

APPENDIX G

**INFORMATION REGARDING SPECIES PRESENCE AND ASSOCIATIONS AT JOINT
REGION MARIANAS**

G1: BIRDS

Table G1-1. Birds Observed on JRM Sites (USAF 2009, NAVFAC Pacific 2010b, U.S. Navy 2010b)

Species	Scientific Name	Native
Common sandpiper (Dulili)	<i>Actitus hypoleucos</i>	Y
Mariana swiftlet (Chachaguak)	<i>Aerodramus vanikorensis bartschi</i>	Y
Northern pintail	<i>Anas acuta</i>	N
Black noddy (Fahang dikike')	<i>Anous minutus</i>	Y
Brown noddy (Fahang dankolo)	<i>Anous stolidus</i>	Y
Micronesian starling (Sali)	<i>Aplonis opaca guami</i>	Y
Great egret	<i>Ardea alba</i>	N
Green heron	<i>Ardea spp.</i>	N
Ruddy turnstone (Dulili)	<i>Arenaria interpres</i>	Y
Cattle egret (Chuchuko')	<i>Bubulcus ibis</i>	Y
Long-toed stint	<i>Calidris subminuta</i>	N
Lesser sand plover	<i>Charadrius mongolus</i>	N
Black-headed gull	<i>Chroicocephalus ridibundus</i>	N
Rock dove	<i>Columba livia</i>	N
Mariana crow (Aga)	<i>Corvus kubaryi</i>	Y
Blue-breasted quail (Bengbeng)	<i>Coturnix chinensis</i>	N
Black drongo (Salin Taiwan)	<i>Dicrurus macrocercus</i>	N
Little egret	<i>Egretta garzetta</i>	N
Pacific reef-heron (Chuchuko atilong)	<i>Egretta sacra</i>	Y
Black francolin	<i>Francolinus francolinus</i>	N
Great frigatebird (Ga'ga'manglo')	<i>Fregata minor</i>	Y
White-throated grounddove	<i>Gallicolumba xanthonura</i>	Y
Mariana common moorhen/Palattat	<i>Gallinula chloropus guami</i>	Y
Guam rail (Ko'ko')	<i>Gallirallus owstonii</i>	Y
Chicken	<i>Gallus domesticus</i>	N
Red junglefowl	<i>Gallus gallus domesticus</i>	N
White tern	<i>Gygis alba</i>	Y
Guam Micronesian kingfisher (Sihek)	<i>Halcyon cinnamomina cinnamomina</i>	Y
Wandering tattler (Dulili)	<i>Heteroscelus incanus</i>	Y
Black-winged stilt	<i>Himantopus himantopus</i>	N
Yellow bittern (Kakkak)	<i>Ixobrychus sinensis</i>	Y
Bar-tailed godwit	<i>Limosa lapponica</i>	N
Black-tailed godwit	<i>Limosa limosa</i>	N

Species	Scientific Name	Native
Micronesian megapode (Sasangat)	<i>Megapodius laperouse</i>	Y
Intermediate egret (Chuchuko')	<i>Mesophoyx intermedia</i>	Y
Guam broadbill (Chuguanguang)	<i>Myiagra freycineti</i>	Y
Cardinal honeyeater (Egigi)	<i>Myzomela cardinalis saffordi</i>	Y
Whimbrel (Kalalang)	<i>Numenius phaeopus</i>	Y
Bristle-thighed curlew	<i>Numenius tahitiensis</i>	N
Sooty tern (Giree'girak)	<i>Onychoprion fuscatus</i>	Y
Eurasian tree-sparrow (Ga'ga'pale')	<i>Passer montanus</i>	N
White-tailed tropicbird (Fakpe/Utag)	<i>Phaethon lepturus</i>	Y
Ruff	<i>Philomachus pugnax</i>	N
American golden-plover	<i>Pluvialis dominica</i>	Y
Pacific golden-plover	<i>Pluvialis fulva</i>	Y
White-browed crane (Bako)	<i>Poliolimnas cinereus</i>	Y
Mariana fruit-dove (Totot)	<i>Ptilinopus roseicapilla</i>	Y
Wedge-tailed shearwater (Paya'ya/Lifa'ru)	<i>Puffinus pacificus</i>	Y
Rufous fantail (Chichirika)	<i>Rhipidura rufifrons uraniae</i>	Y
Black-napped tern	<i>Sterna sumatrana</i>	Y
Island collard dove	<i>Streptopelia bitorquata</i>	N
Brown booby (Lu'ao)	<i>Sula leucogaster</i>	Y
Red-footed booby (Lu'ao talisai)	<i>Sula sula</i>	Y
Great crested tern	<i>Thalasseus bergii</i>	N
Gray-tailed tattler (Dulili)	<i>Tringa brevipes</i>	Y
Wood sandpiper	<i>Tringa glareola</i>	N
Common greenshank	<i>Tringa nebularia</i>	Y
Marsh sandpiper	<i>Tringa stagnatilis</i>	N
Common redshank	<i>Tringa totanus</i>	N
Bridled white-eye (Nossa')	<i>Zosterops conspicillatus conspicillatus</i>	Y

Key:

Native--

Y = Native species

N = Introduced species

G2: MAMMALS

Table G2-1. Mammals Present on JRM (USAF 2009, NAVFAC Pacific 2010b, U.S. Navy 2010b)

Species	Scientific Name	Native	JRM Site
Water buffalo (Carabao)	<i>Bubalis bubalis</i>	N	- Naval Munitions Site
Feral dog	<i>Canis familiaris</i>	N	- Andersen AFB
Phillipine deer	<i>Cervus mariannus</i>	N	- Andersen AFB - Andersen South
Deer	<i>Cervus unicolor</i>	N	- All
Pacific sheath-tailed bat (Payesyes)	<i>Emballonura semicaudata rotensis</i>	Y	- Presumed extirpated on Guam
Feral cat	<i>Felis domesticus</i>	N	- Andersen AFB
House mouse (Cha'ka)	<i>Mus musculus</i>	N	- Andersen AFB
Mariana fruit bat (Fanihi)	<i>Pteropus mariannus mariannus</i>	Y	- Andersen AFB - NBG Main Base - Naval Munitions Site - NBG TS - Communications Site Barrigada
Little Mariana fruit bat	<i>Pteropus tokudae</i>	Y	- Presumed extirpated on Guam
Polynesian rat (Cha'ka)	<i>Rattus exulans</i>	N	- Andersen AFB
Norway rat (Cha'ka)	<i>Rattus norvegicus</i>	N	- Andersen AFB
Roof rat (Cha'ka)	<i>Rattus rattus</i>	N	- Andersen AFB
Spinner dolphin (Toninos)	<i>Stenella longirostris</i>	N	- Andersen AFB - NBG Main Base
Musk shrew (Cha'ka akaleha')	<i>Suncus murinus</i>	N	- Andersen AFB
Wild pig (Babuen halumtano)	<i>Sus scrofa</i>	N	- Andersen AFB - Andersen South
Common bottlenose dolphin (Toninos)	<i>Tursiops truncatus</i>	N	- Andersen AFB - NBG Main Base

Key:

Native--

Y = Native species

N = Introduced species

THIS PAGE INTENTIONALLY LEFT BLANK

G3: FISH, MARINE INVERTEBRATES, AND MARINE PLANT SPECIES

Table G3-1. Fish, Marine Invertebrates, and Marine Plant Species
Present on JRM (U.S. Navy 2010b)

Species	Chamorro Name	Scientific Name
Acanthuridae (surgeonfishes)		
Orange-spot surgeonfish	NA	<i>Acanthurus olivaceus</i>
Yellowfin surgeonfish	Hugupao dangulo	<i>Acanthurus xanthopterus</i>
Convict tang	Kichu	<i>Acanthurus triostegus</i>
Eye -striped surgeonfish	NA	<i>Acanthurus dussumieri</i>
Blue-lined surgeon	NA	<i>Acanthurus nigroris</i>
Whitebar surgeonfish	NA	<i>Acanthurus leucopareius</i>
Blue-banded surgeonfish	Hiyok/filaang	<i>Acanthurus lineatus</i>
Blackstreak surgeonfish	NA	<i>Acanthurus nigricauda</i>
Whitecheek surgeonfish	NA	<i>Acanthurus nigricans</i>
White-spotted surgeonfish	NA	<i>Acanthurus guttatus</i>
Ringtail surgeonfish	NA	<i>Acanthurus blochii</i>
Brown surgeonfish	NA	<i>Acanthurus nigrofuscus</i>
Mimic surgeonfish	NA	<i>Acanthurus pyroferus</i>
Yellow tang	NA	<i>Zebrasoma flavescens</i>
Striped bristletooth	NA	<i>Ctenochaetus striatus</i>
Twospot bristletooth	NA	<i>Ctenochaetus binotatus</i>
Bluespine unicornfish	Tataga	<i>Naso unicornus</i>
Orangespine unicornfish	Hangan	<i>Naso lituratus</i>
Humpnose unicornfish	NA	<i>Naso tuberosus</i>
Black tongue unicornfish	NA	<i>Naso hexacanthus</i>
Bignose unicornfish	NA	<i>Naso vlamingii</i>
Whitemargin unicornfish	NA	<i>Naso annulatus</i>
Spotted unicornfish	NA	<i>Naso brevirostris</i>
Humpback unicornfish	NA	<i>Naso brachycentron</i>
Gray unicornfish	NA	<i>Naso caesius</i>
Balistidae (triggerfishes)		
Orangstriped triggerfish	NA	<i>Balistapus undulatus</i>
Clown triggerfish	NA	<i>Balistoides conspicillum</i>
Wedged Picassofish	NA	<i>Balistoides rectanulus</i>
Titan triggerfish	NA	<i>Balistoides viridescens</i>
Black triggerfish	NA	<i>Melichthys niger</i>
Pinktail triggerfish	NA	<i>Melichthys vidua</i>
Blue triggerfish	NA	<i>Pseudobalistes fuscus</i>
Picassofish	NA	<i>Rhinecanthus aculeatus</i>
Bridled triggerfish	NA	<i>Sufflamen fraenatus</i>

Species	Chamorro Name	Scientific Name
Carangidae (jacks)		
Giant trevally/jack	Tarakitu	<i>Caranx ignobilis</i>
Black trevally/jack	Tarakiton attelong	<i>Caranx lugubris</i>
Mackerel scad	NA	<i>Decapterus macarellus</i>
Bigeye scad	Atulai	<i>Selar crumenophthalmus</i>
Amberjack	Tarakiton tadong	<i>Seriola dumerili</i>
Carcharhinidae (sharks)		
Scalloped hammerhead	Halu'u	<i>Sphyrna lewini</i>
Bigeye thresher shark	NA	<i>A. Superciliusus</i>
Common thresher shark	NA	<i>A. Vulpinus</i>
Pelagic thresher shark	NA	<i>Alopias pelagicus</i>
Oceanic whitetip shark	NA	<i>C. Longimanus</i>
Silky shark	NA	<i>Carcharhinus falciformis</i>
Silvertip shark	NA	<i>Carcharhinus albimarginatus</i>
Grey reef shark	NA	<i>Carcharhinus amblyrhynchos</i>
Galapagos shark	NA	<i>Carcharhinus galapagensis</i>
Blacktip reef shark	NA	<i>Carcharhinus melanopterus</i>
Longfin mako shark	NA	<i>I. Paucus</i>
Shortfin mako shark	NA	<i>Isurus oxyrinchus</i>
Salmon shark	NA	<i>Lamna ditropis</i>
Blue shark	NA	<i>Prionace glauca</i>
Whitetip reef shark	Saksak	<i>Triaenodon obesus</i>
Holocentridae (soldierfish/squirrelfish)		
Bigscale soldierfish	Sagamelon	<i>Myripristis berndti</i>
Bronze soldierfish	Sagamelon	<i>Myripristis adusta</i>
Blotcheye soldierfish	Sagamelon	<i>Myripristis murdjan</i>
Brick soldierfish	Sagamelon	<i>Myripristis amaena</i>
Scarlet soldierfish	Sagamelon	<i>Myripristis pralinia</i>
Violet soldierfish	Sagamelon	<i>Myripristis violacea</i>
Whitetip soldierfish	Sagamelon	<i>Myripristis vittata</i>
Yellowfin soldierfish	Sagamelon	<i>Myripristis chryseres</i>
Pearly soldierfish	Sagamelon	<i>Myripristis kuntee</i>
Tailspot squirrelfish	Sagamelon	<i>Sargocentron caudimaculatum</i>
File-lined squirrelfish	NA	<i>Sargocentron microstoma</i>
Crown squirrelfish	Chalak	<i>Sargocentron diadema</i>
Blue-lined squirrelfish	Sagsag	<i>Sargocentron tiere</i>
Saber or long jaw squirrelfish	Sisiok	<i>Sargocentron spiniferum</i>
Spotfin squirrelfish	Sagsag	<i>Neoniphon spp.</i>

Species	Chamorro Name	Scientific Name
Kuhliidae (flagtails)		
Barred flag-tail	NA	<i>Kuhlia mugil</i>
Kyphosidae (rudderfish)		
Rudderfish	Guili	<i>Kyphosus biggibus</i>
Rudderfish	Guili	<i>Kyphosus cinerascens</i>
Rudderfish	Guilen puengi	<i>Kyphosus vaigienses</i>
Labridae (wrasses)		
Floral wrasse	NA	<i>Cheilinus chlorourus</i>
Napoleon wrasse	Tangison	<i>Cheilinus undulates1</i>
Triple-tail wrasse	Lalacha mamate	<i>Cheilinus trilobatus</i>
Harlequin tuskfish or red-breasted wrasse	NA	<i>Cheilinus fasciatus</i>
Ring-tailed wrasse	NA	<i>Oxycheilinus unifasciatus</i>
Razor wrasse	NA	<i>Xyrichtys pavo</i>
Whitepatch wrasse	NA	<i>Xyrichtys aneitensis</i>
Cigar wrasse	NA	<i>Cheilio inermis</i>
Blackeye thicklip	NA	<i>Hemigymnus melapterus</i>
Barred thicklip	NA	<i>Hemigymnus fasciatus</i>
Three-spot wrasse	NA	<i>Halichoeres trimaculatus</i>
Checkerboard wrasse	NA	<i>Halichoeres hortulanus</i>
Weedy surge wrasse	NA	<i>Halichoeres margaritaceus</i>
Surge wrasse	NA	<i>Thalassoma purpureum</i>
Red ribbon wrasse	NA	<i>Thalassoma quinquevittatum</i>
Sunset wrasse	NA	<i>Thalassoma lutescens</i>
Longface wrasse	NA	<i>Hologymnosus doliatus</i>
Rockmover wrasse	NA	<i>Novaculichthys taeniourus</i>
Mullidae (goatfishes)		
Yellow goatfish	NA	<i>Mulloidichthys</i> spp.
Yellowfin goatfish	Satmoneti	<i>Mulloidichthys vanicolensis</i>
Yellowstripe goatfish	Ti'ao (juv.) Satmoneti (adult)	<i>Mulloidichthys flavolineatus</i>
Banded goatfish	NA	<i>Parupeneus</i> spp.
Dash-dot goatfish	Satmonetiyo	<i>Parupeneus barberinus</i>
Doublebar goatfish	Satmoneti acho	<i>Parupeneus bifasciatus</i>
Redspot goatfish	NA	<i>Parupeneus heptacanthus</i>
White-lined goatfish	Ti'ao (juv.) Satmoneti (adult)	<i>Parupeneus ciliatus</i>
Yellowsaddle goatfish	Ti'ao (juv.) Satmoneti (adult)	<i>Parupeneus cyclostomas</i>
Side-spot goatfish	Ti'ao (juv.) Satmoneti (adult)	<i>Parupeneus pleurostigma</i>

Species	Chamorro Name	Scientific Name
Mullidae (goatfishes) (continued)		
Multi-barred goatfish	Ti'ao (juv.) Satmoneti (adult)	<i>Parupeneus multifaciatus</i>
Bantail goatfish	NA	<i>Upeneus arge</i>
Mugilidae (mullet)		
Striped mullet	Striped mullet	<i>Mugil cephalus</i>
Engel's mullet	Engel's mullet	<i>Moolgarda engeli</i>
Fringelip mullet	Fringelip mullet	<i>Crenimugil crenilabis</i>
Muraenidae (moray eels)		
Yellowmargin moray eel	NA	<i>Gymnothorax flavimarginatus</i>
Giant moray eel	NA	<i>Gymnothorax javanicus</i>
Undulated moray eel	NA	<i>Gymnothorax undulatus</i>
Octopodidae (octopi)		
Octopus	Gamsun	<i>Octopus cyanea</i>
Octopus	Gamsun	<i>Octopus ornatus</i>
Polynemidae		
Threadfin	NA	<i>Polydactylus sexfilis</i>
Pricanthidae (bigeye)		
Glasseye	NA	<i>Heteropriacanthus cruentatus</i>
Bigeye	NA	<i>Priacanthus hamrur</i>
Scaridae (parrotfishes)		
Humphead parrotfish	Atuhong	<i>Bolbometopon muricatum</i> ²
Parrotfish	Palakse	<i>Scarus</i> spp.
Pacific longnose parrotfish	Gualafi	<i>Hipposcarus longiceps</i>
Stareye parrotfish	Palaksin chaguan	<i>Calotomus carolinus</i>
Scombridae		
Dogtooth tuna	White tuna	<i>Gymnosarda unicolor</i>
Siganidae (rabbitfish)		
Forktail rabbitfish	Hiting	<i>Siganus aregentus</i>
Golden rabbitfish	Hiting	<i>Siganus guttatus</i>
Mullidae (goatfishes) (continued)		
Gold-spot rabbitfish	Hiting galagu	<i>Siganus punctatissimus</i>
Randall's rabbitfish	NA	<i>Siganus randalli</i>
Scribbled rabbitfish	Hiting	<i>Siganus spinus</i>
Vermiculate rabbitfish	Hiting	<i>Siganus vermiculatus</i>
Sphyraenidae (barracuda)		
Heller's barracuda	NA	<i>Sphyraena helleri</i>
Great barracuda	NA	<i>Sphyraena barracuda</i>

Species	Chamorro Name	Scientific Name
Turbinidae (turban/green snails)		
Green turban shells	snails Aliling pulan	<i>Turbo</i> spp.
Lutjanidae (snappers)		
Red snapper/silvermouth	Lehi	<i>Aphareus rutilans</i>
Gray snapper/jobfish	Gogunafon	<i>Aprion virescens</i>
Red snapper	Buninas	<i>E. coruscans</i>
Blacktip grouper	Gadao	<i>Epinephelus fasciatus</i>
Red snapper	Buninas agaga	<i>Etelis carbunculus</i>
Blueline snapper	Funai	<i>Lutjanus kasmira</i>
Pink snapper	Buninas	<i>P. filamentosus</i>
Yelloweye snapper	Buninas	<i>P. flavipinnis</i>
Pink snapper	NA	<i>P. seiboldii</i>
Snapper	Buninas rayao amiriyu	<i>P. zonatus</i>
Yellowtail snapper	Buninas	<i>Pristipomoides auricilla</i>
Scyllaridae		
Slipper lobster	NA	<i>Family Scyllaridae</i>
Pandalidae		
Deepwater shrimp	NA	<i>Heterocarpus</i> spp.
Lethrinidae		
Redgill emperor	Mafuti	<i>Lethrinus rubrioperculatus</i>
Palinuridae		
Spiny lobster	NA	<i>Panulirus penicillatus</i>
Raninidae		
Kona crab	NA	<i>Ranina ranina</i>
Serranidae		
Lunartail grouper	Bueli	<i>Variola louti</i>
Scombridae (Tunas)		
Wahoo	Paala	<i>Acanthocybium solandri</i>
Other tuna relatives	NA	<i>Auxis</i> spp. <i>Scomber</i> spp. <i>Allothunus</i> spp.
Kawakawa	NA	<i>Euthynnus affinis</i>
Mullidae (goatfishes)		
Skipjack tuna	Ga'ogo	<i>Katsuwonus pelamis</i>
Albacore	NA	<i>T. alalunga</i>
Bigeye tuna	Asiasi to'uo, ta'uo	<i>T. obesus</i>
Northern bluefin tuna	NA	<i>T. thynnus</i>
Yellowfin tuna	Asiasi to'uo, ta'uo	<i>Thunnus albacores</i>

