City of Long Beach – the river ultimately flows into Long Beach Harbor (Schiff et. al. 2006). In the San Gabriel River, researchers would focus capture efforts primarily in the area adjacent to the Haynes power plant outfall, and secondarily (opportunistically), Alamitos Bay and adjacent waterways (where turtles are sighted during first years of monitoring by Aquarium of the Pacific, its volunteer program, and anecdotal sightings reports by the general public to NMFS-SWR). The location does not have any special status or protection.

3.2.1 Essential Fish Habitat

Activities that have been shown to affect EFH include disturbance or destruction of habitat from stationary fishing gear, dredging and filling, agricultural and urban runoff, direct discharge, and the introduction of exotic species. None of the activities in the Proposed Action are directed at or likely to have any impact on any designated EFH.

3.2.2 Designated Critical Habitat

There is no designated Critical Habitat in the action area.

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 ESA Target Species Under NMFS Jurisdiction

ESA Endangered

Green sea turtle	*Chelonia mydas**
Olive ridley sea turtle	*Lepidochelys olivacea**
Leatherback sea turtle	*Dermochelys coriacea*

*ESA Threatened***

Loggerhead sea turtle	*Caretta caretta*

**Green turtles and Olive ridley turtles in U.S. waters are listed as threatened except for the Florida breeding population and Mexico's Pacific coast breeding population which are listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green and Olive ridley turtles are considered endangered wherever they occur in U.S. waters.*

*** NMFS is currently accepting comments on changing the listing of the loggerhead sea turtle to endangered (75 FR 12598).*

Green sea turtle

Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. Throughout the Pacific, nesting assemblages group into two distinct regional clades: 1) western Pacific and South Pacific islands, and 2) eastern Pacific and central Pacific, including the rookery at French Frigate Shoals, Hawaii. In the Hawaiian Islands, green turtles are site-specific and consistently feed in the same areas on preferred substrates, which vary by location and between islands (in Landsberg *et al.* 1999). In Hawaii, green turtles lay up to six clutches of eggs per year (mean of 3.7) and clutches consist of about 100 eggs each. Females migrate to breed only once every two or possibly many more years. On the Hawaiian Archipelago, females nest every 3 to 4 years (Balazs and Chaloupka 2004). Eastern Pacific green turtles have reported nesting between two and six times during a season, laying a mean of between 65 and 86 eggs per clutch, depending on the area studied (Michoacán, Mexico and Playa Naranjo, Costa Rica) (in Eckert 1993 and NMFS and USFWS 1998). Mean observed and estimated clutch frequency for green turtles nesting at Colola beach (Michoacan, Mexico) was 2.5 and 3.2, respectively (Arias-Coyotl *et al.* 2003). Nesting populations are doing relatively well in the Pacific, Western Atlantic, and Central Atlantic Ocean but are doing relatively poorly in Southeast Asia, Eastern Indian Ocean, and perhaps the Mediterranean (NMFS and USFWS 2007a).

Olive ridley sea turtle

Olive ridley turtles occur throughout the world, primarily in tropical and subtropical waters. The species is divided into three main populations in the Pacific, Indian, and Atlantic oceans. Preferred nesting areas occur along continental margins and, rarely, on oceanic islands. Nesting aggregations in the Pacific Ocean are found in the Marianas Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific); and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific). Olive ridley turtles from both eastern and western Pacific nesting beaches were tagged in the Hawaii-based longline fishery (Polovina *et al.* 2004). Olive ridleys are famous for their synchronized mass nesting emergences, a phenomenon commonly known as "arribadas."

The threatened large arribada populations in the eastern Pacific have declined since the 1970s. Nesting at some arribada beaches continues to decline (e.g., Nancite in Costa Rica) and is stable or increasing at others (e.g., Ostional in Costa Rica) (NMFS and USFWS 2007b).