Species	Chamorro Name	Scientific Name
Xiphias (swordfish) Istiophoridae (Billfishes)		
Sailfish	NA	<i>Istiophorus platypterus</i>
Black marlin	NA	<i>Makaira indica</i>
Blue marlin	NA	<i>Makaira mazara</i>
Shortbill spearfish	NA	<i>Tetrapturus angustirostris</i>
Striped marlin	NA	<i>Tetrapturus audax</i>
Swordfish	NA	<i>Xiphias gladius</i>
Coryphaenidae		
Mahimahi (dolphinfish)	Masimasi	<i>Coryphaena</i> spp.
Oilfish family	NA	<i>Gempylidae</i>
Lampridae		
Moonfish	Koko	<i>Lampris</i> spp.
Ommastrephidae		
Neon flying squid	NA	<i>Ommastrephes Bartamii</i>
Purple flying squid	NA	<i>Sthenoteuthis oualaniensis</i>
Thysanoteuthidae		
Diamondback squid	NA	<i>Thysanoteuthis Rhombus</i>

G4: REPTILES AND AMPHIBIANS

Table G4-1. Reptiles and amphibians Present on JRM (USAF 2009 and NAVFAC Pacific 2010b)

Species	Scientific Name	Native	JRM Site
Green anole	<i>Anolis carolinensis</i>	N	- Andersen AFB
Brown treesnake (Kulepbla)	<i>Boiga irregularis</i>	N	- Andersen AFB - Andersen South - Communications Site Barrigada - Main Cantonment Area - NBG Main Base - Naval Munitions Site
Marine toad (Tot)	<i>Bufo marinus</i>	N	- Andersen AFB
Curious skink	<i>Carlia ailanpalai</i>	N	- Andersen AFB - Andersen South - Communications Site Barrigada - Main Cantonment Area - NBG Main Base - Naval Munitions Site
Green sea turtle (Haggan betde)	<i>Chelonia midas</i>	Y	- Andersen AFB
Snake-eyed skink	<i>Cryptoblepharus poecilopleurus</i>	Y	- Andersen AFB
Leatherback turtle	<i>Dermochelys coriacea</i>	Y	- Andersen AFB
Greenhouse frog	<i>Eluetherodactylus planirostris</i>	N	- Andersen South - Communications Site Barrigada
Pacific blue-tailed skink	<i>Emoia caeruleocauda</i>	Y	- Andersen AFB - Andersen South - Communications Site Barrigada - Main Cantonment Area - NBG Main Base - Naval Munitions Site
Slevin's skink (Guali'ek halom tano')	<i>Emoia slevini</i>	Y	- Andersen AFB
Hawksbill turtle (Haggan karai)	<i>Eretmochelys imbricata</i>	Y	- Andersen AFB
Crab-eating frog	<i>Fejervarya cancrivora</i>	N	- Naval Munitions Site
Oceanic gecko (Achiak)	<i>Gehrya oceanic</i>	Y	- Andersen AFB

Species	Scientific Name	Native	JRM Site
Mutilating gecko	<i>Gehyra mutiata</i>	Y	- Andersen AFB - Andersen South - Communications Site Barrigada - Main Cantonment Area - NBG Main Base - Naval Munitions Site
Pacific slender-toed gecko	<i>Gehyra mutilate</i>	Y	- Main Cantonment Area - Naval Munitions Site
House gecko	<i>Hemidactylus frenatus</i>	N	- Andersen AFB - Andersen South - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
Mourning gecko	<i>Lepidodactylus lugubrus</i>	Y	- Andersen AFB - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
Moth skink	<i>Lipinia noctua</i>	Y	- Andersen AFB - Main Cantonment Area - NBG Main Base - Naval Munitions Site
Eastern dwarf tree frog	<i>Litoria fallax</i>	N	- Andersen AFB - Andersen South - Naval Munitions Site
Pacific slender-toed gecko	<i>Nactus pelagicus</i>	Y	- Andersen AFB
Micronesian gecko	<i>Perochirus ateles</i>	Y	- Andersen AFB
Hong King whipping frog	<i>Polypedates megacephalus</i>	N	- Communications Site Barrigada
Brahminy blind snake	<i>Ramphotyphlops braminus</i>	N	- Andersen AFB - Andersen South
Marine toad	<i>Rhinella marinus</i>	N	- Andersen South - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
Gunther's amoy frog	<i>Sylvirana guentheri</i>	N	- Naval Munitions Site
Monitor lizard	<i>Varanus indicus</i>	Y	- Andersen AFB - Andersen South - NBG Main Base

Key: Y= Native species, N = Introduced species

G5: INVERTEBRATES

Table G5-1. Invertebrates Present on JRM (USAF 2009, NAVFAC Pacific 2010b)

Species	Scientific Name	Native	JRM Site
Giant African snail (Akaleha')	<i>Achatina fulica</i>	N	- Andersen AFB - Andersen South - Communication Site Barrigada
Coconut crab (Ayuyu)	<i>Birgus latro</i>	Y	- Andersen AFB - NBG Main Base
Common emigrant (Ababang)	<i>Catopsilia pomona</i>	Y	- Andersen AFB - Andersen South
Plains cupid (Ababang)	<i>Chilades pandava</i>	N	
Land hermit crab (Dukdok)	<i>Coenobita brevipanus</i>	Y	- Andersen AFB - NBG Main Base - NBG TS
Monarch butterfly (Ababang)	<i>Danaus plexippus</i>	N	- NBG Main Base
Blue-banded king crow butterfly (Ababang)	<i>Euploea eunice</i>	Y	- Andersen AFB - Andersen South - Communication Site Barrigada
Three-spot grass yellow (Ababang)	<i>Eurema blanda</i>	Y	
Crow eggfly (Ababang)	<i>Hypolimnas anomala</i>	Y	
Blue moon (Ababang)	<i>Hypolimnas bolina</i>	Y	- Communication Site Barrigada
Mariana eight-spot (Ababang)	<i>Hypolimnas octucula mariannensis</i>	Y	- Andersen AFB
Common evening brown	<i>Melanitis leda</i>	Y	- Communication Site Barrigada
Common mormon	<i>Papilio polytes</i>	Y	- Andersen South - Communication Site Barrigada
Humped tree snail (Akaleha')	<i>Partula gibba</i>	Y	- Andersen AFB - Andersen South - NBG Main Base - Naval Munitions Site
Guam tree snail	<i>Partula radiolata</i>	Y	- NBG Main Base - Naval Munitions Site
Guam tree snail (Akaleha')	<i>Partula salifana</i>	Y	- Andersen AFB - NBG Main Base
Manokwar flatworms (Tagulan tano)	<i>Platydemus manokwari</i>	N	- Communication Site Barrigada
Fragile tree snail	<i>Samoan fragilis</i>	Y	- NBG Main Base

Species	Scientific Name	Native	JRM Site
(No common name)	<i>Satsuma mercatoria</i>	N	- Andersen South - Communication Site Barrigada
Mariana wandering (Ababang)	<i>Vagrans egistina</i>	Y	
Lesser grass blue (Ababang)	<i>Zizina otis</i>	Y	
Tiny grass blue (Ababang)	<i>Zizula hylax</i>	Y	

Key:

Native--

Y = Native species

N = Introduced species

G6: PLANTS

Table G6-1. Plants Present on JRM with the Exception of Andersen AFB (NAVFAC Pacific 2010b)

Species	Scientific Name	Native	JRM Site
Mapunao	<i>Aglaia mariannensis</i>	Y	- Andersen South - Communication Site Barrigada - NBG Main Base
Sumak	<i>Aidia cochinchinensis</i>	Y	- Andersen South - Communication Site Barrigada - NBG Main Base
Custard apple (Annonas)	<i>Annona reticulate</i>	N	- Andersen South - Communications Site Barrigada - NBG Main Base
Betelnut palm	<i>Areca catechu</i>		- Naval Munitions Site
Seeded breadfruit (Dogduk)	<i>Artocarpus mariannensis</i>	Y	- Andersen South
Pickle tree	<i>Averrhoa bilimbi</i>	N	- Andersen South
Common bamboo	<i>Bambusa vulgaris</i>	N	- Naval Munitions Site
Palomaria (Da'ok)	<i>Calophyllum inophyllum</i>	Y	- Naval Munitions Site
Ilangilang	<i>Cananga odorata</i>	N	- Naval Munitions Site
Papaya	<i>Carica papaya</i>	N	- Andersen South - Communication Site Barrigada - NBG Main Base
(No common name)	<i>Cassia alata</i>	N	- Naval Munitions Site
Ironwood (Gagu)	<i>Casuarina equisetifolia</i>		- NBG Main Base
Chiute	<i>Cerbera dilatata</i>	Y	- Naval Munitions Site
Inkberry (Tinta'n-china)	<i>Cestrum diurnum</i>	N	- Andersen South - NBG Main Base - Naval Munitions Site
Chormolaena	<i>Chromolaena odorata</i>		- Communications Site Barrigada
Coconut	<i>Cocos nucifera</i>	N	- NBG Main Base - Naval Munitions Site
(No common name)	<i>Coelogyne guamensis</i>	Y	- Naval Munitions Site
Tree fern (Såtsa)	<i>Cyathea lunulata</i>	Y	- Naval Munitions Site
Cycad (Fadang)	<i>Cycas micronesica</i>	Y	- Andersen South - NBG Main Base - Naval Munitions Site

Species	Scientific Name	Native	JRM Site
Gulos	<i>Cynometra ramiflora</i>	Y	- NBG Main Base - Naval Munitions Site
(No common name)	<i>Dendrocoide latifolia</i>	Y	- NBG Main Base
Otot	<i>Discocalyx megacarpum</i>	Y	- Naval Munitions Site
(No common name)	<i>Eria rostiflora</i>	Y	- Naval Munitions Site
Agatelang	<i>Eugenia palumbis</i>	Y	- NBG Main Base
A'abang	<i>Eugenia reinwardtiana</i>	Y	- Andersen South - NBG Main Base - Naval Munitions Site
(No common name)	<i>Fagraea berteriana</i>	Y	- Naval Munitions Site
Banyan (Nunu)	<i>Ficus prolixa</i>	Y	- Communications Site Barrigada - NBG Main Base
Dyer's fig (Hodda)	<i>Ficus tinctoria</i>	Y	- Andersen South - Communication Site Barrigada - Naval Munitions Site
(No common name)	<i>Glochidion marianum</i>	Y	- Andersen South - Naval Munitions Site
Paipai	<i>Guamia mariannae</i>	Y	- Andersen South - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
Panao	<i>Guettarda speciosa</i>	Y	- Naval Munitions Site
(No common name)	<i>Hedyotis laciniata</i>	Y	- Naval Munitions Site
Ufa-halomtano	<i>Heritiera longipetiolata</i>	Y	
Nonag	<i>Hernandia peltata</i>	Y	- NBG Main Base
Pago	<i>Hibiscus tiliaceus</i>	Y	- Andersen South - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
Ifit	<i>Intsia bijuga</i>	Y	- Communication Site Barrigada - NBG Main Base
(No common name)	<i>Ixora triantha</i>	Y	- Andersen South - Communication Site Barrigada
Tangantangan	<i>Leucaena leucocephala</i>	N	- Andersen South - Communications Site Barrigada - NBG Main Base
(No common name)	<i>Luisia teretifolia</i>	Y	- Naval Munitions Site

Species	Scientific Name	Native	JRM Site
Disciplina	<i>Lycopodium phlegmaria</i>	Y	
Pengua	<i>Macaranga thompsonii</i>	Y	- Andersen South
(No common name)	<i>Maesa</i> sp.	Y	- Naval Munitions Site
Mango	<i>Mangifera indica</i>	N	- Naval Munitions Site
Luluhut	<i>Maytenus thompsonii</i>	Y	- Andersen South - NBG Main Base
Alum	<i>Melanolepis multiglandulosa</i>	Y	- Communication Site Barrigada
Melastoma (Gafao)	<i>Melastoma malabathricum</i>	Y	- Naval Munitions Site
Faniok	<i>Merrioliodendron megacarpus</i>	Y	- NBG Main Base - Naval Munitions Site
Indian mulberry (Lada)	<i>Morinda citrifolia</i>	Y	- Andersen South - Communication Site Barrigada - NBG Main Base - Naval Munitions Site
Fagot	<i>Neisosperma oppositifolia</i>	Y	- Andersen South - Communications Site Barrigada - NBG Main Base
(No common name)	<i>Nervilia jacksoniae</i>	Y	
(No common name)	<i>Nervilia platyphila</i>	Y	- Naval Munitions Site
Screw pine (Pahong)	<i>Pandanus dubius</i>	Y	- Communication Site Barrigada - NBG Main Base - Naval Munitions Site
Kafu	<i>Pandanus tectorius</i>	Y	- Andersen South - Communication Site Barrigada - NBG Main Base - Naval Munitions Site
Bay rum tree	<i>Pimenta racemosa</i>	N	- Andersen South - Naval Munitions Site
Umumu	<i>Pisonia grandis</i>	Y	- NBG Main Base
(No common name)	<i>Polypodium punctatus</i>		- Communications Site Barrigada
Pepega	<i>Polyscias grandifolia</i>	N	- NBG Main Base
False elder (Ahgao)	<i>Premno obtusifolia</i>	Y	- Andersen South - NBG Main Base - Naval Munitions Site
Half flower (Nanaso)	<i>Scaevola taccada</i>	Y	- Andersen South

Species	Scientific Name	Native	JRM Site
Foreign wood, or Northern tree (Hayun-lago)	<i>Serianthes nelsonii</i>	Y	- Andersen AFB
African tulip tree	<i>Spathodea campanulata</i>	N	- Communication Site Barrigada - NBG Main Base
(No common name)	<i>Stachytarpheta urticifolia</i>		- Communications Site Barrigada
(No common name)	<i>Tabernaemontana rotensis</i>	Y	- NBG Main Base
(No common name)	<i>Thelypteris warburgii</i>	Y	- Naval Munitions Site
(No common name)	<i>Tinosperma homosepela</i>	Y	
Lemondichina	<i>Triphasia trifolia</i>	N	- Andersen South - Communications Site Barrigada - NBG Main Base - Naval Munitions Site
	<i>Tristiropsis acutangula</i>	N	- NBG Main Base
(No common name)	<i>Tuberolabium guamensis</i>	Y	- Naval Munitions Site
Molave tree	<i>Vitex pariflora</i>	N	- Andersen South - NBG Main Base - Naval Munitions Site

Key:

Native--

Y = Native species

N = Introduced species

G7: 2008 VEGETATION SURVEY AND MAPPING (HDR|e²M) FOR ANDERSEN AFB

The vegetation classification system used by Parsons Corporation reflects that the vegetation communities on Andersen AFB (and Guam) have changed in response to human perturbation, increase in nuisance nonnative plant species, and climatic events, with the latter most notably being typhoons and super typhoons. In mid 1950, when Fosberg began his field efforts on Guam, he noted that human impacts and climatic events have affected the vegetation communities on the island. Also, he noted that the nuisance nonnative shrub *Leucaena leucocephala* had begun to dominate portions of the landscape. However, since the 1950s, several other nuisance nonnative plants have begun to flourish on Guam, including *Chromolaena odorata* and *Vitex parviflora*. Both species, in addition to *Leucaena leucocephala* have become so prevalent that they might warrant their own vegetation community type.

Given the continued increase in military readiness at Andersen AFB coupled with the drastic changes in vegetation community composition over the past 60 years, 36th Civil Engineering Squadron/Environmental Flight (36 CES/CEV) determined that a detailed basewide vegetation survey and map was necessary to reflect the existing vegetation community. Knowledge of the existing vegetation community would assist installation natural resource managers at Andersen AFB in effectively managing natural resources, including those federally listed as threatened or endangered.

Basewide vegetation survey and mapping was conducted in 2007 and 2008 which included quantitative characterization of 3,211 randomly located plots on 15,371 acres on Andersen AFB proper and the adjacent Guam National Wildlife Refuge on Ritidian Point. The limits of the vegetation survey and mapping were the forested and vegetated areas of the Guam National Wildlife Refuge, Andersen Overlay (Refuge), and Andersen AFB, with the exception of the NWF planned administrative area and main base Aircraft Staging Area. Vegetation species, tree and shrub diameter and height, understory description, and incidental observations were recorded in each of the 3,211 survey plots. Stereoscopic photogrammetric mapping in combination with field reconnaissance and verification was used to determine vegetation community boundaries. Vegetation community boundaries were further verified based on site-specific data compiled for the sample plot locations.

Twenty-two distinct communities (21 vegetative communities and disturbed land) were observed on Andersen AFB within the survey area. Vegetation community types were named in accordance with the Fosberg classification (1960), with secondary forest subdivisions based on descriptions of Donnegan et al. 2004. Community types were typically named by the dominant or keystone plant species therein. Given the change in plant species composition over the past 60 years, more vegetation communities exist and were observed during the basewide vegetation survey effort, than were reported by Fosberg (1960). **Table F7-1** presents the community types identified in the basewide survey and mapping along with the dominant vegetation species characterizing each community type. **Table F7-2** provides total acreage of each of the community types identified on Andersen AFB within the survey area at the time of the survey. **Figures F-7a** through **F-7i** provide the maps of vegetative communities occurring on Andersen AFB based on the basewide vegetation survey and mapping.

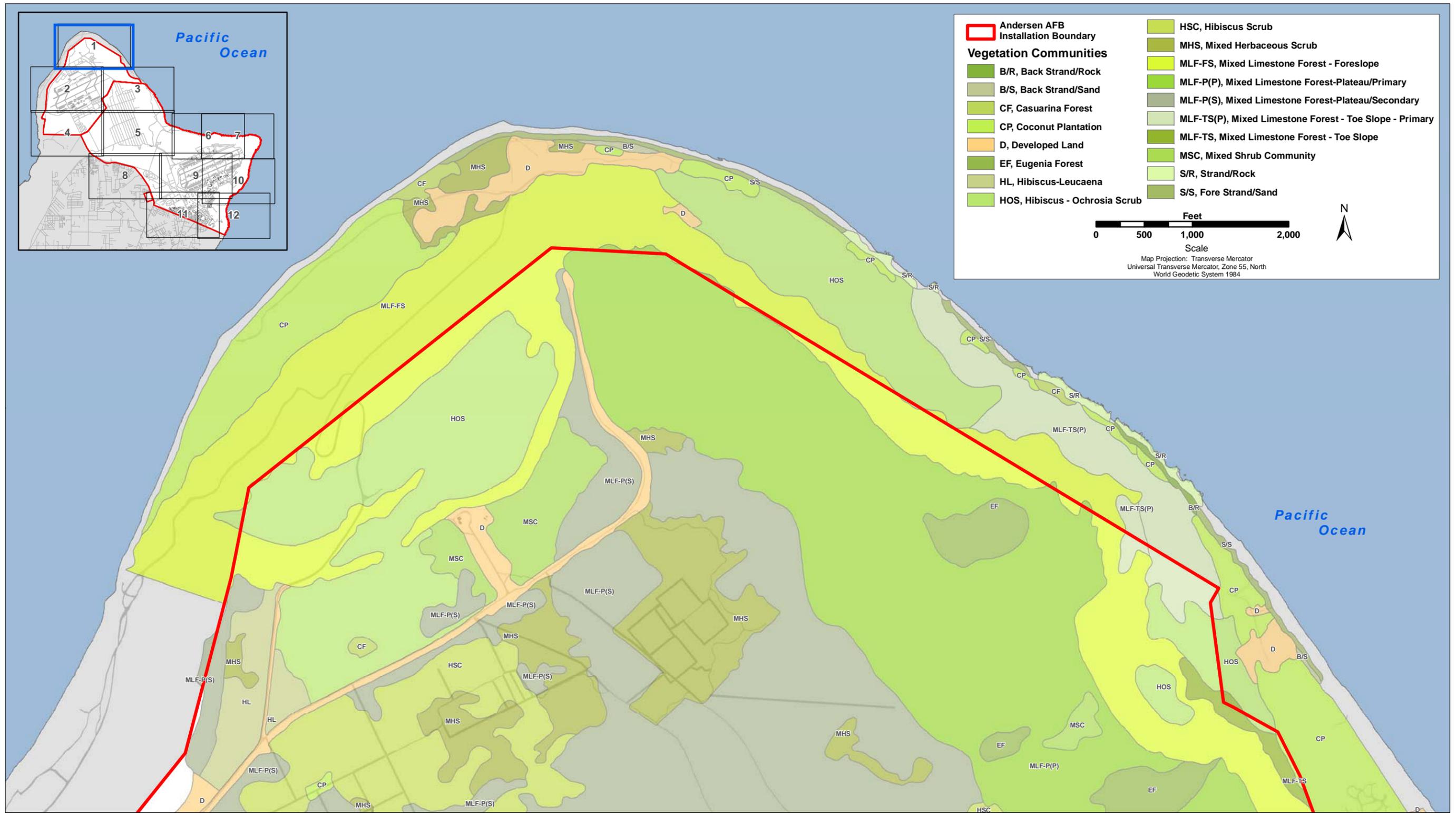
Table G7-1. Vegetation Community Types and Characteristic Species on Andersen AFB

Community Types	Characteristic Species
Mixed Limestone Forest-Plateau/Primary	<i>Ficus, Premna, Neisosperma</i>
Mixed Limestone Forest-Plateau/Secondary	<i>Vitex, Ficus, Premna, Neisosperma, Guamia, Aglaia</i>
Mixed Limestone Forest-Fore Slope	<i>Triphasia, Aglaia, Neisosperma, Guamia</i>
Mixed Limestone Forest-Toe Slope/Primary	<i>Mammea, Aglaia, Cynometra, Hibiscus</i>
Mixed Limestone Forest-Toe Slope	<i>Guamia, Neisosperma, Hibiscus</i>
Fore Strand/Sand	<i>Scaevola, Tournefortia, Sophora</i>
Back Strand/Sand	<i>Hernandia, Casuarina, Cocos</i>
Back Strand/Rock	<i>Callicarpa, Ochrosia</i>
Strand/Rock	<i>Pemphis</i>
Hibiscus-Ochrosia Scrub	<i>Hibiscus, Ochrosia, Cestrum, Neisosperma</i>
Ochrosia Edge	<i>Ochrosia</i>
Neisosperma Forest	<i>Neisosperma, Aglaia</i>
Coconut Plantation	<i>Cocos</i>
Casuarina Forest	<i>Casuarina</i>
Vitex-Closed Canopy	<i>Vitex</i>
Vitex-Sparse Canopy	<i>Vitex, Guamia, Aglaia</i>
Mixed Herbaceous Scrub	<i>Stachytarpheta</i>
Mixed Shrub	<i>Triphasia, Cestrum, Hibiscus, Morinda</i>
Hibiscus Scrub	<i>Hibiscus</i>
Eugenia Forest	<i>Eugenia</i>
Hibiscus-Leucaena	<i>Hibiscus, Leucaena</i>
Developed Land	pavement, structures, maintained lawn grasses

Table G7-2. Total Area for each Vegetation Community Type on Andersen AFB

Community Types	Total Area (acres)
Mixed Limestone Forest-Plateau/Primary	1540.67
Mixed Limestone Forest-Plateau/Secondary	4107.34
Mixed Limestone Forest-Fore Slope	833.88
Mixed Limestone Forest-Toe Slope/Primary	115.88
Mixed Limestone Forest-Toe Slope	26.69
Fore Strand/Sand	34.04
Back Strand/Sand	13.98
Back Strand/Rock	38.20
Strand/Rock	99.92
Hibiscus-Ochrosia Scrub	623.90
Ochrosia Edge	37.74
Neisosperma Forest	285.66
Coconut Plantation	486.96
Casuarina Forest	102.25
Vitex-Closed Canopy	850.77
Vitex-Sparse Canopy	807.01
Mixed Herbaceous Scrub	731.81
Mixed Shrub	32.26
Hibiscus Scrub	431.46
Eugenia Forest	39.14
Hibiscus-Leucaena	109.29
Developed Land	4501.21

THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: ePM, Inc 2008

Figure G7-1a. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK



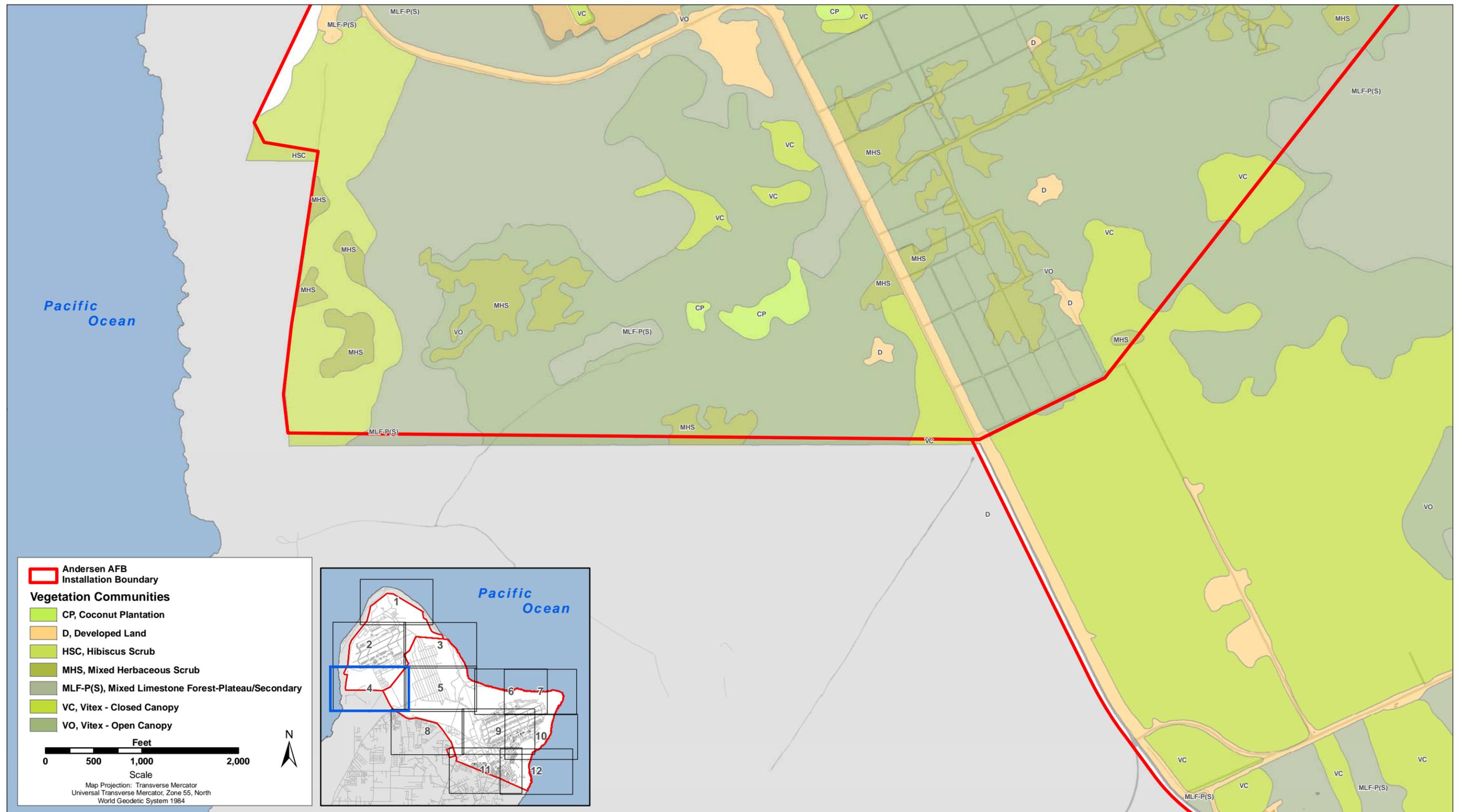
Figure G7-1b. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK



Figure G7-1c. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: ePM, Inc 2008

Figure G7-1d. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK

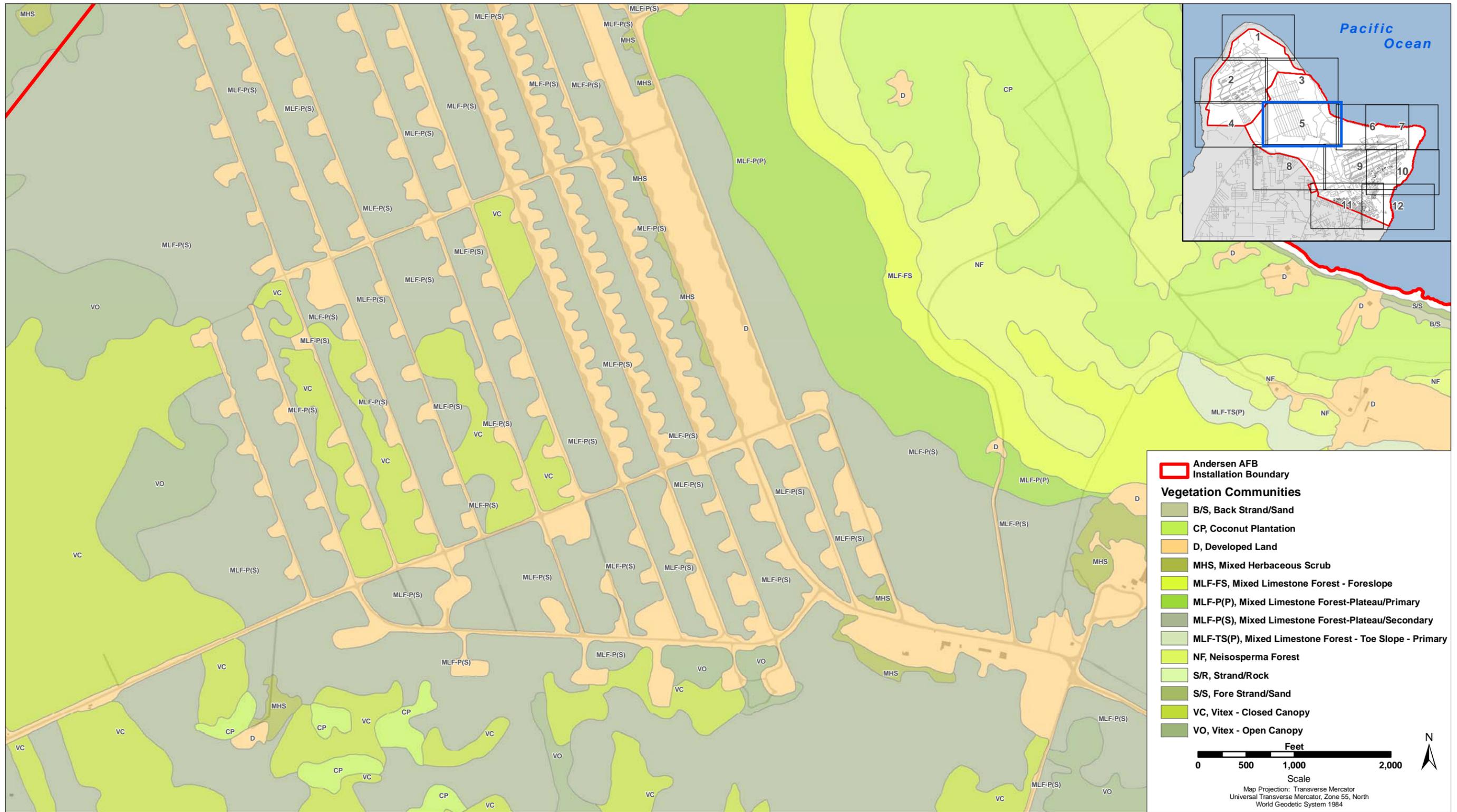
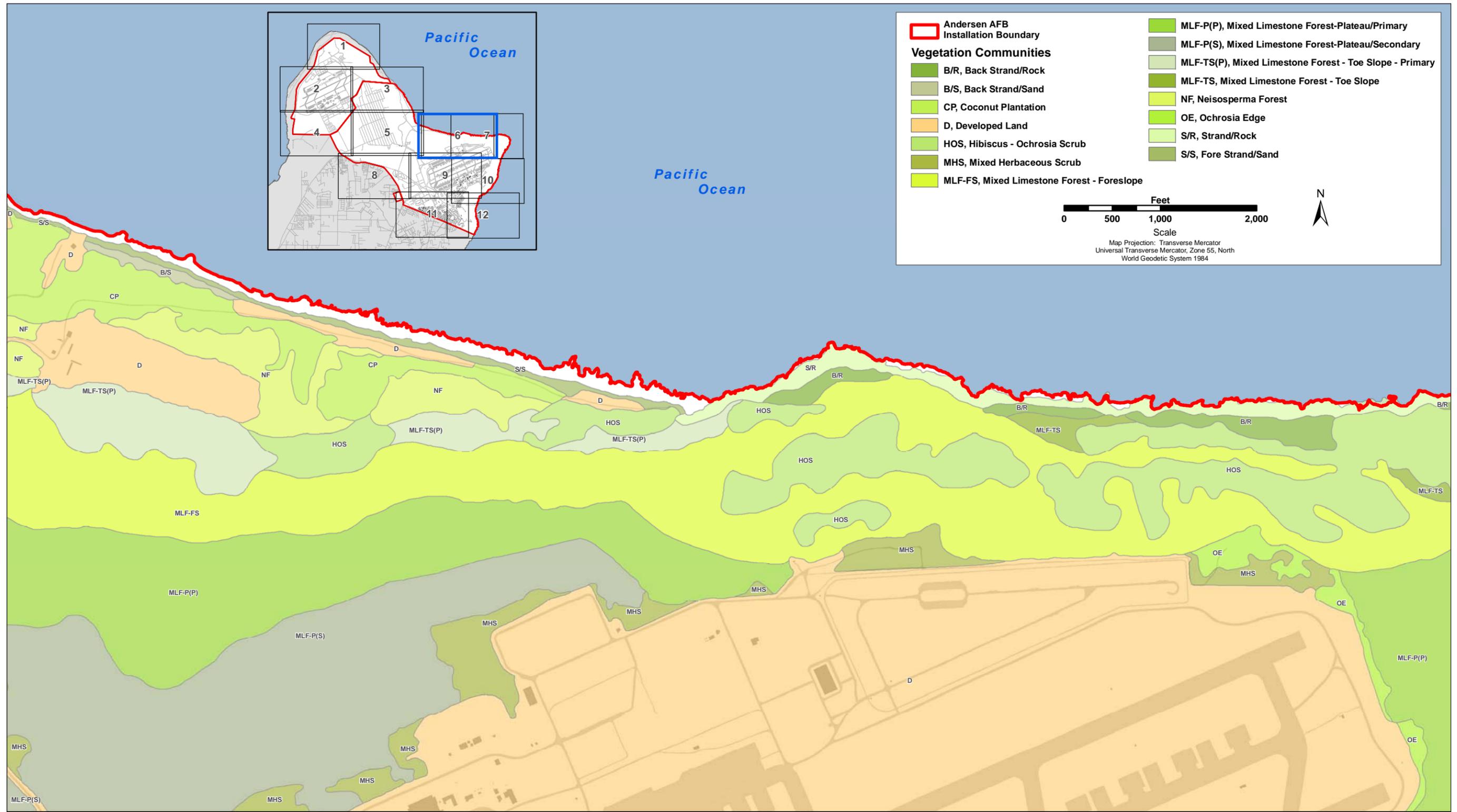


Figure G7-1e. Natural Vegetation Communities on Andersen AFB

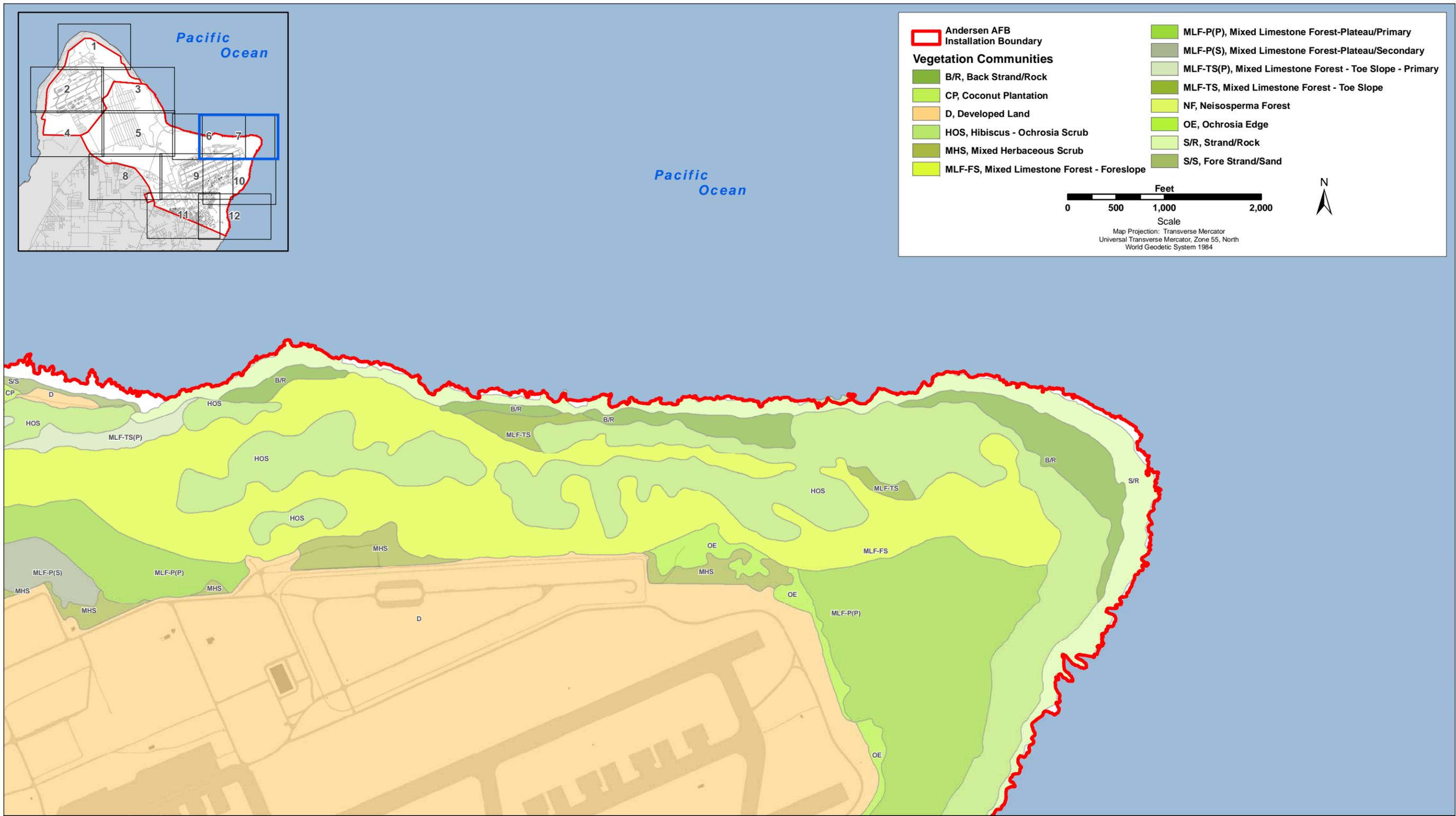
THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: e*³M, Inc 2008