Leatherback sea turtle

The leatherback ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). Leatherbacks are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour 1972). Historically, population decline was due primarily to intense exploitation of the eggs (Ross 1979), but adult mortality has increased significantly from interactions with fishery gear (Spotila *et al.* 1996). On some beaches in the Pacific, nearly 100 percent of the eggs laid have been harvested (Eckert 1993). Adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries (Eckert 1993; Eckert 1997; Spotila *et al.* 1996). In the western Pacific, the major nesting beaches in Papua New Guinea, Papua, Indonesia, Solomon Islands, and Vanuatu (Limpus 2002, Dutton *et al.* 2007), consist of approximately 2,700-4,500 breeding females. However, this estimate should be interpreted with caution as it was derived from nest counts, and reliable data on the number of nests per female are not available (Dutton *et al.* 2007).

Loggerhead sea turtle

While loggerheads can be found throughout tropical to temperate waters in the Pacific, there are a restricted to a number of breeding sites in the North Pacific and South Pacific. The recent loggerhead status review (Conant *et al.* 2009) concluded that there are nine loggerhead distinct population segments (DPSs). These include the North Pacific Ocean DPS; the South Pacific DPS; the North Indian Ocean DPS; the Southeast Indo-Pacific Ocean DPS; the Southwest Indian Ocean DPS; the Northwest Atlantic Ocean DPS; the Northeast Atlantic Ocean DPS; the Mediterranean Sea DPS; and the South Atlantic Ocean DPS. While NMFS has not yet officially recognized these DPSs, the information provided in the status review represents the most recent and available information relative to the status of this species. On March 16, 2010 NMFS published a Notice of a Proposed Rule (75 FR 12598) to formally designate the loggerhead with these nine DPS' worldwide. The notice also stated that NMFS plans to reclassify both DPS' within the United States as endangered (N. Pacific DPS and Northwest Atlantic Ocean DPS). The public has until June 14, 2010 to comment on the proposed rule.

Animals from the North Pacific Ocean DPS and the South Pacific Ocean DPS would be affected by the proposed action. Conant *et al*. (2009) assessed the extinction risk of the North Pacific and South Pacific Ocean DPS. Given that it is unlikely that loggerhead bycatch mortality in fisheries can be sufficiently reduced in the near future due to a host of challenges, and given coastal development and coastal armoring on nesting beaches continues as a substantial threat, the assessment concluded that these DPS' are currently at risk of extinction.

Non Target Species

No sea birds are anticipated to be taken incidental to this project. No marine mammals are anticipated to be taken incidental to this research project. While California sea lions (*Zalophus californianus*) have been seen in the area, protocols would be in place such that the area would be scanned for marine mammals prior to setting the net to reduce the risk of entanglement.

Should any marine mammals be seen in the area, researchers would wait until the animals leave the area prior to setting the net.

Cartilaginous fishes that may be incidentally taken include the gray smoothhound shark (*Mustelis californicus*) and the bat ray (*Myliobatis californica*). Researchers anticipate that no more than 10 of each of these species would be caught in the net annually due to the large mesh size of the sampling net. No mortality would be expected due to the anticipated short duration of capture time for any animals because of the constant monitoring of the sample net (30 minute intervals).

Bony fish species in the area that may be incidentally taken include: California barracuda (*Sphyraena argentea*), California corbina (*Menticirrhus undulatus*), white seabass (*Atractoscion nobilis)*, striped mullet (*Mugil cephalu*s), yellowfin croaker (*Umbrina roncador*), California halibut (*Paralichthys californicus*), diamond turbot (*Hypsopsetta guttulata*), spotted turbot (*Pleuronichthys ritteri*), and tilapia (*Oreochromis spp.*) (MBC, unpublished data, 2004). Reseachers anticipate that no more than 10 of each of these species would be caught in the net over the duration of this permit due to the large mesh size of the sampling net. No mortality would be expected due to the anticipated short duration of capture time for any animals because of the constant monitoring of the sample net (30 minute intervals).

One invertebrate, the striped shore crab (*Pachygrapsus crassipes*), may also be incidentally taken. While it is unlikely that this small crab would be captured by the net, it is possible that crabs might be exploring the net for food and could latch on to it with their claw during net retrieval. Researchers estimate that up to 500 crabs may be brought up out of the water during the course of this research permit. Careful handling of all bycatch species would help ensure that no mortality would be associated with their release.