Figure G7-1f. Natural Vegetation Communities on Andersen AFB

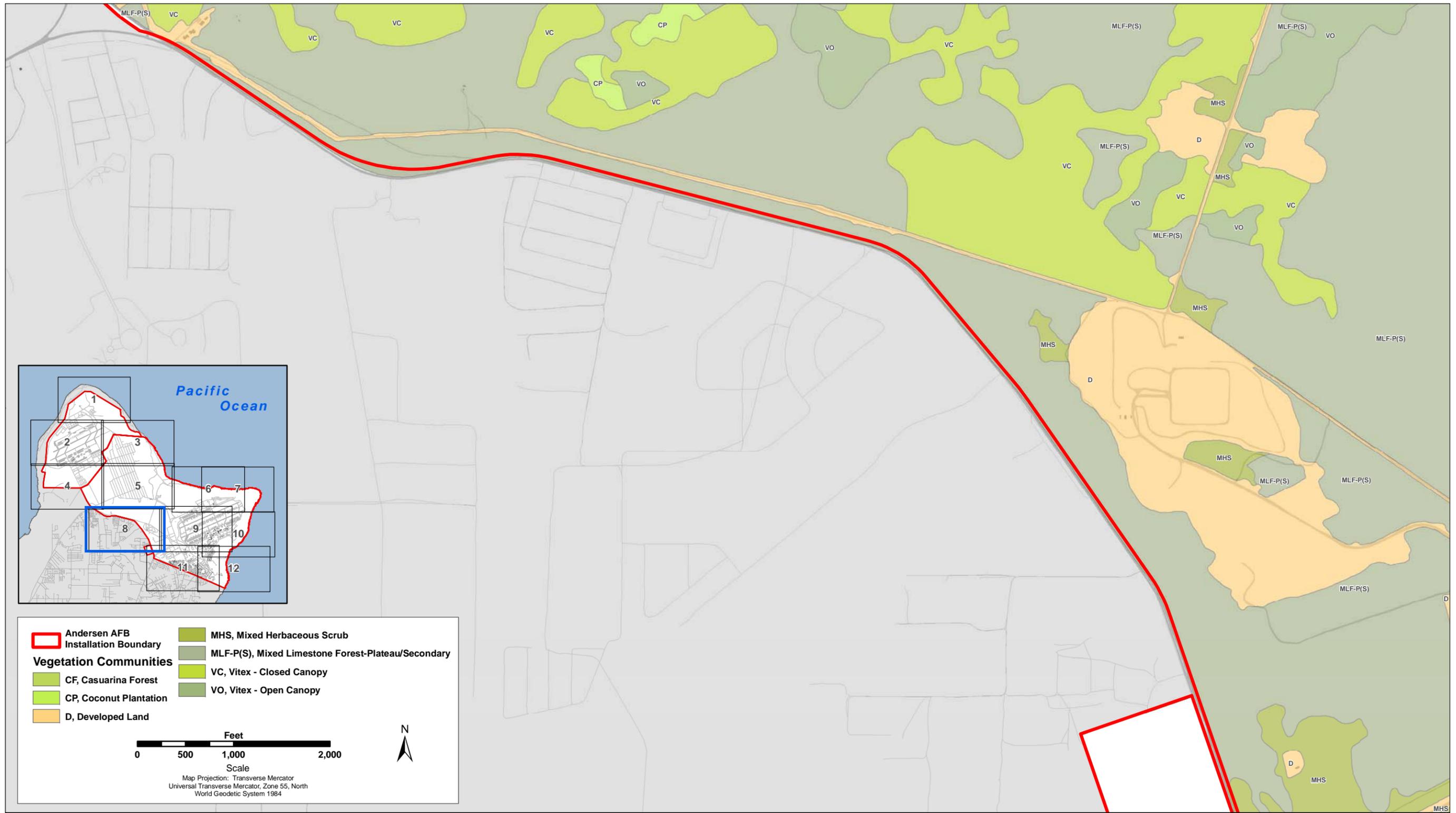
THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: eM, Inc 2008

Figure G7-1g. Natural Vegetation Communities on Andersen AFB

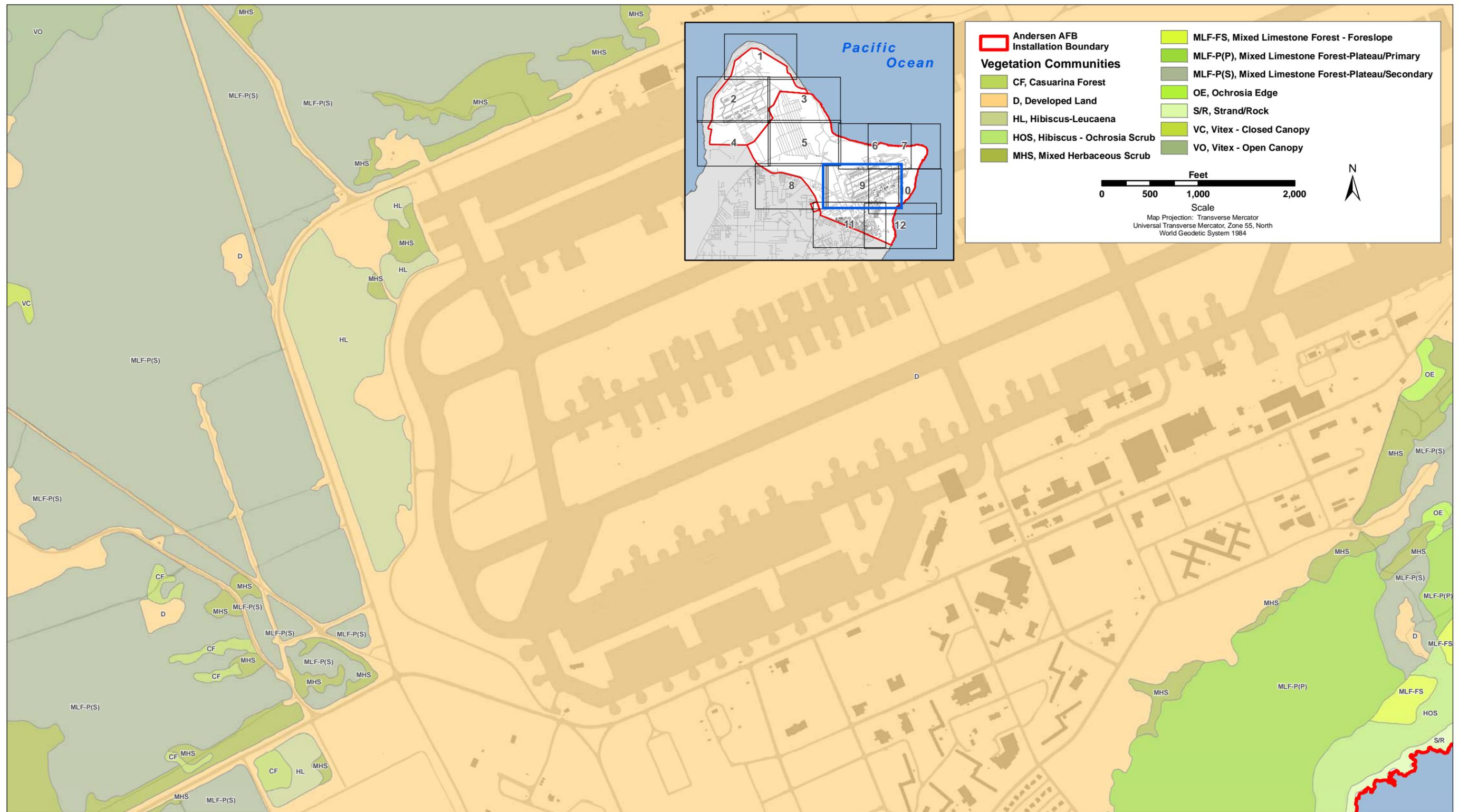
THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: e*^m, Inc 2008

Figure G7-1h. Natural Vegetation Communities on Andersen AFB

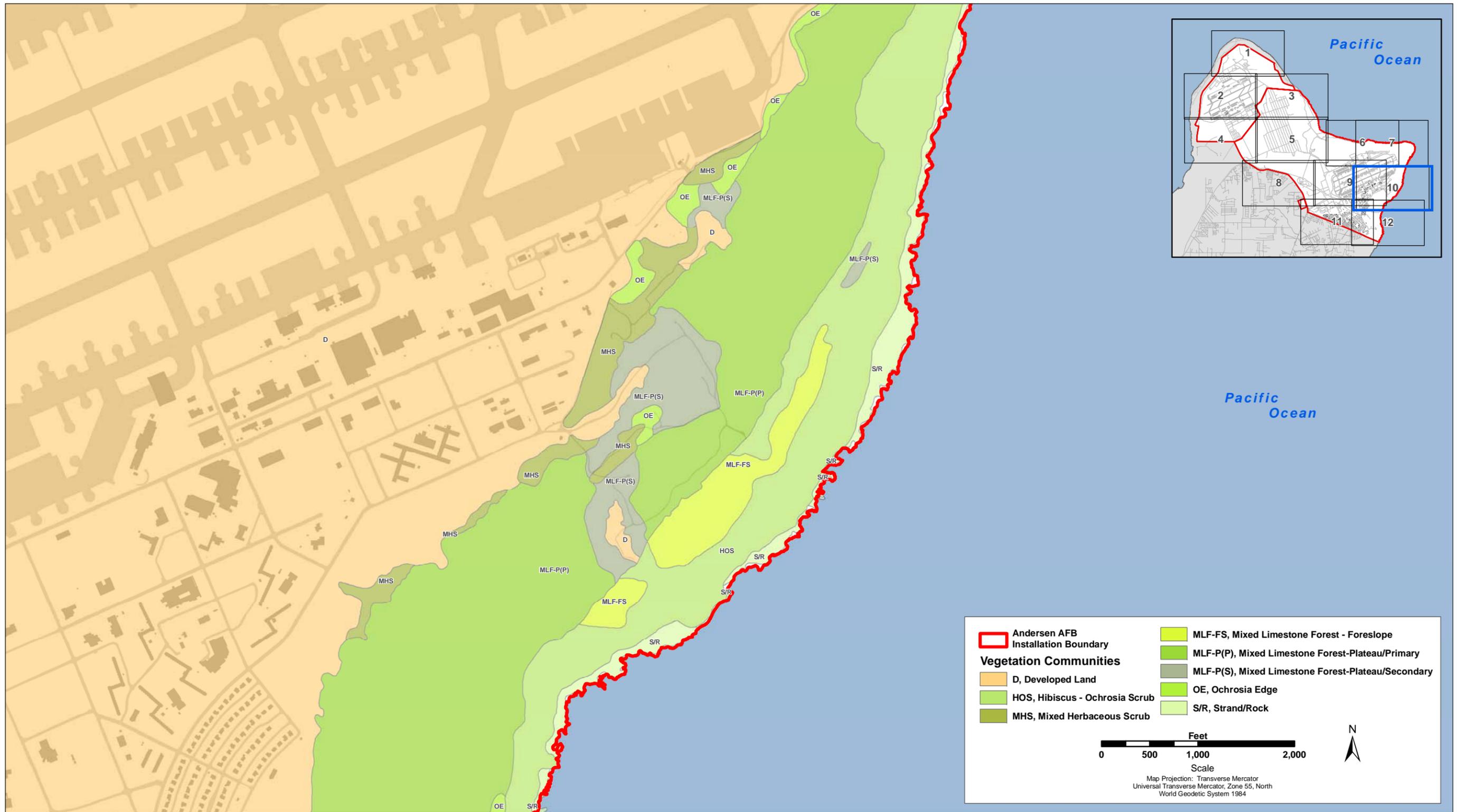
THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: ePM, Inc 2008

Figure G7-1i. Natural Vegetation Communities on Andersen AFB

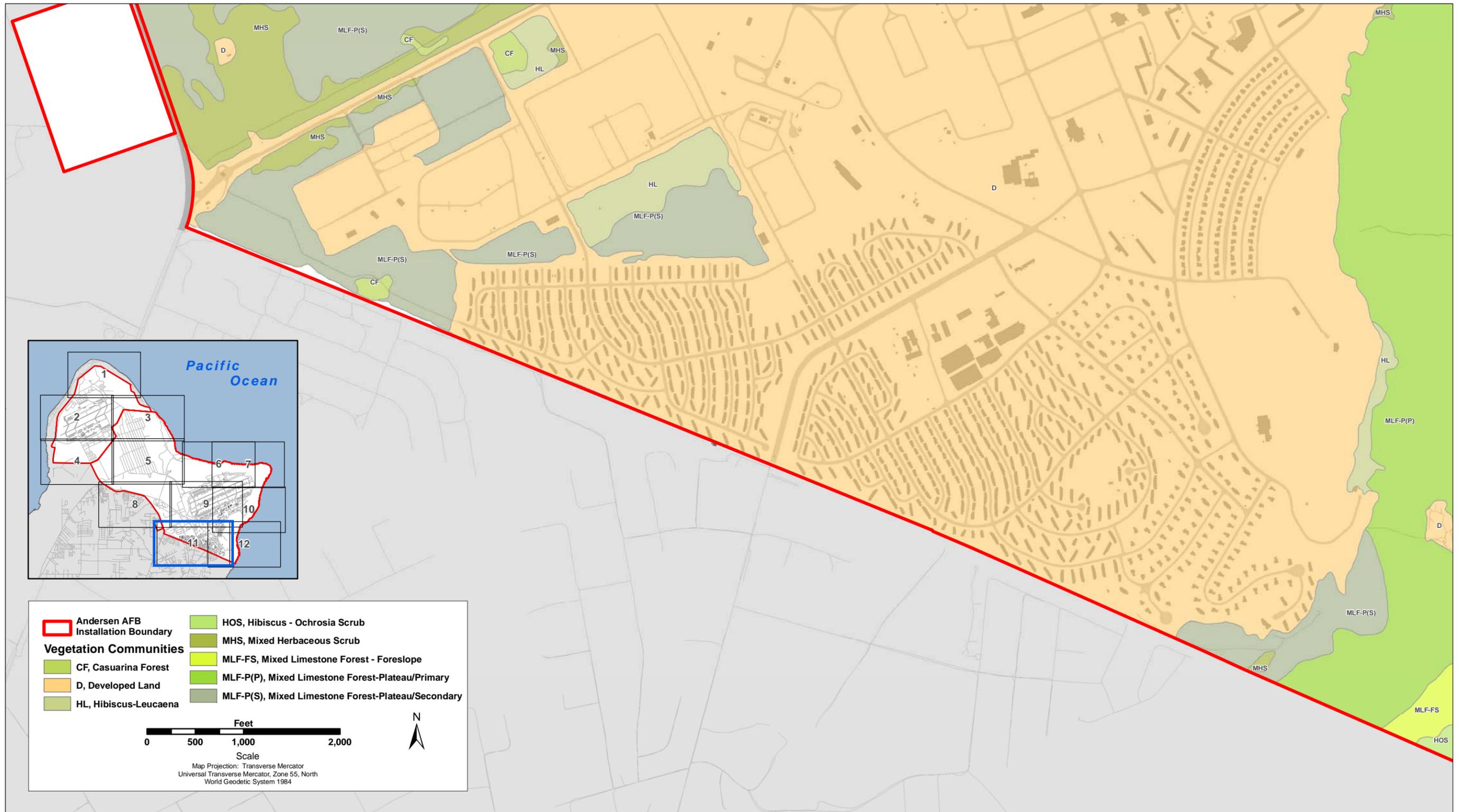
THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: e*^M, Inc 2008

Figure G7-1j. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK



Source of Base Data: 36th Wing 2008. Source of Vegetation Communities: ePM, Inc 2008

Figure G7-1k. Natural Vegetation Communities on Andersen AFB

THIS PAGE INTENTIONALLY LEFT BLANK



Figure G7-11. Natural Vegetation Communities on Andersen

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H

NATURAL RESOURCES METRICS INFORMATION

Appendix H

Natural Resources Metrics Information

Annually, the Navy sends out a natural resources data call for the Metrics Builder database, where each base has to provide answers to a list of questions to determine effectiveness of Integrated Natural Resources Management Plan (INRMP) implementation. The program rates base responses using a good, medium, or bad designator, and the information generated from the program is used by the Navy to produce the annual service report to Congress on INRMP implementation as required by the Sikes Act Improvement Act (SAIA)

The Navy Natural Resources (NR) Metrics were developed to support the annual Natural Resources Program reviews between the Navy and its Sikes Act partners, the U. S. Fish and Wildlife Service, state fish and wildlife agencies and when applicable National Oceanic and Atmospheric Administration Fisheries Service . There are seven (7) Focus Areas that comprise the NR Metrics to be evaluated during the annual review of the Natural Resources Program and associated INRMP.

1. Ecosystem Integrity
2. Listed Species and Critical Habitat
3. Fish and Wildlife Management for Public Use
4. Partnership Effectiveness
5. Team Adequacy
6. INRMP Project Implementation
7. INRMP Impact on the Installation Mission

For fiscal year 2010, JRM sites had good ratings for all criteria. The actual ratings for each criterion were as follows:

Installation Name	INRMP Project Implementation	Listed Species and Critical Habitat	Partnership Effectiveness	Fish and Wildlife Management and Public Use	Team Adequacy	Ecosystem Integrity	INRMP Impact on the Installation Mission
JRM	1.0	0.96	0.99	1.0	0.89	0.81	0.97

Each of the seven Focus Areas contains a series of questions. The questions are slightly weighted, with responses to questions having different values, ranging from 0.0 to 1.0. Each Focus Area is scored, using a rating scheme of **Green (1.0-0.67)**, **Yellow (0.66-0.34)**, and **Red (0.33-0.0)**, the final report summarizes the scorecards for all focus areas evaluated for each Navy installation.

Focus Area 1: Ecosystem Integrity

Note: This Focus Area is intended to define the ecosystems that occur on the installation and assess the integrity of those ecosystems. Terrestrial ecosystems, as defined by Nature Serve’s [“Ecological Systems of the United States: A Working Classification of US Terrestrial Systems”](#) and marine ecosystems, as defined by NOAA’s [“Coastal and Marine Ecological Classification Standard”](#).