Given the precautionary conditions the permit would contain to minimize the impact of the research and that there would be no expected population effects, these species are not considered further in this analysis.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 EFFECTS OF ALTERNATIVE 1: No Action

An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to all aspects of the environment from the proposed research activities. It would prohibit researchers from gathering information that could help endangered and protected sea turtles.

4.2 EFFECTS OF ALTERNATIVE 2: Issue permit with standard conditions

Any impacts of the proposed action would be limited primarily to the biological environment, specifically the animals that would be studied or affected by the research. The type of action proposed in the permit requests would have a negligible effect on the physical environment and would be unlikely to affect the socioeconomic environment or pose a risk to public health and safety.

4.2.1 Effects on Biological Environment

Effects of the action on sea turtles captured, entrained in power plants, or stranded in the marine environment are discussed below.

Capture

As with any in-water capture program, there is a possibility that entangled turtles could suffer ill-effects from capture, ranging from acute stress to drowning. However, to minimize the potential for adverse impact on the turtles, researchers would constantly examine the nets while they are in the water, so that any turtle caught would be instantly retrieved. Even if no entangled turtle is seen at the water's surface researchers would hand-walk the nets every 30 minutes.

Dr. Lance Adams, a veterinarian from the Aquarium of the Pacific, would be on call during all capture activities in the event veterinary consultation is required. If a turtle is encountered in a comatose state, researchers would immediately commence resuscitation techniques. The fact that the turtles would only be held for a maximum of 2.5 hours would minimize stress.

Handle/Measure/Weigh/Ultrasound/Photograph

Standard measurements and weight would be collected on sea turtles captured, found entrained in power plant intake valves, or marine stranded. Should a sea turtle be recaptured, weight and measurements would be taken to measure growth over time. The effects of harassment on turtles during capture and handling can result in raised levels of stressor hormones and may cause some discomfort during tagging procedures. However, based on past observations of similar research, these effects are expected to dissipate within a day (Stabenau and Vietti, 2003, Dutton pers. comm., 2008).

NMFS does not expect that individual turtles would experience more than short-term stresses during the handling, measuring, and weighing. No injury would be expected from these activities. Turtles would be worked up as quickly as possible to minimize stresses resulting from capture. The permit holder would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling animals.

Oral/Cloacal Swab

Each turtle would be sampled using a sterile swab. This procedure could result in minor discomfort to the turtle with no lasting effects. All the turtles sampled by the NMFS Beaufort Laboratory exhibited normal behavior as they were released, and of those that have been recaptured, none have shown an adverse effect.

Flipper Tag/PIT Tagging

Flipper tagging has been used for more than 20 years in green turtle populations such as Hawaii and San Diego Bay (Balazs 1999, Dutton, NMFS pers. comm., 2009) to track sea turtle movement and growth. All tag types have negative aspects associated with them, especially concerning tag retention. Plastic tags can become brittle, break, and fall off underwater, and titanium tags can bend during implantation and thus not close properly, leading to tag loss. The small wound-site resulting from a tag applied to a flipper has been observed to heal completely in a short period of time in animals recaptured in San Diego Bay, and the risk of infection is low, especially because the equipment and tag are sterilized prior to tagging each turtle (Dutton, NMFS, pers. comm., 2009). If the flipper tag does fall off given the very small amount of debris they would represent and the fact that they do not contain any highly dangerous or radioactive materials, NMFS does not expect them to have any significant effect on the environment.

PIT tags range in size from 11.5 x 2.1 mm to 20.0 to 3.2 mm. Over time, PIT tags can migrate within body tissue, making it necessary to scan the entire surface of the implantation area. Migration is minimized when PITs are injected into muscle. PIT tags have the advantage of being encased in glass, which makes them inert, and are positioned inside the turtle, where loss or damage over time due to abrasion, breakage, corrosion or age is virtually non-existent (Balazs 1999, McDonald and Dutton 1996). Currently available PITs are designed with a coating that promotes growth of muscle fibers to promote healing and encase and hold the PIT in place when injected into muscle.

The application of both types of tags would produce some level of pain to the turtle receiving the tag. The discomfort displayed is usually short and highly variable between individuals. Balazs (1999) states that most turtles barely seem to notice when being tagged, while others exhibit a marked response. Based on past research projects conducted by NMFS-SWFSC scientists in San Diego Bay, CA; Bahia de Los Angeles, Mexico; and St. Croix, USVI, which all employ flipper and PIT tagging techniques, no post-tagging infection has been noted (Dutton and Seminoff, NMFS, pers. comm, 2009). In addition, animals tagged in San Diego Bay have been observed in the initial capture area for over 19 years, indicating that tagging has had no lasting effects on the animals. NMFS does not anticipate any mortality or long-term adverse effect to the turtle with the attachment of the flipper tags or insertion of PIT tags.

Tetracycline Injection

NMFS does not expect that individual turtles would experience more than short-term stress resulting from tetracycline injections. The turtles may experience some minor discomfort or pain while the antibiotic is being administered, however, that discomfort is expected to be brief. Injection sites would always be disinfected with 10% povidone-iodine both prior to giving the injection and also after the needle has been removed from the turtle to prevent infection.

Due to the ubiquitous presence of antibiotics in the environment as a result of use in aquaculture, in addition to introduction via sewage outflow from human communities, concerns have recently arisen regarding the potential effects of these antibiotics on wildlife. As a result, recent research efforts have sought to address the potential effects of tetracycline, including the dosage used to mark bones for aging research on sea turtles. Harms et al. (2004) investigated the pharmacokinetics of oxytetracycline, or OTC, in juvenile loggerhead turtles that were kept in captivity. A total of 20 two-year old juvenile loggerheads were injected with 25 mg/kg OTC (the dosage typically used for bonemarking assuming an oxytetracycline concentration of 200 mg/ml) either intravenously or intramuscularly. The injections did not produce any adverse responses in either treatment group. During physical examinations of turtles throughout the study, turtles appeared to have normal flipper movement, activity, and food consumption.

Tetracycline was not detected in the blood of control turtles that were not injected with tetracycline, but were kept in the same tanks as the experimental turtles, indicating that OTC uptake from surrounding seawater does not occur. The tetracycline was fully metabolized in injected turtles after 66 hours.

Blood Sample

The permits would contain conditions to mitigate adverse impacts to turtles. The applicants would be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling and sampling animals. It is not expected that individual turtles would experience more than short-term stresses during blood sampling. NMFS expects that the collection of a blood sample would cause minimal additional stress or discomfort to the turtle beyond what was experienced during capture, collection of measurements, tagging, etc. The potential for infection resulting from a blood sample would be minimized by the applicant's use of antiseptic techniques before sampling.

Tissue/Scute Sample

The effects of harassment on turtles during tissue sampling can result in raised levels of stressor hormones and may cause some discomfort during sampling procedures. However, no adverse effects have been noted when sampling animals in San Diego Bay (P. Dutton, NMFS, pers. comm., 2008). Researchers who examined turtles recaptured two to three weeks after initial capture and sample collection noted that the sample collection site was almost completely healed (W. Witzel, Research Biologist; P. Dutton, NMFS, pers. comm., 2008). Sampling sites on turtles re-captured in San Diego Bay after several months to years have completely healed and have shown no signs of infection. In San Diego Bay, animals remain in the study area long term,

indicating that sampling does not produce any adverse effects on their behavior (Dutton, NMFS, pers. comm., 2009). NMFS does not expect that the collection of a tissue sample will cause any additional stress or discomfort to the turtle beyond what was experienced during the capture, collection of measurements, and tagging.

Lavage

This technique has been successfully used on green, hawksbill, olive ridley, and loggerhead turtles ranging in size from 25 to 115 inches curved carapace length. Forbes (1999) states that many individual turtles have been lavaged more than three times without any known detrimental effect. Individuals have been recaptured from the day after the procedure up to three years later and appear healthy and feeding normally. Laparoscopic examination following the procedure has not detected any swelling or damage to the intestines. While individual turtles are likely to experience discomfort during this procedure, NMFS does not expect individual turtles to experience more than short-term stress. The applicant is experienced in this technique and has not reported any injuries or mortalities occurring as a result of this procedure.