Question	Response 1	Response 2	Response 3	Response 4	Responses 5 and 6
Q1: To what extent is the ecological system on the installation fragmented due to land conversion? (0-5)	Ecosystem fragmentation is the result of five (5) of the phenomena (0)	Ecosystem fragmentation is the result of four (4) of the phenomena (0.20)	Ecosystem fragmentation is the result of three (3) of the phenomena (0.40)	Ecosystem fragmentation is the result of two (2) of the phenomena (0.60)	Ecosystem fragmentation is the result of one (1) of the phenomena (0.80)
					No fragmentation (1.00)
Q2: Is the ecosystem effectively managed to sustain viable populations of species? (0-3)	Not effectively managed (0)	Minimally effective management (0.33)	Moderately effective management (0.67)	Effectively managed (1.00)	
Q3: To what degree is the ecological system vulnerable to stressors? (0-5)	Completely Vulnerable (0)	Severely Vulnerable to Stress (0.20)	Highly Vulnerable to Stress (0.40)	Moderately Vulnerable to Stress (0.60)	Slightly Vulnerable to Stress (0.80)
					Not Vulnerable to Stress (1.00)
Q4: To what degree has the installation’s INRMP/NR Program provided an overall benefit to ecological integrity? (0-3)	0 = No Benefit (0)	Minor Benefit (0.33)	Moderate Benefit (0.67)	Significant Benefit (1.00)	

Focus Area 2: Listed Species and Critical Habitat

Question	Response 1	Response 2	Response 3	Response 4	Response 5
Q1: To what extent do INRMP projects and programs provide a benefit to this species? (0-4, NA)	No benefit (0.0)	Minor benefits (0.25)	Moderate benefit (0.50)	Major benefit (0.75)	Significant benefit (1.00)
Q2: To what degree have projects been funded in support of this species? (0-4, NA)	No funding (0.0)	1% to 25% funded (0.25)	26% to 50% funded (0.50)	51% to 75% funded (0.75)	76% to 100% funded (1.00)
Q3: To what extent are quantifiable goals, parameters, and monitoring requirements in place to assess conservation effectiveness? (0-4, NA)	None (0.0)	Minimal (0.25)	Moderate (0.50)	Good (0.75)	Excellent (1.00)
Q4: Do existing surveys provide adequate data on habitat conditions? (Y/N)	Yes (1.0)	No (0.0)			
Q5: Do existing surveys provide adequate data on population presence and numbers? (Y/N)	Yes (1.0)	No (0.0)			

Focus Area 3: Fish and Wildlife Management for Public Use

Question	Response 1	Response 2	Response 3	Response 4	Response 5
Q1: Are recreational opportunities available on the installation? (Y/N)	Yes (1.0)	No (0.0)	Not Applicable (landscape doesn't support recreational opportunities)		

Question	Response 1	Response 2	Response 3	Response 4	Response 5
Q2: If recreational opportunities are available, are they limited and/or restricted for security reasons? (Y/N/NA)	Yes (1.0)	No (0.0)	Not Applicable (recreational opportunities are not available)		
Q3: If recreational opportunities are available, are they offered to the public? (Y/N/NA)	Yes (1.0)	No (0.0)	Not Applicable (recreational opportunities are not available)		
Q4: If recreational opportunities are available, are they offered to DOD personnel?	Yes (1.0)	No (0.0)	Not Applicable (recreational opportunities are not available)		
Q5: If recreational opportunities are available, are they accessible by disabled veterans/Americans?	Yes (1.0)	No (0.0)	Not Applicable (recreational opportunities are not available)		
Q6: Are Sikes Act fees collected for outdoor recreational opportunities? (Y/N/NA)	Yes (1.0)	No (0.0)	Not Applicable - (recreational opportunities do not include hunting or fishing)		
Q7: Is there an active natural resources law enforcement program on the installation? (Y/N/NA)	Yes (1.0)	No (0.0)	Not Applicable - (recreational opportunities do not include hunting or fishing)		
Q8: Are sustainable harvest goals addressed in the INRMP and effective for the management of the species' population? (0-4, NA)	Not effective (0)	Minimal effectiveness (0.25)	Moderate effectiveness (0.50)	Effective (0.75)	Highly effective (1.00)
					NA (recreational opportunities do not include hunting and fishing)
Q9: Is public outreach/educational awareness provided? (0-4, NA)	No public outreach provided (0)	Low outreach (0.25)	Moderate outreach (0.50)	Good outreach (0.75)	Excellent outreach (1.00)
					Not Applicable

Focus Area 4: Partnership Effectiveness

Purpose: The purpose of this Focus Area is to determine to what degree partnerships are cooperative and result in effective implementation of the INRMP.

Question	Response 1	Response 2	Response 3	Response 4	Response 5
Q1: Does your Natural Resources program support the regional conservation efforts of the USFWS?	Yes (1.0)	No (0.0)			
Q2: Does your Natural Resources program support State conservation goals identified in State Wildlife Action Plans (SWAPs)? (Y/N)	Yes (1.0)	No (0.0)			
Q3: Does your Natural Resources program support regional NOAA/NMFS conservation objectives/efforts? (Y/N/NA)	Yes (1.0)	No (0.0)	Not Applicable		
Q4: Does your Natural Resources program support other Conservation Initiatives? (Y/N)					

Focus Area 5: Team Adequacy

Purpose: The purpose of this Focus Area is to assess the effectiveness and adequacy of the Navy natural resources team in accomplishing the goals and objectives of the INRMP and Natural Resources Program at each installation. “Team” in this section refers to the Navy staff only

Question	Response 1	Response 2	Response 3	Response 4	Response 5
Q1: Is there a Navy professional Natural Resources Manager assigned by the Installation Commanding Officer? (Y/N)	Yes (1.0)	No (0.0)			
Q2: Is there an on-site Navy professional Natural Resources Manager? (Y/N)	Yes (1.0)	No (0.0)			
Q3: Is HQ and Regional support adequate, e.g. reach back support for execution, policy support, etc.)? (0-4)	No support (0)	Minimal support (0.25)	Satisfactory support (0.50)	Well supported (0.75)	Very well supported (1.00)
Q4: Is there adequate Natural Resources staff to properly implement the INRMP goals and objectives? (Y/N)	Yes (1.0)	No (0.0)			
Q5: The team is enhanced by the use of contractors. (0-4)	Disagree (0)	Somewhat agree (0.25)	Neutral (0.50)	Agree (0.75)	Strongly Agree (1.00)
Q6: The team is enhanced by the use of volunteers. (0-4, NA)	Disagree (0)	Somewhat agree (0.25)	Neutral (0.50)	Agree (0.75)	Strongly Agree (1.00)
					Not Applicable
Q7: The Natural Resources team is adequately trained to accomplish its duties to ensure compliance. (0-4)	Disagree (0)	Somewhat agree (0.25)	Neutral (0.50)	Agree (0.75)	Strongly Agree (1.00)

Focus Area 6: INRMP Project Implementation

Note: The purpose of this Focus Area is to assess how the goals and objectives of the INRMP have been met through the projects implemented during the previous fiscal year.

Question	Response 1	Response 2	Response 3	Response 4	Responses 5
Q1: Is project accomplishment on schedule? (Y/N)	Yes (1.0)	No (0.0)			
Q2: What is the Project Status? (0,1)	On-Hold (0.0)	Funds Not Yet Received (0.0)	In EPRWeb; In POM; or Emergent Project (1.0)	Funding Received; SOW Prepared, Awarded/ Executed (1.0)	Now In-Progress; Project Completed (1.0)
Q3: Which Natural Resources Program Area was most benefitted from the project? (0,1)	0 = None (0)	1 = Flora; Fauna; At Sea; INRMP; Wetlands; Listed Species; Forestry; Invasive Mgmt; Soils; Erosion Control; Outdoor Recreation; Training; Other (1.0)			
Q4: The project design met the goals and objectives of the INRMP. (0-4)	Disagree (0)	Neither agree nor disagree (0.25)	Somewhat Agree (0.50)	Fully Agree (0.75)	Strongly Agree (1.00)

Focus Area 7: INRMP Impact on Installation Mission

Question	Response 1	Response 2	Response 3	Response 4	Responses 5
Q1: Has Coordination between natural resources staff and other installation departments and military staff been successful/effective? (0-4)	No coordination (0)	Minimal coordination (0.25)	Satisfactory coordination (0.50)	Effective coordination (0.75)	Highly effective coordination (1.0)
Q2: To what extent has the INRMP successfully supported other mission areas? (e.g. encroachment, BASH, range support, port operations, air operations, facilities management, etc.) (0-4)	Not supported (0)	Minimally supported (0.25)	Satisfactorily supported (0.50)	Well supported (0.75)	Very well supported (1.0)
Q3: To what extent has there been a net loss of training lands or mission-related operational/training activities? (0-4)	Mission activities are fully impeded; training activities cannot be conducted (0)	Mission/Training activities are somewhat impeded with workarounds (0.25)	Neutral (0.50)	No loss occurred (0.75)	Mission has seen benefits (1.0)
Q4: Does the Natural Resource program effectively consider current mission requirements? (0-4)	Strongly disagree (0)	Disagree (0.25)	Neutral (0.50)	Agree (0.75)	Strongly Agree (1.0)

Terms and Definitions:

Compliant INRMP - A compliant INRMP is defined as “a complete plan that meets the purposes of the Sikes Act (§101(a)(3)(A-C)), contains the required plan elements (§101(b)(1)(A-J)), and has been reviewed for operation and effect within the past 5 years (§101(2)(b)(2)).” Therefore, a compliant INRMP must be Sikes Act compliant and less than 5 years old. If the INRMP is greater than 5 years old, then it must have undergone a review for operation and effect within the past 5 years.

Review for Operation and Effect - A review for operation and effect is defined as “a comprehensive review by the Parties, at least once every 5 years, to evaluate the extent to which the goals and objectives of the INRMP continue to meet the purpose of the Sikes Act, which is to carry out a program that provides for the conservation and rehabilitation of natural resources on military installations.

Ecosystem Integrity - The term Ecosystem Integrity refers to the quality of state of being complete, unbroken condition, wholeness, entirety, unimpaired, without significant damage, good condition, or general soundness.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX I

INRMP DOCUMENTATION, CORRESPONDENCE, AND COMPLETED COMMENT RESPONSE MATRICES

APPENDIX J

**INFORMATION SUPPORTING FISH AND WILDLIFE AND THREATENED AND
ENDANGERED SPECIES MANAGEMENT**

Migratory Bird Standard Operating Procedures

THIS PAGE INTENTIONALLY LEFT BLANK

**Mariana Common Moorhen Monitoring Program
Standard Operation Procedure**

THIS PAGE INTENTIONALLY LEFT BLANK

**Mariana Swiftlet Monitoring Program
Standard Operating Procedure**

THIS PAGE INTENTIONALLY LEFT BLANK

**Sea Turtle Monitoring Program
Standard Operating Procedure**

THIS PAGE INTENTIONALLY LEFT BLANK

Memorandum of Understanding between Government of Guam, U.S. Air Force, U.S. Navy and U.S. Fish and Wildlife Service on Establishment and Management of the Guam National Wildlife Refuge, Guam

THIS PAGE INTENTIONALLY LEFT BLANK

COPY

MEMORANDUM OF UNDERSTANDING

among the

GOVERNMENT OF GUAM

and the

U.S. AIR FORCE

and the

U.S. NAVY

and the

U.S. FISH AND WILDLIFE SERVICE

for the

ESTABLISHMENT AND MANAGEMENT OF THE
GUAM NATIONAL WILDLIFE REFUGE,
GUAM

I. INTRODUCTION

WHEREAS, the Government of Guam, the Department of Defense through the U.S. Air Force (Air Force) and the U.S. Navy (Navy), and the Department of the Interior through the U.S. Fish and Wildlife Service (Service), desire to establish overlay units of the Guam National Wildlife Refuge;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service share common goals and responsibilities for the recovery of endangered and threatened species, the protection of native flora and fauna, the conservation of unique ecosystems, and the maintenance of native biological diversity of Guam;

WHEREAS, certain Government of Guam, Air Force, Navy, and Service lands may provide habitats essential to the survival and recovery of endangered and threatened species and support other native fish and wildlife resources of Guam;

WHEREAS, Air Force and Navy lands on Guam are essential for national defense and national security purposes;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire to continue cooperative and coordinated efforts to develop and implement programs for the recovery of endangered and threatened species and to protect key wildlife habitats;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service, in recognition that the alien brown tree snake is the major cause of the demise of native birds and a major cause of the demise of the bats, shall continue to support efforts to control and eradicate this pest species on Guam;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire that conservation actions to recover and conserve endangered and threatened species and their habitats within the Guam National Wildlife Refuge be undertaken to fully meet the spirit and intent of the Endangered Species Act of 1973, as amended;

WHEREAS, the establishment and management of the Guam National Wildlife Refuge would offer proactive measures for the recovery and preservation of endangered and threatened species and their essential habitats;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire to provide opportunities for the public to gain a better understanding of and appreciation for wildlife, natural landscapes, and the relationship between humans and the environment in a manner compatible with the purposes of the Guam National Wildlife Refuge and consistent with the national defense mission of the Air Force and the Navy; and,

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service are sensitive to landowner's rights and shall work together to resolve access across Federal lands to private lands adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge.

NOW, THEREFORE, the Government of Guam, the Air Force, the Navy, and the Service do hereby agree to establish the overlay units of the Guam National Wildlife Refuge as hereinafter defined and in accordance with the provisions of the separate Cooperative Agreements to be executed between the Service and the Government of Guam, the Air Force, and the Navy.

II. AUTHORITIES

This Memorandum of Understanding is hereby made and entered into by and among the Government of Guam, the Air Force, the Navy, and the Service under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543); the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754); the Organic Act of Guam (48 U.S.C. 1421 *et seq.*); the Endangered Species Act of Guam (5 G.C.A. 63204 and 63205); and other laws, as applicable.

III. GOALS

The Government of Guam, the Air Force, the Navy, and the Service deem it mutually advantageous and desirable to establish the Guam National Wildlife Refuge and agree to cooperate and coordinate toward achievement of the following goals:

- A. To develop Cooperative Agreements between the Government of Guam and the Service, between the Air Force and the Service, and between the Navy and the Service for the establishment and cooperative management of the Guam National Wildlife Refuge;
- B. To include certain lands containing important biological values owned by the Government of Guam, the Air Force, the Navy, and the Service within the Guam National Wildlife Refuge under the terms of the respective Cooperative Agreements;
- C. To provide funding for the cooperative management of the Guam National Wildlife Refuge within the limits of available resources;
- D. To prepare annual work plans for the management of the Guam National Wildlife Refuge including, but not limited to, brown tree snake control and eradication, endangered and threatened species recovery, endangered species reintroduction, research, environmental education, wildlife management, law enforcement, compatible recreation, and interagency coordination;
- E. To effect a long-term comprehensive program to conserve and recover endangered and threatened species, migratory birds, and other native flora and fauna of Guam;
- F. To complement the ongoing work of the Government of Guam, the Air Force, the Navy, and the Service in natural resources and wildlife management, habitat protection, conservation, protection of historic and cultural resources, law enforcement, research, and environmental education;
- G. To exchange technical information and expertise among the Government of Guam, the Air Force, the Navy, and the Service to implement applicable Federal and Government of Guam wildlife conservation and environmental protection mandates;

- H. To provide increased coordination on relevant law enforcement issues among the Government of Guam, the Air Force, the Navy, and the Service in the administration and management of the Guam National Wildlife Refuge; and
- I. To continue the development of research and environmental education programs and to promote public use and public access within the Guam National Wildlife Refuge in a manner compatible with the purposes of the Guam National Wildlife Refuge and, where applicable, consistent with the national defense mission of the Air Force and the Navy.

IV. SPECIAL PROVISIONS

- A. Nothing in this Memorandum of Understanding shall be construed as obligating the Government of Guam, the Air Force, the Navy, or the Service to the expenditure of funds. The Government of Guam, the Air Force, the Navy, and the Service shall continue to seek funding for the management of the Guam National Wildlife Refuge;
- B. This Memorandum of Understanding shall remain in effect until amended or cancelled. Any signatory party of this Memorandum of Understanding may propose amendments to this Memorandum of Understanding. The Memorandum of Understanding may be amended or cancelled at any time by written mutual agreement among the parties that are signatories of this Memorandum of Understanding;
- C. This Memorandum of Understanding is not intended to nullify or supersede any existing Memorandum of Understanding or Cooperative Agreement between or among the Government of Guam, the Air Force, the Navy, or the Service;
- D. The primary purpose of Air Force and Navy lands within the Guam National Wildlife Refuge is to support the national defense mission of the Air Force and the Navy. The primary purpose of the Government of Guam lands within the Guam National Wildlife Refuge is for the conservation of natural resources for the benefit of the people of Guam. The Air Force, the Navy, the Government of Guam, and the Service recognize that their lands included within the Guam National Wildlife Refuge may provide habitats essential to the survival and recovery of endangered and threatened species;

- E. In the interest of national defense and national security, the Secretary of the Air Force or the Secretary of Navy shall, by written notice to the signatories of this Memorandum of Understanding, be exempt from complying with any or all aspects of this Memorandum of Understanding;
- F. The Government of Guam, Air Force and Navy lands identified in the respective approved Cooperative Agreements to be included in the Guam National Wildlife Refuge will be administered as an overlay National Wildlife Refuge. Under this type of designation, the primary jurisdiction of the land is retained by the host agency and the refuge program is superimposed as a secondary interest in the property. The Cooperative Agreements will state the responsibilities and obligations of each party;
- G. The signatory parties to this Memorandum of Understanding may mutually reconsider the goals of the Guam National Wildlife Refuge upon a decision by the Secretary of the Interior, based upon the best available scientific and commercial data, that endangered and threatened species found within the Guam National Wildlife Refuge have become extinct, or have recovered to the point where protection under the Endangered Species Act is no longer required, or the scientific data for the classification of the endangered or threatened species were in error;
- H. The Government of Guam, the Air Force, and the Navy shall each retain the option of unilaterally withdrawing from this Memorandum of Understanding and from their respective Cooperative Agreements in the event any portion of their respective lands are designated critical habitat; and,
- I. The Government of Guam, the Air Force, the Navy, and the Service shall work together to expeditiously resolve access across Federal lands to private lands adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge. The Government of Guam, the Air Force, the Navy, and the Service shall work together to expeditiously initiate and complete the Federal environmental reviews necessary for the Service and the Air Force to make a decision on granting access to private landowners adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge.

COPY

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Alan J. Habbitt
Deputy Assistant Secretary

10DEC93
Date

U.S. Navy

Assistant Secretary

Date

U.S. Fish and Wildlife Service

Director

Date

Government of Guam

Approved as to form

Guam Attorney General

Date

Government of Guam

Governor of Guam

Date

COPY

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Assistant Secretary

Date

U.S. Navy

Assistant Secretary

Date

U.S. Fish and Wildlife Service

Richard M. Smith

Director

12/10/93

Date

Government of Guam

Approved as to form

Guam Attorney General

Date

Government of Guam

Governor of Guam

Date

COPY

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Assistant Secretary

Date

U.S. Navy



Assistant Secretary

14 DEC 1993
Date

U.S. Fish and Wildlife Service

Director

Date

Government of Guam

Approved as to form

Guam Attorney General

Date

Government of Guam

Governor of Guam

Date

ORIGINAL

COOPERATIVE AGREEMENT

between the

U.S. AIR FORCE

and the

U.S. FISH AND WILDLIFE SERVICE

for the

ESTABLISHMENT AND MANAGEMENT OF THE
GUAM NATIONAL WILDLIFE REFUGE,
GUAM

I. Introduction

The U.S. Air Force (Air Force), the U.S. Navy (Navy), the Government of Guam, and the U.S. Fish and Wildlife Service (Service) share common goals for the recovery of endangered and threatened species, the protection of native flora and fauna, the conservation of unique ecosystems, and the maintenance of the native biological diversity of Guam. These shared goals are expressed in the 1993 Memorandum of Understanding among the Government of Guam, the Navy, the Air Force, and the Service (Attachment 1).

To address the complex ecological and endangered species issues facing the island of Guam, the Government of Guam, the Navy, the Air Force, and the Service have mutually agreed to establish the Guam National Wildlife Refuge on certain lands owned and administered by the Navy, the Air Force, the Government of Guam, and the Service as described in the Final Environmental Assessment for the Guam National Wildlife Refuge. Within certain lands administered by the Air Force, the Guam National Wildlife Refuge encompasses lands identified in recovery plans as essential habitat for the recovery of the endangered Mariana common moorhen, the Mariana crow, the Guam rail, the Guam broadbill, the Guam bridled white-eye, the Guam Micronesian kingfisher, the Mariana fruit bat, the little Mariana fruit bat, and the Vanikoro swiftlet. The Guam National Wildlife Refuge also includes certain beaches and reefs used for nesting and foraging by endangered and threatened sea turtles.

The establishment and management of the Guam National Wildlife Refuge on Air Force lands provides a commitment by the Air Force and the Service for a coordinated program centered on the protection of endangered and threatened species and other native flora and fauna, maintenance of native ecosystems, and the conservation of native biological diversity in cooperation with the Guam Department of Agriculture-Division of Aquatic and Wildlife Resources, consistent with the national defense mission of the Air Force. The Air Force has provided \$105,000 for a Natural Resource Management Plan and \$120,000 for botanical surveys of endangered plants for Andersen Air Force Base to the Service and continues to contribute staff, resources, and in-kind services for the recovery of endangered and threatened species on Guam.

Cooperative Agreement **Guam National Wildlife Refuge**
U.S. Air Force and U.S. Fish and Wildlife Service

II. Authorities

This Cooperative Agreement is hereby made and entered into by and between the Air Force and the Service under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), as amended; the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), as amended; the Fish and Wildlife Act of 1956 (16 U.S.C. 742(a)-754), as amended; the Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended; the Economy Act of 1932 (31 U.S.C. 1535); the Sikes Act of 1960 (16 U.S.C. 670a-670c), as amended; and other laws, as applicable.

III. Purposes of the Cooperative Agreement

- A. This Cooperative Agreement establishes overlay units of the Guam National Wildlife Refuge on certain lands containing important biological values under Federal ownership and administered by the Air Force on Guam.
- B. This Cooperative Agreement also defines the management and administrative roles and responsibilities of the Air Force and the Service for the Guam National Wildlife Refuge.

IV. Establishment of the Guam National Wildlife Refuge

- A. The Service recognizes that the primary purpose of the Air Force lands within the Guam National Wildlife Refuge is to support the national defense mission of the Air Force. The Air Force recognizes that their lands included within the Guam National Wildlife Refuge provide habitats essential to the survival and recovery of endangered and threatened species.
- B. The boundaries of the Guam National Wildlife Refuge on Air Force lands may include lands identified in the July 1993 Final Environmental Assessment for the Guam National Wildlife Refuge and shall be based on mutual consultations between the Air Force and the Service. Those lands mutually approved by the Air Force and the Service shall be included within the Guam National Wildlife Refuge as overlay units and are identified on the attached map (Attachment 2). These lands shall be made available by the Air Force for the establishment of the Guam National Wildlife Refuge in conjunction with lands owned by the Government of Guam, the Navy, and the Service.
- C. The boundaries of Air Force lands included within the Guam National Wildlife Refuge may be amended by the following:

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

1. Written mutual agreement between the Air Force and the Service; or
2. Unilateral written declaration by either the Air Force or the Service in accordance with the provisions of Section V of this Cooperative Agreement.

V. Tenure of the Guam National Wildlife Refuge

A. ~~The~~ Air Force lands identified under Section IV.B. and as amended under Section IV.C. of this Cooperative Agreement shall be made available for inclusion in the Guam National Wildlife Refuge under a license, lease, easement, use agreement, or other appropriate instrument until such time as any of the following conditions apply:

1. The Air Force may withdraw any or all land from the Guam National Wildlife Refuge boundaries when necessary for national emergency or national defense requirements, as determined by the Secretary of the Air Force, or higher authority;
2. The Air Force shall retain the option of unilaterally withdrawing any or all Air Force lands from the Guam National Wildlife Refuge in the event that any Air Force lands on Guam are designated critical habitat;
3. Inclusion of Air Force lands within the Guam National Wildlife Refuge shall not preclude the Air Force from determining that those areas are excess to the military mission of the Department of Defense and reporting them as excess to the General Services Administration for disposition in accordance with the Federal Property and Administrative Service Act of 1949, as amended (40 U.S.C. 471-535). As to such Air Force lands, this Cooperative Agreement shall have no further application upon title passing from the Air Force under that Act or any other Act of Congress or Executive Order; or
4. The Secretary of the Interior, using the best available scientific and commercial data, determines that all endangered and threatened species found within the Guam National Wildlife Refuge have become extinct, or have recovered to the point where protection under the Endangered Species Act is no longer required, or the scientific data for the classification of the endangered or threatened species were in error.

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

VI. Purposes of the Guam National Wildlife Refuge

The purposes of the Guam National Wildlife Refuge are as follows:

- A. ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species . . . or (B) plants . . . (C) the ecosystems upon which endangered species and threatened species depend . . ." (Endangered Species Act of 1973, 16 U.S.C. 1534);
- B. "~~It~~ shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements . . . and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon . . ." (Fish and Wildlife Coordination Act, 16 U.S.C. 664);
- C. ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources" (Fish and Wildlife Act of 1956, 16 U.S.C. 742f(a)(4));
- D. ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purposes for which acceptance is sought." (Fish and Wildlife Act of 1956, 16 U.S.C. 742f(b)(1));
- E. ". . . (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species and threatened species (Refuge Recreation Act, 16 U.S.C. 460k-1);
- F. ". . . the Secretary . . . may accept and use . . . donations of . . . real . . . property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by the donors . . ." (Refuge Recreation Act, 16 U.S.C. 460k-2); and
- G. To ensure that Air Force lands within the Guam National Wildlife Refuge remain available for the use of the Air Force to carry out its responsibilities to organize, supply, equip, train, service, mobilize, demobilize, administer, and maintain forces (10 U.S.C. 8013).

Cooperative Agreement **Guam National Wildlife Refuge**
U.S. Air Force and U.S. Fish and Wildlife Service

VII. Goals of the Guam National Wildlife Refuge

The Air Force and the Service mutually agree that the Air Force lands included within the Guam National Wildlife Refuge shall be managed and administered for the following goals, consistent with the accomplishment of the national defense mission of the Air Force:

- A. To develop and implement a long-term, comprehensive program to conserve and recover endangered and threatened species, candidate and proposed species, migratory birds, and other native flora and fauna. This conservation program includes, but is not limited to, brown tree snake control and eradication, wildlife habitat and ecosystem protection, endangered and threatened species recovery and reintroduction, research, environmental education, compatible public use, and law enforcement;
- B. To complement the ongoing efforts of the Air Force, the Government of Guam, the Navy, the Service, and other agencies in natural resources and wildlife management and conservation, protection of historic and cultural resources, law enforcement, research, and environmental education;
- C. To exchange technical information and expertise to implement appropriate wildlife conservation and environmental protection mandates;
- D. To provide increased coordination on applicable law enforcement issues in accordance with the 1990 Memorandum of Agreement for Cooperative Law Enforcement between the Service and the Department of Agriculture-Division of Aquatic and Wildlife Resources and the Cooperative Agreements between the Air Force, the Navy, the Service, and the Government of Guam under the Sikes Act;
- E. To develop research and environmental education programs and to consider public use and public access compatible with the Guam National Wildlife Refuge and consistent with the national defense mission;
- F. To ensure that Federal actions, including management plans, within the Guam National Wildlife Refuge comply with the National Environmental Policy Act of 1969; Endangered Species Act of 1973, as amended; the Migratory Bird Treaty Act of 1918; Coastal Zone Management Act of 1972; Federal Water Pollution Control Act, as amended; Rivers and Harbors Act of 1938; National Historic Preservation Act of 1966; and other laws, as applicable;

Cooperative Agreement **Guam National Wildlife Refuge**
U.S. Air Force and U.S. Fish and Wildlife Service

- G. To provide for consultation with the Service for actions which are funded, authorized, or carried out by the Federal Government within the Guam National Wildlife Refuge that may impact habitat of endangered or threatened species even if those species are extirpated from the affected area, but are not extinct, and for contemplated projects that affect nesting beaches of endangered and threatened sea turtles;
- H. To develop and implement a Refuge Management Plan for the Guam National Wildlife Refuge and to provide periodic updates of the Refuge Management Plan;
 - 1. The Refuge Management Plan for the Guam National Wildlife Refuge shall be developed by the Service in consultation with and with the concurrence of the landowners;
 - 2. The Refuge Management Plan shall incorporate the relevant sections of each landowner's natural resources management plans.
- I. To consider wildlife and fishery concerns in the development of other management plans such as law enforcement, prescribed burning, public use, public hunting, public fishing, and integrated pest management; and
- J. To develop and implement an Annual Work Plan and an Annual Accountability Report for the Guam National Wildlife Refuge.
- K. To administer and manage the Guam National Wildlife Refuge consistent with the national defense mission.

VIII. Specific Obligations of the Parties

A. The U.S. Fish and Wildlife Service's Obligations

The Service shall:

- 1. Recommend the specific Air Force lands to be included within the boundaries of the Guam National Wildlife Refuge based on consultations with the Air Force. Provide information on habitat quality and sensitivity for listed species for the development of management plans and zoning maps for Air Force lands within the Guam National Wildlife Refuge;

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

2. Locate and post the boundaries of Air Force lands included within the Guam National Wildlife Refuge with National Wildlife Refuge and Air Force signs. The wording, format, and placement of signs shall be coordinated with the Air Force;
3. Request annual funding for the management and administration of the Guam National Wildlife Refuge;
4. Undertake the staffing of the Guam National Wildlife Refuge, subject to adequate funding for a Refuge Manager, Biologist, and administrative, maintenance, and program support staff.
5. Participate directly in the development of the Annual Work Plan and shall:
 - a. Coordinate the input of the Navy, the Government of Guam, and the Air Force in the development of the Annual Work Plan;
 - b. Finalize the Annual Work Plan including mutually agreed-upon Annual Work Plan Tasks;
 - c. Administer and track the Service's budget for the Guam National Wildlife Refuge;
 - d. Distribute the Annual Work Plan to the Navy, the Government of Guam, the Air Force, and other participating agencies;
 - e. Implement the Service's Annual Work Plan Tasks as identified in the Annual Work Plan within the limits of funds and personnel;
 - f. Monitor the implementation and completion of the Annual Work Plan Tasks agreed upon by the Navy, the Government of Guam, and the Air Force;
 - g. Provide a written report of Service accomplishments of the Annual Work Plan Tasks in the Annual Accountability Report; and
 - h. Participate in the evaluation of the Annual Accountability Reports from the Government of Guam, the Navy, the Air Force, and other participating agencies.

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

6. Provide law enforcement support as specified in Section IX of this Cooperative Agreement;
7. Conduct, assist, and/or support surveys, censuses, and population monitoring of endangered and threatened species, proposed and candidate species, and other rare native species in coordination with the Air Force and the Guam Division of Aquatic and Wildlife Resources;
8. Conduct, assist, and/or support surveys and censuses of the distribution and condition of the habitats for endangered and threatened species, proposed and candidate species, and other rare native species in coordination with the Air Force and the Guam Division of Aquatic and Wildlife Resources;
9. Conduct, assist, and/or support research on the natural history and limiting factors of endangered and threatened species, proposed and candidate species, and other rare native species in coordination with the Air Force and the Guam Division of Aquatic and Wildlife Resources;
10. Conduct, assist, and/or support control and research programs in understanding the natural history of the alien brown tree snake in coordination with the Air Force and the Guam Division of Aquatic and Wildlife Resources;
11. Participate in recovery plan actions as outlined in the implementation schedules for the various recovery plans (Guam Mariana Fruit Bat and Little Mariana Fruit Bat Recovery Plan. 1990. U.S. Fish and Wildlife Service. 63 pp.); (Native Forest Birds of Guam and Rota of the Commonwealth of the Northern Mariana Islands Recovery Plan. 1990. U.S. Fish and Wildlife Service. 86 pp.); (Recovery Plan for the Mariana Islands Population of the Vanikoro Swiftlet, *Aerodramus vanikorensis bartschi*. 1991. U.S. Fish and Wildlife Service. 49 pp.); (Recovery Plan for the Mariana Common Moorhen (= Gallinule), *Gallinula chloropus guami*. 1991. U.S. Fish and Wildlife Service. 55 pp.); and (Draft Recovery Plan for *Serianthes nelsonii*. 1993. U.S. Fish and Wildlife Service. 47 pp.);
12. Provide opportunities for public environmental education within the Guam National Wildlife Refuge;
13. Participate fully in the Endangered Species Act consultation process, including early advice on projects and ways to minimize the impacts of Federal actions to endangered species and their habitats;

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

14. Coordinate and consult with all parties and with the concurrence of the appropriate landowner to identify opportunities for compatible public access and recreation on Federal and Government of Guam lands included within the Guam National Wildlife Refuge;
15. Obtain appropriate primary landowner approval prior to issuance of any permit, easement, license, grant, right-of-way, or concession contract affecting Air Force lands or the national defense mission; and,
16. Coordinate and consult with the Government of Guam and the Air Force in establishing compatible recreational access and uses at the Ritidian Point Unit of the Guam National Wildlife Refuge. The Service shall be responsible for issuing a Special Use Permit to the Government of Guam for the operation and management of the compatible recreational uses on certain lands at the Ritidian Point Unit upon compliance with the National Environmental Policy Act of 1969; the Endangered Species Act of 1973, as amended; the Coastal Zone Management Act of 1972; the National Historic Preservation Act of 1966; the National Wildlife Refuge System Administration Act of 1966; other applicable Federal laws and Executive Orders and to be compatible with the purposes for which the Guam National Wildlife Refuge was established.

B. U.S. Air Force's Obligations

The Air Force shall:

1. Consult with the Service and determine the specific areas to be included within the boundaries of the Guam National Wildlife Refuge;
2. Identify existing uses on Air Force lands within the boundaries of the Guam National Wildlife Refuge;
3. Request additional funding and in-kind services as justified and negotiated for the establishment and management of the Guam National Wildlife Refuge on Air Force lands and subject to the availability of funding and in-kind services;
4. The Service and the Air Force shall enter into inter-agency agreements for the transfer of funds related to the administration and management of the Guam National Wildlife Refuge in accordance with the Economy Act, 31 U.S.C. 1535 as implemented by the Federal Acquisition Regulations Section 17.501 and DFARS Section 217.502;

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

5. Participate directly in the development of the Annual Work Plan as specified in Section X of this Cooperative Agreement;
6. Provide law enforcement support as specified in Section IX of this Cooperative Agreement;
7. Provide access to the employees of the Service and the Guam Division of Aquatic and Wildlife Resources who require access to Air Force lands on a regular basis for purposes related to this Cooperative Agreement. The Air Force may temporarily suspend access to certain areas for emergency or national defense purposes or for situations/purposes declared essential by the Wing Commander, 633rd Air Base Wing, Andersen Air Force Base;
8. Provide access to realty maps and survey information to Service personnel participating in the boundary surveys;
9. Provide access to the Service for the posting of the Guam National Wildlife Refuge boundaries;
10. Participate fully in the Endangered Species Act consultation process as required by statute;
11. Coordinate and consult with the Service and the Government of Guam in establishing compatible recreational access and uses at the Ritidian Point Unit of the Guam National Wildlife Refuge. The Air Force shall assist the Service in developing the Special Use Permit for public access at the Ritidian Point Unit in compliance with the National Environmental Policy Act of 1969; the Endangered Species Act of 1973, as amended; the Coastal Zone Management Act of 1972; the National Historic Preservation Act of 1966; the National Wildlife Refuge System Administration Act of 1966; other applicable Federal laws and Executive Orders and to be compatible with the purposes for which the Guam National Wildlife Refuge was established; and
12. Coordinate and consult with the Service to identify opportunities for compatible public access and recreation on Air Force lands included within the Guam National Wildlife Refuge.

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

2. The Service shall coordinate the development of the meeting agendas, prepare and distribute background information and minutes, schedule meetings, and hold meetings on Guam or other locations.
- C. The Air Force and the Service may meet jointly as needed for any Federal action that may affect endangered and threatened species, proposed and candidate species, habitats for endangered and threatened species, and habitats for proposed and candidate species within Air Force lands included within the Guam National Wildlife Refuge;
1. These meetings may include the Guam Division of Aquatic and Wildlife Resources and other agencies as mutually agreed to by the Service and the Air Force; and,
 2. These meetings may constitute informal consultations between the Service and the Air Force. The Air Force and the Service shall work together to identify, propose, and implement project modifications consistent with the purposes of this Cooperative Agreement that minimize or mitigate adverse effects to endangered and threatened species, proposed and candidate species, habitats for endangered and threatened species, and habitats for proposed and candidate species within Air Force lands included within the Guam National Wildlife Refuge.
- D. The Air Force shall consult with the Service on any action authorized, funded, or carried out, in whole or in part, by the Air Force that may affect endangered and threatened species, as provided for in 50 C.F.R. 402, Interagency Cooperation under the Endangered Species Act of 1973, as amended. Since the Service is also a cooperator for land management actions on Air Force lands, the Service may initiate intra-Service Section 7 consultation under appropriate circumstances;
- E. Similarly, the Air Force shall coordinate with the Service for any Federal action that may affect Air Force lands included within the Guam National Wildlife Refuge and identified as providing essential habitat for the endangered Mariana fruit bat (Guam Mariana Fruit Bat and Little Marians Fruit Bat Recovery Plan. 1990. U.S. Fish and Wildlife Service. 63 pp.); the endangered Guam rail, the Guam Micronesian kingfisher, and the Mariana crow (Native Forest Birds of Guam and Rota of the Commonwealth of the Northern Mariana Islands Recovery Plan. 1990. U.S. Fish and Wildlife Service. 86 pp.); habitats for the endangered Vanikoro swiftlet (Recovery Plan for the Mariana Islands Population of the

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

Vanikoro Swiftlet, *Aerodramus vanikorensis bartschi*. 1991. U.S. Fish and Wildlife Service. 49 pp.); habitats for the endangered Mariana common moorhen (Recovery Plan for the Mariana Common Moorhen (= Gallinule), *Gallinula chloropus guami*. 1991. U.S. Fish and Wildlife Service. 55 pp.); habitats for the endangered hayun lagu tree (Draft Recovery Plan for *Serianthes nelsonii*. 1993. U.S. Fish and Wildlife Service. 47 pp.); habitats identified in other recovery plans; or beaches and reefs used for nesting and foraging by endangered and threatened sea turtle species;

- F. The Service shall provide the draft biological opinion for review and comment to the Air Force. The Air Force may provide the draft biological opinion to the Guam Division of Aquatic and Wildlife Resources. The Service shall fully consider the views of the Air Force and the Guam Division of Aquatic and Wildlife Resources, as appropriate, in carrying out the consultation process under Section 7 of the Endangered Species Act;
- G. The Service shall be the final authority on scientific matters relating to whether a Federal action may affect endangered and threatened species and proposed and candidate species on Air Force lands included within the Guam National Wildlife Refuge and shall provide recommendations on minimizing or mitigating any adverse impacts.
- H. Either party may elevate legal disputes to the Department of Justice for resolution in accordance with Executive Order 12146, Sections 1-4.
- I. Nothing in this Cooperative Agreement shall be interpreted to diminish the responsibilities of the Air Force or the Service to comply with 50 C.F.R. 402, Interagency Cooperation under the Endangered Species Act of 1973, as amended.

XI. Project Officers

- A. Project Officer for the Service shall be:
 - 1. Project Leader
Hawaiian and Pacific Islands National Wildlife Refuge
Complex
300 Ala Moana Boulevard, Room 5302
Honolulu, Hawaii 96850
Telephone: (808) 541-1201
Fax: (808) 541-1216

Cooperative Agreement **Guam National Wildlife Refuge**
U.S. Air Force and U.S. Fish and Wildlife Service

2. The Project Leader shall be recognized as the official representative of the Service.
3. The Guam National Wildlife Refuge Manager shall be recognized as the on-island point-of-contact for routine affairs related to the management of the Guam National Wildlife Refuge. Telephone: (671) 355-5096.
Fax: (671) 355-5098.

B. Project Officer for the Air Force shall be:

1. **Commander**
633rd Civil Engineering Squadron
Andersen Air Force Base, Guam
APO, AP 96543-4007
Telephone: (671) 366-7101 or 366-6205
Fax: (671) 366-8010

2. The Commander shall be recognized as the official representative of the Air Force.
3. The point-of-contact for routine affairs shall be the Natural Resource Planner, 633 CES/CEV, APO AP 96543-4007.
Telephone: (671) 366-2549 or 366-2101.