Transmitter Attachment

The total weight of transmitter attachments would not exceed 5% of the body mass of the animal. Also, each attachment must be made so that there is no risk of entanglement. The transmitter attachment would contain either a weak link or have no gap between the transmitter and the turtle that could result in entanglement.

Because telemetered turtles are studied for the purpose of extrapolation to untagged individuals, it is important to consider the extent to which results may be biased by the effects of the telemetry packages (i.e. hydrodynamic drag and weight). The transmitters (TDR, video camera, satellite tags, ultrasonic tags) used in this study would have negligible effects on the movements of turtles examined because of the following: (1) in a study of video camera equipped green turtles, telemetered turtles exhibited normal diving behavior, and swimming speeds (Seminoff et al. 2006) because the turtles in the present study would likely be larger (mean of previous captured green turtles in the southern foraging area, San Diego Bay = 85.73 cm straight carapace length; SCL) than those studied by Seminoff et al. (mean SCL = 79.6 cm SCL), any potential impacts would be even less significant; (2) during a study of sonic tracked turtles by Seminoff et al. (2002), green turtles returned to areas of initial capture, suggesting that the transmitters and the tagging experience left no lasting effect on habitat use patterns; (3) the use of transmitters with angled edges - as would be used in this study - have been shown to substantially reduce hydrodynamic drag of backpack mounted satellite transmitters in experimental conditions (Watson and Granger 1998); and (4) during previous tracking sessions in San Diego Bay, both telemetered and non-telemetered turtles were seen in the same areas exhibiting roughly similar surface behavior, even swimming within meters of the tracking vessel, thus suggesting negligible effects of the transmitter packages.

In addition, turtles outfitted with transmitters have been recaptured after several years with no indication that they previously carried a transmitter (Dutton, NMFS, pers. comm. 2009). Currently, the SWFSC (J. Seminoff) and the University of British Columbia (T. Jones) have teamed up to conduct research on "Satellite Telemetry Tag Attachment Best Practices." The researchers would be running molded hardshelled and leatherback turtles through wind and water

flumes in order to determine the best location (i.e. least resistance) on the sea turtle for applying transmitters. Tested transmitters include nine different Wildlife Computers transmitters as well as tags by Telonics and Sonotronics. Any information on the optimum location for transmitter application would be applied to this project to minimize impacts to sea turtles as well as optimize research results (J. Seminoff, NMFS, pers. comm., 2009).

Ultrasonic transmitters are relatively small in size and weight and appear to have no lasting effects on turtles outfitted with this type of device. Recent research in San Diego Bay has indicated that ultrasonic transmitters usually fall off of the animal within approximately six months. A majority of re-captured turtles, where an ultrasonic transmitter was applied, have shown no sign of the previous application. In instances where an ultrasonic transmitter was still attached, it was carefully removed if the device was no longer working at time of re-capture. To date, more than 100 ultrasonic transmitters have been deployed on turtles in San Diego Bay and no adverse effects from the devices have been noted (Dutton and Seminoff, NMFS, pers. comm., 2009).

Another important consideration is whether the sounds emitted by the ultrasonic transmitters would attract potential predators, primarily sharks. Unfortunately, hearing data on sharks is limited. Casper et al. (2004) examined the hearing abilities of the nurse shark (*Ginglymostoma cirratum*) and results show that this species detected low frequency sounds from 100-1000 Hz with best sensitivity from 100-400 Hz. Hueter et al. (2004) explained that few audiograms have been published in elasmobranchs to date. However, available laboratory studies suggest that shark hearing is less sensitive than some other fishes and all sharks tested show mainly low-frequency sensitivity. While hearing information for all the sharks that could potentially prey on sea turtles is limited, estimates for hearing sensitivity in available studies provided ranges of 25 Hz to 1,000 Hz. In general, these studies found that shark hearing is not as sensitive as in other tested fishes and that sharks are most sensitive to low frequency sounds (Kritzler and Wood, 1961; Banner, 1967; Casper et al., 2003). Thus it appears that the sonic transmitters would not attract potential shark predators to the turtles, given the frequency of the sonic tags is well above the 1,000 Hz threshold.

Although the sonic frequency of the tags does fall within the range of some other marine animal species (e.g., marine mammals), the intensity of the sound would not be expected to have any measurable impact on these species. NMFS believes the use of sonic tags under the proposed research would not appreciably affect any sea turtle or other marine animal species.

Ultrasonic tags would be shed when turtles shed their scutes. Although tags used in this research would be shed into the ocean, given the very small amount of debris they would represent and the fact that they do not contain any highly dangerous or radioactive materials, NMFS does not expect them to have any significant effect on the environment. The permit would also require that the total weight of transmitter attachments for any one turtle must not exceed 5% of the body mass of the animal.

With respect to the turtles that would be equipped with multiple large devices (e.g. satellite tag & video camera), such packages would only be applied to the largest of turtles (90 cm SCL) to reduce the relative drag to turtles. Furthermore, the fact that the video camera apparatus would

detach within 20 hours suggests that any cumulative effects from multiple tags would be very short term. Turtles outfitted with satellite tags and ultrasonic tags during the same interaction in San Diego Bay have been recaptured in the original capture area indicating that applications of more than one type of transmitter does not have a negative effect on the turtles' behavior (Dutton and Seminoff, NMFS, pers. comm., 2009).

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

As summarized below, NMFS has determined that the proposed research is consistent with the purposes, policies, and applicable requirements of the ESA, and NMFS regulations. NMFS issuance of the permit would be consistent with the ESA.

4.3.1 Endangered Species Act

To comply with section 7 of the regulations (50 CFR 402.14(c)), a Section 7 consultation was initiated by NMFS PR under the ESA. In accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.), a biological opinion was prepared for this proposed action and it concluded that after reviewing the current status of listed sea turtles, the environmental baseline for the action area, the effects of the take authorized in the permit, and probable cumulative effects, it is NMFS' biological opinion that issuance of Permit No. 14510, as proposed, is not likely to jeopardize the continued existence of any listed sea turtles, or any other NMFS ESA-listed species and is not likely to destroy or adversely modify designated critical habitat.

4.4 COMPARISON OF ALTERNATIVES

While the no action alternative would have zero environmental effects, the opportunity would be lost to collect information that would contribute to better understanding sea turtles and that would provide information to NMFS that is needed to implement NMFS management activities. This is important information that would help conserve and manage sea turtles as required by the ESA and NMFS implementing regulations. The preferred alternative would affect the environment, primarily individual sea turtles. However, the effects would be minimal and the alternative would allow the collection of valuable information that could help NMFS' efforts to recover sea turtles. Neither the no action nor the preferred alternative is anticipated to have adverse population or stock-level effects on sea turtles.

4.5 MITIGATION MEASURES

There are no additional mitigation measures beyond those standard conditions that would be required by permit. The conditions that would be required if a permit were issued are outlined in Appendix A. These conditions are intended to minimize unavoidable adverse effects of the various research activities. The permit conditions also require regular reports on the effectiveness of the research at achieving the applicant's stated objectives (and thus at achieving the purpose and need of the federal action) and on the effectiveness of the mitigation measures required by the permit. By statute, regulation, and permit conditions, NMFS has authority to modify the permit or suspend the research if information suggests it is having a greater than anticipated adverse impact on target species or the environment.

4.6 UNAVOIDABLE ADVERSE EFFECTS

The research activities would cause disturbance and stress and injury to the captured sea turtles (temporarily interrupting normal activities such as feeding). The research is not expected to have more than a minimal effect on individuals, and no effect on populations. While individual sea turtles may experience short term stress and discomfort in response to the activities of researchers, the impact to individual animals is not expected to be significant.

The measures required by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on all species. Because the research involves wild animals that are not accustomed to being captured, the research activities would unavoidably result in harassment; however, the harassment would not rise to significant levels.