XII. Special Provisions

- A. This Cooperative Agreement does not nullify or supersede any existing Cooperative Agreements or Memorandum of Agreements including the following:
 1. 1993 Memorandum of Understanding between the Government of Guam, the U.S. Navy, the U.S. Air Force, and the U.S. Fish and Wildlife Service for the Establishment and Management of the Guam National Wildlife Refuge, Island of Guam;
 2. 1990 Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and the Department of Agriculture-Division of Aquatic and Wildlife Resources;
 3. 1988 Memorandum of Agreement Related to Concurrent Jurisdiction between the Government of Guam, the Commander, U.S. Naval Forces Marianas, and the Commander, 43D Combat Support Group, Andersen Air Force Base, Guam;

Cooperative Agreement **Guam National Wildlife Refuge**
U.S. Air Force and U.S. Fish and Wildlife Service

4. 1988 Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at U.S. Naval Communication Area Master Station, WESTPAC between the Navy, the Service, and the Government of Guam;
 5. 1988 Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at U.S. Naval Supply Depot, Guam between the Navy, the Service, and the Government of Guam;
 6. 1988 Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at U.S. Naval Magazine, Guam between the Navy, the Service, and the Government of Guam;
 7. 1988 Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at U.S. Navy Public Works Center, Guam between the Navy, the Service, and the Government of Guam;
 8. 1988 Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at U.S. Naval Station, Guam between the Navy, the Service, and the Government of Guam; and
 9. 1986 Cooperative Agreement for the Protection, Development, and Management of Fish and Wildlife Resources at Andersen Air Force Base, Territory of Guam, between the Air Force, the Service, and the Government of Guam.
- B. The Air Force lands identified in this Cooperative Agreement will be included within the Guam National Wildlife Refuge as an overlay national wildlife refuge. The primary administration of those lands will be retained by the Air Force and the Guam National Wildlife Refuge will be superimposed as a secondary interest in the property.
- C. The Government of Guam, the Navy, the Air Force, and the Service shall mutually reconsider the goals of the Guam National Wildlife Refuge upon the decision by the Secretary of the Interior, based upon the best available scientific and commercial data, that all endangered and threatened species found within the Guam National Wildlife Refuge have become extinct, or have recovered to the point where protection under the Endangered Species Act is no longer required, or the scientific data for the classification of the endangered or threatened species were in error.

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

- D. Nothing in this Cooperative Agreement shall relieve, and no action may be taken under this Cooperative Agreement to relieve the Secretary of the Air Force or any responsible party from any obligation or other liability on Air Force lands under the Comprehensive Environmental Response, Compensation and Liability Act (26 U.S.C. 4611-4682; 94 Stat. 2797; P.L. 96-510, December 11, 1980; as amended); Toxic Substances Control Act (15 U.S.C. 2601-2671; 90 Stat. 2003; P.L. 94-469; as amended); Resource Conservation and Recovery Act (42 U.S.C. 6901-6992; 90 Stat. 2795; P.L. 94-580, October 21, 1976; as amended); Clean Air Act (42 U.S.C. 7401-7642; as amended) and the Clean Air Amendments (P.L. 95-95; 91 Stat. 685; as amended); National Emission Standards for Hazardous Air Pollutants (40 C.F.R. Part 61, Subpart M); and other laws and regulations, as applicable.
- E. Nothing in this Cooperative Agreement shall be construed to affect the degree of cleanup at any Air Force lands required to be carried out under the Comprehensive Environmental Response, Compensation and Liability Act, Toxic Substances Control Act, Resource Conservation and Recovery Act, Clean Air Act, Clean Air Amendments, the National Emission Standards for Hazardous Air Pollutants, and other laws and regulations, as applicable.
- F. If critical habitat is designated on any Air Force lands on Guam, the Air Force shall have the right to unilaterally declare this Cooperative Agreement null and void, and may, at its discretion, reinstate consultations and negotiations with the Service.

Cooperative Agreement Guam National Wildlife Refuge
U.S. Air Force and U.S. Fish and Wildlife Service

XIII. IN WITNESS WHEREOF, each party hereto has caused this Cooperative Agreement to be executed by an authorized official on the day and year set forth opposite their signature. This Cooperative Agreement shall become effective upon the date of the final signature.

U.S. Air Force

By: 
Dennis R. Larsen, Colonel, USAF
U.S. Air Force
Commander, 633rd Air Base Wing

Date: 10 Mar-94

U.S. Fish and Wildlife Service

By: _____
Marvin Plenert
Regional Director, Region 1
U.S. Fish and Wildlife Service

Date: _____

Cooperative Agreement
U.S. Air Force and U.S. Fish and Wildlife Service

Guam National Wildlife Refuge

XIII. IN WITNESS WHEREOF, each party hereto has caused this Cooperative Agreement to be executed by an authorized official on the day and set forth opposite their signature. This Cooperative Agreement shall become effective upon the date of the final signature.

U.S. Air Force

By: _____
Dennis R. Larsen, Colonel, USAF
U.S. Air Force
Commander, 633rd Air Base Wing

Date: _____

U.S. Fish and Wildlife Service

By: Marvin Plenert
Marvin Plenert
Regional Director, Region 1
U.S. Fish and Wildlife Service

Date: 3-4-84

ATTACHMENT 1

MEMORANDUM OF UNDERSTANDING

among the

GOVERNMENT OF GUAM

and the

U.S. AIR FORCE

and the

U.S. NAVY

and the

U.S. FISH AND WILDLIFE SERVICE

for the

**ESTABLISHMENT AND MANAGEMENT OF THE
GUAM NATIONAL WILDLIFE REFUGE,
GUAM**

I. INTRODUCTION

WHEREAS, the Government of Guam, the Department of Defense through the U.S. Air Force (Air Force) and the U.S. Navy (Navy), and the Department of the Interior through the U.S. Fish and Wildlife Service (Service), desire to establish overlay units of the Guam National Wildlife Refuge;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service share common goals and responsibilities for the recovery of endangered and threatened species, the protection of native flora and fauna, the conservation of unique ecosystems, and the maintenance of native biological diversity of Guam;

WHEREAS, certain Government of Guam, Air Force, Navy, and Service lands may provide habitats essential to the survival and recovery of endangered and threatened species and support other native fish and wildlife resources of Guam;

WHEREAS, Air Force and Navy lands on Guam are essential for national defense and national security purposes;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire to continue cooperative and coordinated efforts to develop and implement programs for the recovery of endangered and threatened species and to protect key wildlife habitats;

Memorandum of Understanding

Guam National Wildlife Refuge

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service, in recognition that the alien brown tree snake is the major cause of the demise of native birds and a major cause of the demise of the bats, shall continue to support efforts to control and eradicate this pest species on Guam;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire that conservation actions to recover and conserve endangered and threatened species and their habitats within the Guam National Wildlife Refuge be undertaken to fully meet the spirit and intent of the Endangered Species Act of 1973, as amended;

WHEREAS, the establishment and management of the Guam National Wildlife Refuge would offer proactive measures for the recovery and preservation of endangered and threatened species and their essential habitats;

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service desire to provide opportunities for the public to gain a better understanding of and appreciation for wildlife, natural landscapes, and the relationship between humans and the environment in a manner compatible with the purposes of the Guam National Wildlife Refuge and consistent with the national defense mission of the Air Force and the Navy; and,

WHEREAS, the Government of Guam, the Air Force, the Navy, and the Service are sensitive to landowner's rights and shall work together to resolve access across Federal lands to private lands adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge.

NOW, THEREFORE, the Government of Guam, the Air Force, the Navy, and the Service do hereby agree to establish the overlay units of the Guam National Wildlife Refuge as hereinafter defined and in accordance with the provisions of the separate Cooperative Agreements to be executed between the Service and the Government of Guam, the Air Force, and the Navy.

II. AUTHORITIES

This Memorandum of Understanding is hereby made and entered into by and among the Government of Guam, the Air Force, the Navy, and the Service under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543); the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754); the Organic Act of Guam (48 U.S.C. 1421 et seq.); the Endangered Species Act of Guam (5 G.C.A. 63204 and 63205); and other laws, as applicable.

Memorandum of Understanding

Guam National Wildlife Refuge

III. GOALS

The Government of Guam, the Air Force, the Navy, and the Service deem it mutually advantageous and desirable to establish the Guam National Wildlife Refuge and agree to cooperate and coordinate toward achievement of the following goals:

- A. To develop Cooperative Agreements between the Government of Guam and the Service, between the Air Force and the Service, and between the Navy and the Service for the establishment and cooperative management of the Guam National Wildlife Refuge;
- B. To include certain lands containing important biological values owned by the Government of Guam, the Air Force, the Navy, and the Service within the Guam National Wildlife Refuge under the terms of the respective Cooperative Agreements;
- C. To provide funding for the cooperative management of the Guam National Wildlife Refuge within the limits of available resources;
- D. To prepare annual work plans for the management of the Guam National Wildlife Refuge including, but not limited to, brown tree snake control and eradication, endangered and threatened species recovery, endangered species reintroduction, research, environmental education, wildlife management, law enforcement, compatible recreation, and interagency coordination;
- E. To effect a long-term comprehensive program to conserve and recover endangered and threatened species, migratory birds, and other native flora and fauna of Guam;
- F. To complement the ongoing work of the Government of Guam, the Air Force, the Navy, and the Service in natural resources and wildlife management, habitat protection, conservation, protection of historic and cultural resources, law enforcement, research, and environmental education;
- G. To exchange technical information and expertise among the Government of Guam, the Air Force, the Navy, and the Service to implement applicable Federal and Government of Guam wildlife conservation and environmental protection mandates;

Memorandum of Understanding

Guam National Wildlife Refuge

- H. To provide increased coordination on relevant law enforcement issues among the Government of Guam, the Air Force, the Navy, and the Service in the administration and management of the Guam National Wildlife Refuge; and
- I. To continue the development of research and environmental education programs and to promote public use and public access within the Guam National Wildlife Refuge in a manner compatible with the purposes of the Guam National Wildlife Refuge and, where applicable, consistent with the national defense mission of the Air Force and the Navy.

IV. SPECIAL PROVISIONS

- A. Nothing in this Memorandum of Understanding shall be construed as obligating the Government of Guam, the Air Force, the Navy, or the Service to the expenditure of funds. The Government of Guam, the Air Force, the Navy, and the Service shall continue to seek funding for the management of the Guam National Wildlife Refuge;
- B. This Memorandum of Understanding shall remain in effect until amended or cancelled. Any signatory party of this Memorandum of Understanding may propose amendments to this Memorandum of Understanding. The Memorandum of Understanding may be amended or cancelled at any time by written mutual agreement among the parties that are signatories of this Memorandum of Understanding;
- C. This Memorandum of Understanding is not intended to nullify or supersede any existing Memorandum of Understanding or Cooperative Agreement between or among the Government of Guam, the Air Force, the Navy, or the Service;
- D. The primary purpose of Air Force and Navy lands within the Guam National Wildlife Refuge is to support the national defense mission of the Air Force and the Navy. The primary purpose of the Government of Guam lands within the Guam National Wildlife Refuge is for the conservation of natural resources for the benefit of the people of Guam. The Air Force, the Navy, the Government of Guam, and the Service recognize that their lands included within the Guam National Wildlife Refuge may provide habitats essential to the survival and recovery of endangered and threatened species;

Memorandum of Understanding

Guam National Wildlife Refuge

- E. In the interest of national defense and national security, the Secretary of the Air Force or the Secretary of Navy shall, by written notice to the signatories of this Memorandum of Understanding, be exempt from complying with any or all aspects of this Memorandum of Understanding;
- F. The Government of Guam, Air Force and Navy lands identified in the respective approved Cooperative Agreements to be included in the Guam National Wildlife Refuge will be administered as an overlay National Wildlife Refuge. Under this type of designation, the primary jurisdiction of the land is retained by the host agency and the refuge program is superimposed as a secondary interest in the property. The Cooperative Agreements will state the responsibilities and obligations of each party;
- G. The signatory parties to this Memorandum of Understanding may mutually reconsider the goals of the Guam National Wildlife Refuge upon a decision by the Secretary of the Interior, based upon the best available scientific and commercial data, that endangered and threatened species found within the Guam National Wildlife Refuge have become extinct, or have recovered to the point where protection under the Endangered Species Act is no longer required, or the scientific data for the classification of the endangered or threatened species were in error;
- H. The Government of Guam, the Air Force, and the Navy shall each retain the option of unilaterally withdrawing from this Memorandum of Understanding and from their respective Cooperative Agreements in the event any portion of their respective lands are designated critical habitat; and,
- I. The Government of Guam, the Air Force, the Navy, and the Service shall work together to expeditiously resolve access across Federal lands to private lands adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge. The Government of Guam, the Air Force, the Navy, and the Service shall work together to expeditiously initiate and complete the Federal environmental reviews necessary for the Service and the Air Force to make a decision on granting access to private landowners adjacent to the Ritidian Point Unit of the Guam National Wildlife Refuge.

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Alan J. Habbitt
Deputy Assistant Secretary

10/21/03
Date

U.S. Navy

Assistant Secretary

Date

U.S. Fish and Wildlife Service

Director

Date

Government of Guam

Approved as to form

Guam Attorney General

Date

Government of Guam

Governor of Guam

Date

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Assistant Secretary

Date

U.S. Navy



Assistant Secretary

14 DEC 1993

Date

U.S. Fish and Wildlife Service

Director

Date

Government of Guam

Approved as to form

Guam Attorney General

Date

Government of Guam

Governor of Guam

Date

Memorandum of Understanding

Guam National Wildlife Refuge

V. APPROVALS

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature. This Memorandum of Understanding shall become effective for each party on the date of the authorized official's signature.

U.S. Air Force

Assistant Secretary

Date

U.S. Navy

Assistant Secretary

Date

U.S. Fish and Wildlife Service

Richard M. Smith

Director

12/10/93

Date

Government of Guam

Approved as to form

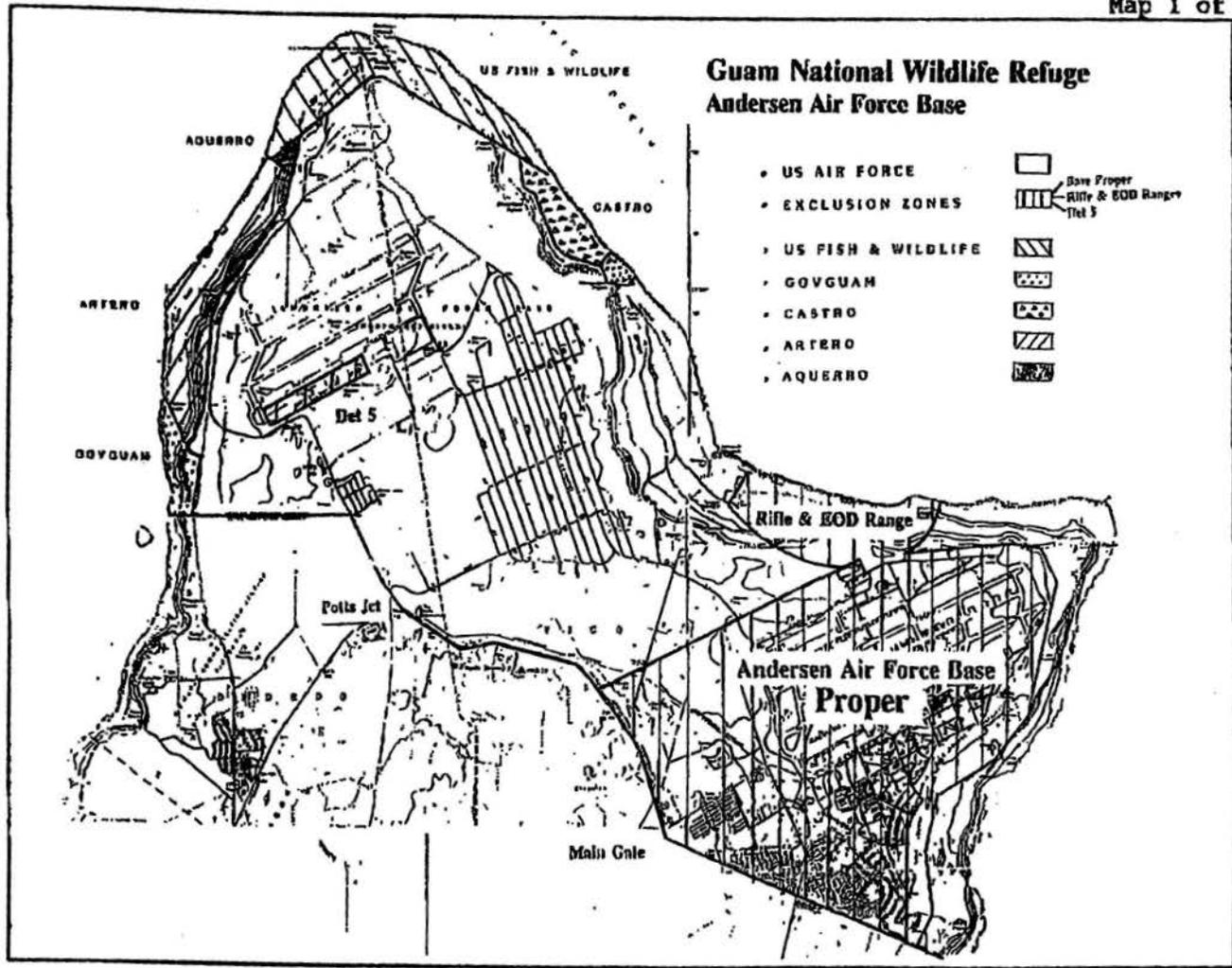
Guam Attorney General

Date

Government of Guam

Governor of Guam

Date



Map showing Air Force lands included in the Guam National Wildlife Refuge.

Aug-28-2002 01:38pm To-816713665088 From-US FWS PACIFIC ISLANDS T-210 P.027/027 F-225

Bird/Wildlife Aircraft Strike Hazard Management at Andersen Air Force Base

BASH PROGRAM PEST MANAGEMENT CONSIDERATIONS

Food Source Control—Invertebrates and rodents provide important food sources for many birds. The pest management section should periodically survey and reduce these pests when required. Control of insects, earthworms, rodents, etc., through use of insecticides and rodenticides will be accomplished under the supervision of the Base Pest Management Office approved by the U.S. Environmental Protection Agency (USEPA). Control should begin early in the spring. This must be coordinated with the fish and wildlife management section of the Integrated Natural Resources Management Plan (INRMP).

Eliminate Roosting Sites—Blackbirds and starling roosts will be controlled by vegetation management of roost sites where possible. Trees will be pruned to reduce the number of perches available, and entire trees or stands removed if necessary. When necessary, other methods should be considered.

Bird-Proofing Buildings and Hangars—Pigeons, sparrows, and starlings frequently occur in buildings and hangars, and must be excluded. Denying access by screening windows, closing doors, and blocking entry holes is most effective. When necessary, other methods should be considered.

Pellet Guns—Consider shooting birds as a short-term solution. Experience has shown that not all birds can be removed using this technique. Proper safety equipment is necessary. A depredation permit also might be required.

Netting—Consider installing under superstructure to exclude pest birds from roosting areas. Ensure no gaps or holes are present for birds to get through.

Avitrol—Pest management personnel can consider placing this in or near hangars to kill birds or create a distressed response that scares them away.

Trapping and Removal—Consider using large cages with food, water, and other birds to trap pest birds. Birds can either be released away from the hangar or killed. Permits from the U.S. Fish and Wildlife Service and the territorial wildlife agency are required to kill protected birds.

Design Features—Consider structures with the support features on the outside of the building to greatly reduce bird numbers. Consider this design when planning a new hangar.

Door Coverings—Consider using netting or plastic strips suspended over the doors to exclude birds. Ensure no tears or holes are present that allow birds access to the hangar.

Sharp Projections—Consider use in limited areas such as ledges, overhangs, or small places where birds cannot be allowed. Expense prohibits their use on the entire structure.

Night Harassment—Consider use of high-pressure air or water streams to make hangars an undesirable roosting site. Persistence is the key.

GUIDELINES TO DECREASE AIRFIELD ATTRACTIVENESS TO BIRDS

The most permanent methods of discouraging birds from using airfields involve removing attractive habitat features. The following information is provided to assist the staff organization(s) assigned the responsibilities for airfield grounds maintenance, solid waste management, and wildlife management. Implementation of any bird/wildlife aircraft strike hazard (BASH) reduction measure should be accomplished in coordination with considerations identified in the Base natural resources management plan (such as endangered species and wetland constraints) and pest management plan.