4.7 CUMULATIVE EFFECTS

Cumulative effects are defined those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

4.7.1 Other research permits and authorizations

NMFS has issued two other permits for sea turtle research in California. The applicant is the permit holder for these issued permits (Permit Nos. 1591 and 1596). **Permit No. 1591** authorizes the long-term monitoring of the status of sea turtles in San Diego Bay. Researchers study the species present at this temperate foraging area to determine their abundance, size ranges, growth, sex ratio, health status, diving behavior, local movements, habitat use, and migration routes. A primary goal is to integrate data from genetic analysis, flipper tagging, and satellite telemetry to identify nesting beach origins of turtles occurring in San Diego Bay and contribute to the overall understanding of sea turtle stock structure in the Pacific Ocean. The action area of this permit does not overlap with that of the proposed action. **Permit No. 1596** authorizes research activities to continue long-term monitoring of the status of leatherback sea turtles off the coasts of California, Oregon, and Washington. The researchers study the species to determine their abundance, distribution, size ranges, sex ratio, health status, diving behavior, local movements, habitat use, and migration routes. This leatherback focused research will not overlap with the proposed research on green sea turtles.

4.7.2 Other human activities

Within the action area the target sea turtles are adversely affected by human activities including commercial and recreational fishing, and tourism and recreation (via harassment from human approach and presence).

4.7.3 Summary of cumulative effects

It is likely that issuance of the proposed permit would have some cumulative adverse effects on the target animals due to the disturbances associated with research activities. These adverse effects would likely be additive to those resulting from disturbance under other permits, and to disturbances related to other human activities in the action area. Some animals may be acclimated to a certain level of human activity and may be able to tolerate disturbance associated

with these activities with little adverse impacts on population or species vital rates. However, even animals acclimated to a certain level of disturbance may be adversely affected by additive effects that exceed their tolerance threshold. Based on the review of past, present and future actions that impact the target species, the incremental contribution of the short-lived impacts associated with the proposed action is not anticipated to result in significant cumulative impacts to the human environment.

Overall, the preferred alternative would not be expected to have more than short-term effects on endangered and threatened sea turtles species. The impacts of the non-lethal research activities are not expected to have more than short-term effects on individual sea turtles; any increase in stress levels from the research would dissipate within approximately a day and injuries caused by tagging and sampling are expected to heal. Even if an animal was exposed to additional research effort (e.g., a week later), no significant cumulative effects of research would be expected given the nature of the effects. NMFS does not expect the authorization of the proposed research activities of the preferred alternative to appreciably reduce the species' likelihood of survival and recovery in the wild because it would not likely adversely affect their birth rates, death rates, or recruitment rates. In particular, NMFS does not expect the proposed research activities to affect adult female turtles in a way that appreciably reduces the reproductive success of adults, the survival of young, or the number of young that annually recruit into the breeding populations of any of the target species.

The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions discussed here would not be significant at an individual or a population level. The data generated by the tagging, measuring, and sampling activities associated with the proposed action would help determine the movement and habitat use of sea turtles found in the waters of the action area. The research would provide information that would help manage, conserve, and recover threatened and endangered species.

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED

This EA was prepared by the National Marine Fisheries Service, Office of Protected Resources in Silver Spring, Maryland.

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APPENDIX A: PERMIT CONDITIONS

In an effort to mitigate the effects of research the proposed permits would be conditioned with the following requirements:

- Researchers must suspend activities in the event of a serious injury or mortality or if the level of authorized take is exceeded.
- Researchers must submit annual reports each year the permit is valid and a final report summarizing the research results.
- Researchers must notify the appropriate NMFS regional office at least two weeks before beginning the field season. This is will help to coordinate the level of research occurring in the action area.

The following conditions are specific to sea turtle permits and would accompany the general conditions listed above:

- Instruments and equipment must be cleaned and disinfected between animals.
- Researchers must use a separate set of sampling equipment for handling animals displaying fibropapillomas tumors/or lesions (all equipment that comes in contact with the turtle must be cleaned with a disinfectant between the processing of each turtle).
- Researchers must use care when handling live animals to minimize any possible injury, and appropriate resuscitation techniques must be used on any comatose turtle prior to returning it to the water.
- During release, turtles must be lowered as close to the water's surface as possible to prevent potential injuries.
- NMFS researchers must carefully observe newly released turtles and record observations on the turtle's apparent ability to swim and dive in a normal manner.
- Total weight of transmitter attachments would not exceed 5% of the body mass of the animal. Each attachment would be made so that there is no risk of entanglement.
- New biopsy punch must be used on each animal.
- Disposable needles for blood collection must be used on each animal.
- Nets must be checked at intervals of less than 30 minutes, and more frequently whenever turtles or other organisms are observed in the net. The float line of all nets must be observed at all times for movements that indicate an animal has encountered the net. When this occurs the net must be immediately checked. "Net checking" is defined as a complete and thorough visual check of the net either by snorkeling the net in clear water or by pulling up on the top line such that the full depth of the net is viewed along the entire length.
- If water temperatures are $\leq 10^{o}C$ or $\geq 30^{o}C$, nets must be checked at less than 20-minute intervals. Researchers must plan for unexpected circumstances or demands of the research activities and have the ability and resources to meet this net checking condition at all times (e.g. if one animal is very entangled and requires extra time and effort to remove from the net, researchers must have sufficient staff and resources to continue checking the rest of the net at the same time).
- The actual lavaging of an individual turtle must not exceed three minutes.

APPENDIX B: ANNUAL TAKES AUTHORIZED UNDER THE PROPOSED PERMIT

TABLE 1 Directed Capture, Annual Takes, Year Round , San Gabriel River and Los Alamitos Bay Area, California

Species	Life Stage	Sex	Number of Animals	Take Action
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	5	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, release
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	15	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab,inject with tetracycline, attach sonic tag, track, release
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	5	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, attach sonic tag and satellite transmitter, track, release
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	5	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, attach sonic tag, attach camera, track, release
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	5	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, attach sonic tag, attach TDR, track, release
Loggerhead Sea Turtle *Caretta caretta*	J, SA, and A	M, F	5	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, release

Species	Life Stage	Sex	Number of Animals	Take Action
Loggerhead Sea Turtle *Caretta caretta*	J, SA, and A	M, F	1	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, attach satellite transmitter, release
Olive Ridley Sea Turtle *Lepidochelys olivacea*	J, SA, and A	M, F	4	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, release
Olive Ridley Sea Turtle *Lepidochelys olivacea*	J, SA, and A	M, F	2	Capture, measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, attach satellite transmitter, release

*= Capture includes tangle net, dip net, seine net, and SCUBA

TABLE 2 Annual Take, Year Round, Power Plant Entrainments Along the Coast of California, Animals Already Legally Incidentally Captured

Species	Life Stage	Sex	Number of Animals	Take Action
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	7	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, ultrasound, transport, release; salvage*, necropsy*,
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	3	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,

Species	Life Stage	Sex	Number of Animals	Take Action
Olive Ridley Sea Turtle *Lepidochelys olivacea*	J, SA, and A	M, F	1	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,
Loggerhead Sea Turtle *Caretta caretta*	J, SA, and A	M, F	2	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, ultrasound, transport, release; salvage*, necropsy*,
Loggerhead Sea Turtle *Caretta caretta*	J, SA, and A	M, F	1	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, oral swab, cloacal swab, inject with tetracycline, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,

*= only if unintentional mortality occurs as result of capture in power plant

NOTE, no capture authorized. Animals already incidentally taken in power plants and take is authorized via ESA Section 7 or Section 10.

TABLE 3 Annual Take, Year Round, Strandings In the Marine Environment Along the Coast of California

Species	Life Stage	Sex	Number of Takes	Take Action
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	3	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, ultrasound, transport, oral swab, cloacal swab, release; salvage*, necropsy*,
Green Sea Turtle *Chelonia mydas*	J, SA, and A	M, F	1	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, oral swab, cloacal swab, lavage, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,
Olive Ridley Sea Turtle *Lepidochelys olivacea*	J, SA, and A	M, F	1	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, lavage, oral swab, cloacal swab, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,
Loggerhead Sea Turtle *Caretta caretta*	J, SA, and A	M, F	1	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, oral swab, cloacal swab, lavage, ultrasound, transport, attach satellite transmitter, release; salvage*, necropsy*,
Leatherback Sea Turtle *Dermochelys coriacea*	J, SA, and A	M, F	2	measure, weigh, photograph/video, flipper tag, PIT tag, tissue biopsy, blood sample, scute scrape, oral swab, cloacal swab, lavage, ultrasound, attach camera**, release; salvage*, necropsy*,

*= only if mortality occurs as result of stranding
**= via suction cup