Grass Height Management—Tall grass discourages flocking species from entering the airfield because reduced visibility disrupts interflock communication and flock integrity and also prevents predator detection. However, grass normally should not exceed 14 inches, because high grass will attract some bird and rodent species that in turn attract predators such as raptors. In mowing operations in the clear zone maintain a uniform grass height of between 7 and 14 inches. Mowing frequency should be as needed to maintain these height requirements. Airfields with a variety of grass species can have a fast-growing strain that reaches 14 inches sooner than the rest of the airfield. Mowing should be conducted when the average grass height reaches 14 inches. Higher grass height can be appropriate for short periods of time if the airfield is outleased for hay production. Begin mowing adjacent to runways and finish in the infield or outermost grass area. This will tend to cause insects and other animals to move away from aircraft take-off and landing areas. Also, grass should not be mowed to a shorter length next to the runway than in other areas. Coordinate mowing with periods of low-flight activity. Grass should be cut before it goes to seed to discourage seed-eating birds from using the airfield.

Broad-Leafed Weed Control—Broad-leafed weeds attract a variety of birds, may produce seeds and berries, and may limit grass growth. Broad-leafed weeds should be kept to a minimum on the airfield. Apply herbicides, as necessary, to accomplish this.

Planting Bare Areas—Bare areas are frequently used by birds as resting sites and should be eliminated on the airfield. Grass should be planted as necessary, and appropriate irrigation maintained until complete ground cover is established.

Fertilizing—Selectively stimulate grasses to promote a uniform cover. Irrigation may be required for short periods of time to support turf growth. Watering should be controlled to enhance root production and decrease seed head production.

Landscaping—Shrubs, ornamental trees, shelterbelts, hedgerows, and noise-suppression barriers are important plantings on an air station. However, the airfield and clear zones are not proper places for landscape planting. These types of vegetation can influence bird populations and their movements around the airfield. Trees that are planted close together when they are young often intermingle as they mature, forming a continuous canopy. This close, dense foliage attracts birds and is ideal for providing shelter, food, and nesting. Proper planning can reduce these potential bird attractants. When planting shrubs, select those species that do not produce fruit, especially during the winter. Ripe berries attract birds for short periods each year. Blackbird and starling roosts are particularly hazardous because of the large number of birds (often numbering in the hundreds) that may be present in a single roost. Birds usually can be stimulated to move by pruning and thinning trees and shrubs to open the canopy. In some situations, it might be necessary to remove all the plants. Trees and shrubs should not be allowed to grow in the infield areas.

Reducing Edge Effect—Edge effect refers to the transition zone between two distinct habitat types (e.g., brush to grassland) that are highly attractive to wildlife. The airfield should be maintained as

uniformly as possible to reduce this effect (if a BASH problem is caused by animals attracted to the transition zone)

Leveling of Airfield—High and low spots on the field should be leveled or filled to reduce attractiveness to birds and prevent standing water.

Removal of Dead Vegetation—Dead vegetation such as brush piles, large amounts of grass clippings, hay bales, etc., and the cover it affords, should be removed as soon as possible.

Removal of Remains from Airfield—Dead birds or other animals should be removed from the field to avoid attracting vultures and other scavenging birds. Forward remains might have resulted from collisions with aircraft to the appropriate natural resources office if assistance in identification is needed.

Drainage Ditches—Inspect ditches regularly and keep them obstacle-free. Ditch sides should be maintained as steeply as possible—minimum slope ratio of 5:1—to discourage wading birds and emergent vegetation. Vegetation should be removed as often as necessary to maintain flow and discourage use by birds.

Eliminate Standing Water—Coordination with the U.S. Army Corps of Engineers is required before altering wetlands. Small ponds or puddles and some large bodies of standing water should be eliminated to reduce attractiveness to birds. Maintaining drainage in low spots and ditch maintenance are essential to avoid standing water.

Use Proper Erosion Control Vegetation—Vegetation should be used that is appropriate for the region and supports BASH reduction philosophy (i.e., do not control erosion using plants that produce seeds at heights below 14 to 18 inches)

What to collect:

- Any and all feather material that is found in engine or on aircraft
- Any feathers or parts of feathers found on airfield
- Any bird parts (i.e., feet, talons, bones)

How to send:

- Place unknown material in a zip-lock bag (do not put small samples in large bags because it is difficult to locate the feathers)
- Tiny bits and pieces of feathers can be placed in a clean white envelope and then put in a zip-lock bag.
- Include all information pertaining to the strike (e.g., date, locality, time of day, altitude, damage amount, number of birds seen)
- Send as much material as possible—even if it has a putrid odor.
- Send the material as soon as possible (before it decomposes) by Federal Express, AirBorne Express, or overnight mail.

What NOT to do:

- Never use cellophane tape on feathers (downy barbules get tangled and glued and are impossible to remove)
- Never cut feathers off of the bird or cut the tips away from whole feathers (sometimes it is necessary to examine the fine structures in the fluffy part of the feather; if that part has been cut away it is impossible to do the analysis)
- Never use Post-It® notes (feathers get stuck in the glued edge)

Where to send:

**Smithsonian
Attn: Carla Dove
Natural Resources Building
MRC-116
10th and Constitution Ave., NW
Washington, DC 20560**

Source: Laybourne, Roxy. The Smithsonian Institute. Museum of Natural History, Ornithology Department.

Table J-1. Species-Specific Information for the BASH Program

Species	Information for the BASH Program
Loons, Grebes, Pelicans, Cormorants, and Mergansers	These are fish-eating birds. Control is best accomplished by removing fish-producing ponds near the airfield. Removal of the food source is not always possible, though pyrotechnics can be used to effectively frighten the birds from the area. Avoid flying at sunrise and sunset when large flocks, often in formation, can be found flying to and from feeding areas.
Long-legged Waders (herons, egrets, ibises, storks)	Most of these species are attracted to water where they feed on fish, amphibians, reptiles, and anthropoids. Control is next accomplished by eliminating the food sources. Steepening the sides of ditches and ponds and removing emergent vegetation will drastically reduce accessibility to food sources. Pyrotechnics should be used to disperse any birds which do occur after habitat modification.
Cattle Egrets	These birds have different feeding habits than their relatives, preferring open fields where they primarily feed on insects. They frequently follow mowers for the insects which are stirred up. Mowing should be accomplished during non-flying hours when Cattle Egrets are present. Grass should be maintained between 7-14 inches. Periodic pesticide application may be necessary for insect control. Roost sites should be eliminated on or near Base by removing or thinning roost trees and brush, and dispersing the birds each evening with pyrotechnics.
Waterfowl (ducks, geese, swans)	A distinction must be made between resident and migrating populations.
Resident waterfowl	Resident waterfowl are attracted to an area to breed or feed. Ponds, lakes, ditches, etc., may attract these birds, particularly if these areas contain emergent or submerged vegetation for feeding, nesting, or shelter. Steepening ditch and pond banks and removing vegetation will reduce waterfowl numbers. When possible, drainage of water sources should be accomplished. Grainfields may also attract waterfowl in large numbers and should be eliminated. Pyrotechnics, gas cannons, and hawk kites/balloons are all excellent control techniques. Resident birds are most active at dawn and dusk, moving at low altitudes to and from feeding areas. Avoid flying near wildlife refuges, or any ponds, lakes or rivers with known waterfowl concentrations during these times.
Migrating waterfowl	Migrating waterfowl are particularly dangerous to flight safety due to the large number and generally higher altitude of the birds. Large flocks of waterfowl travel along traditional flyways to their breeding and wintering grounds during spring and fall. Huge flocks may stop along the route awaiting favorable weather conditions to continue. Migrating birds are most active from sunset through midnight, with numbers decreasing in the early morning hours. October and November are most hazardous. Avoidance of flying during the evening hours is generally safest. Obtain BAM data from the USAF BASH Team for information and planning purposes for comparing low-level routes. Wintering concentration areas should be avoided.

Species	Information for the BASH Program
Raptors (hawks, falcons, eagles, vultures)	These birds can be particularly hazardous to aircraft because of their size and widespread distribution over bases and low-level areas. Raptors (particularly vultures) use thermals to their advantage to search for prey. These birds become active during mid-morning and remain aloft until late afternoon. Avoid areas with thermal-generating terrain such as ridge lines, rolling hills, and near water. Landfills are particularly attractive to soaring vultures. In the fall, raptors migrate by day to areas of heavy winter concentrations in the southern states. These birds can be controlled by removal of dead animals on the airfield, proper management of landfills, rodent control on airfields, and removal of dead trees and other perching sites on the airfield. Pyrotechnics may be used to frighten raptors from the airfield.
Pheasants	These game birds are most effectively controlled through proper grass-height management. Do not allow grass to exceed 14 inches and eliminate all brush and weed patches on the field, particularly if the plants are seed-producing. Pyrotechnics, gas cannons, live ammunition or periodic hunts can effectively disperse these birds. The killing of these birds outside the normal hunting season requires special permits from the USFWS and the state or territorial wildlife agency.
Cranes	These large birds are most hazardous during migrating periods, particularly in the fall when many thousands of birds may be concentrated in a small area. Avoid flying at dawn and dusk in areas of known concentration. Pyrotechnics can be effectively used in the airfield to disperse these birds.
Sandpipers/Shorebirds	The most significant hazard from these birds occurs when large numbers flock in tight groups, particularly during migration and along coastlines. Many of the upland species such as Upland Sandpipers and Buff-breasted Sandpipers may nest on airfields in spring and early summer. Other species such as Killdeer are quite adept at avoiding aircraft and do not pose a significant hazard. Flocks in coastal areas can be hazardous and should be avoided. To control these birds, proper grass height management must be observed. Water in puddles should be eliminated and ditch banks steepened to limit access to these birds. Pyrotechnics can be used for all species and some respond well to bioacoustics.
Gulls	These birds represent the most significant hazard to aircraft worldwide. Due to their omnivorous feeding habits and preference for flat, open areas to rest they are commonly found on airfields. Gulls are most active just after sunrise and before sunset as they move to and from feeding areas. Improperly operated landfills are a significant source of attraction for gulls and should not be allowed in the airfield vicinity. Maintenance of grass height between 7 and 14 inches is critical in reduction of gull numbers. Even with this in effect, gulls may inhabit the airfield, particularly during inclement weather. Persistent harassment using pyrotechnics and bioacoustics is necessary to discourage these birds. Occasionally, live ammunition should be used to reinforce these techniques. Other techniques such as gas cannons, model gulls, radio-controlled model aircraft, and even falconry should be considered if available and cost-effective. Poisoning of earthworms and insects (especially grasshoppers) may be accomplished if these invertebrates are found to attract gulls. Do not allow these birds to establish a habit of using the airfield to feed, breed, or rest.

Species	Information for the BASH Program
Pigeons and Doves	These birds are seed-eaters and are attracted to seed-producing weeds, grasses, and shrubs. Open areas or bare spots are attractive as resting or feeding sites. Pyrotechnics can be effective in frightening these birds. Proper grass-height management, irrigation, and mowing before grass goes to seed will limit the number of pigeons and doves on the field. Pigeons frequently occur in structures such as hangars. Netting, shooting, trapping, poison baiting, and especially using toxic bird perches (such as Rid-A-Bird) can drastically reduce their numbers in these structures.
Owls	Most owls are nocturnal and attracted to rodents as a food source. Rodent control may be necessary on the airfield; proper management of airfield grass will limit their numbers. Remove perch sites such as unnecessary fence posts and dead trees to limit the number of owls. Avoid overflying landfills at night to reduce hazards from owls.
Woodpeckers	Woodpecker strikes should be extremely rare. These birds are common in forested areas, but generally remain below canopy level. On the airfield, elimination of trees should eliminate strikes with these birds. Migratory birds may be encountered, but are rarely struck.
Horned Larks	These birds are very difficult to control. They are attracted by bare spots such as areas along runway sides, where they eat weed seeds and insects. The best defense against these birds is a thick, uniform grass with no bare spots. Consider coating bare spots, particularly along runways, with oil-Base or asphalt cover. Pyrotechnics can be used, but these birds will tend to fly only short distances and settle down. Persistence is the key to success.
Swallows and Pratincoles	These birds eat insects in flight and are commonly found above airfields. Fortunately, swallows are adept at avoiding aircraft, but if they present a problem, measures can be taken for their dispersal. Insect control will reduce the swallow numbers, and discouragement of nesting will further decrease numbers. Wash mud nests from eaves, culverts, etc., with a hose as the birds begin nesting. If swallows are noted resting on runways or taxiways, use pyrotechnics to disperse them.
Crows and Ravens	These omnivorous birds are common in open areas and around landfills. These birds may occur in large flocks, particularly at sunset as they return to roost sites. Proper grass-height management will reduce population numbers. Remove any known roost sites or thin individual roost trees. Landfills must be operated in a manner to discourage these birds. Bioacoustics and pyrotechnics can be used to frighten these birds if they occur on the field.

Species	Information for the BASH Program
Blackbirds, Grackles, Cowbirds, and Starlings	<p>These birds can be particularly hazardous because they frequently occur in huge flocks, sometimes in the millions. Blackbirds and starlings are attracted to flat, open areas to feed, rest, or stage. Maintenance of grass height between 7 and 14 inches is the best means of reducing airfield blackbird and starling numbers. Do not allow seed-producing plants to grow on the airfield nor outlease grain crops in areas where these birds are known to occur. Roost sites must be eliminated near the flightline. Selective pruning or removal of roost trees, brush, or cattails must be accomplished if blackbirds and starlings are roosting on the Base. Blackbirds and starlings respond well to an intense frightening program using bioacoustics and pyrotechnics. Other methods should be used to supplement this program as necessary. Starlings are not Federally protected and may be killed without permits. Permits are required for other species. Occasional shooting of birds will reinforce other frightening techniques. Poisoning or trapping also may be considered, with USFWS assistance recommended. If these birds occur in hangars, toxic bird perches are recommended to eliminate the problem. Avoid flying near known blackbird and starling roosts, especially at sunrise and sunset and during spring and fall migration.</p>
Meadowlarks	<p>These birds occur on nearly every airfield and are attracted to grasslands and low weeds. Eliminate broad-leafed weeds and maintain grass height at 7 to 14 inches. Elimination of suitable perching sites, such as fence posts and brush, also will aid in reduction. Pyrotechnics can be used, but meadowlarks usually only fly a short distance before settling down again. Persistence is the key to success.</p>
House Sparrows	<p>These birds are not frequently struck by aircraft, but are common pests around structures. House sparrows often nest in hangars and dense shrubs and trees. These birds are not protected by law and may be killed without permit. Toxic bird perches may be used to remove house sparrows from hangars or other structures. Frightening techniques are usually ineffective against these birds.</p>
Warblers	<p>The wide range of species of warblers thrives in a variety of habitats. Most prefer shrubs, trees, or riparian habitats where they feed, breed, or rest. These habitat types should not be allowed on the airfield, and warbler strikes will be rare as a result. Migrating warblers may be struck at night, especially as they fly south in the fall. Fortunately, these birds are very small and rarely cause damage.</p>
Fringillids (sparrows, finches, grosbeaks, and buntings)	<p>Most fringillids are not hazardous to aircraft operations, but occasional large flocks can be encountered, particularly during migration. These birds are seed-eaters, as a rule, and most prefer weedy, brushy, or forested areas. Proper grass height management is the best means of control. Grass exceeding 14 inches will attract many of these birds and should not be allowed. Mowing should be accomplished before grass goes to seed. Pyrotechnics can be used to frighten many of these birds. Success may be limited with others.</p>
Mammals	<p>Although concern is mostly centered on birds, several mammalian species also pose threats to flight operations and must be considered.</p>

Species	Information for the BASH Program
Pronghorn Antelope and Mule Deer	Pronghorn antelope and mule deer occasionally occur on airfields. These species are generally browsers, preferring broad-leafed weeds, shrubs, and trees. Do not allow growth of these plants on the airfield. The presence of these plants in surrounding areas will serve to draw these animals to the airfield. Tall fences (at least 15 feet) can discourage these animals from entering airfields, but due to expense, they should only be used in urgent cases. Pyrotechnics should be used to frighten these animals when they do occur in the airfield.
Coyotes and Foxes	These animals are attracted to airfields by rodents, rabbits, and other food sources. Dens may be found in banks, culverts, or other suitable areas. Rodent control will reduce the numbers of these animals. Pyrotechnics can be used to frighten these species and occasional shooting of individual animals or recurrent pests also will reduce the hazard. Permits may be required.
Rabbits and Hares	In addition to direct hazards to aircraft, these animals often attract raptors. Proper grass management will reduce the number of these animals on airfields. Occasional extensive rabbit hunts on the field can reduce populations for several subsequent years. Poisoning also can be effective for reduction of populations. Permits may be required.
Rodents	These animals attract raptors. They can be controlled by maintaining a uniform turf at the proper heights. Rodenticides may be used in some cases. Specific information on the management of prairie dogs is presented in Section 6.6 of this INRMP.

THIS PAGE INTENTIONALLY LEFT BLANK

Management Plans Provided via CD

1. The Recovery Subpermit to Remove and Reduce to Possession *Serianthes nelsonii*
2. *Serianthes nelsonii* Recovery Plan
3. Final Report for Survey of *Tabernaemontana rotensis*
4. Fruit Bat Management Plan for Andersen Air Force Base
5. Draft Revised Recovery Plan for the Mariana Fruit Bat or Fanihi (*Pteropus mariannus mariannus*)
6. Final Green Sea Turtle Management Plan
7. Mariana Islands Population of the Vanikoro Swiftlet Recovery Plan
8. Mariana Crow Recovery Plan
9. Native Forest Birds of Guam and Rota of the Commonwealth of the Northern Marianas
10. Micronesian Megapode Recovery Plan
11. Mariana Common Moorhen Recovery Plan
12. U.S. Fish and Wildlife Service Revised Recovery Plan for the Sihek or Guam Micronesian Kingfisher
13. Orote Peninsula Ecological Reserve Area General Management Plan
14. Haputo Ecological Reserve Area General Management Plan
15. Guam Submerged Lands Management Plan

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX K

INFORMATION SUPPORTING WETLANDS AND FLOODPLAINS MANAGEMENT

APPENDIX L

INFORMATION SUPPORTING WATERSHED MANAGEMENT AND PROTECTION

APPENDIX M

INFORMATION SUPPORTING COASTAL ZONE MANAGEMENT

APPENDIX N

INFORMATION SUPPORTING SUBMERGED LANDS MANAGEMENT

INRMP Based Response to Proposed Listing of 82 Species of Coral

The following universal text is required for inclusion in DoN INRMPs for each installation that may potentially be impacted by the NMFS critical habitat designation for species of corals proposed for listing. The following text is an excerpt from: *Final Deliverable for CNIC's INRMP Based Response to the Proposed Listing of 82 Species of Coral: Prepared by NAVFAC ESC SDS 17 September 2010.*

INTRODUCTION

The U.S. Department of Defense (DOD), with the assistance of the U.S. Fish and Wildlife Service (FWS), the National Oceanic and Atmospheric Administration (NOAA) and the states, is responsible under the Sikes Act (16 U.S.C. 670a-670f, as amended) for carrying out programs and implementing management strategies to conserve and protect biological resources on its lands. Because military lands and waters often are protected from human access and impact, they contain some of our nation's most significant remaining large tracts of land with valuable natural resources. Congress established the Sikes Act in 1960 to manage these lands for wildlife conservation and human access. The Sikes Act was amended in 1997 to develop and implement mutually agreed upon Integrated Natural Resource Management Plans (INRMPs) through voluntary cooperative agreements between the DOD installation, FWS, NOAA and the respective state fish and wildlife agencies. INRMPs are planning documents that allow DOD installations to implement landscape-level management of their natural resources while coordinating with various stakeholders. They are extremely important management tools that ensure military operations and natural resources conservation are integrated and consistent with stewardship and legal requirements.

INRMPs are based on the principles of ecosystem management. INRMPs provide for the management of natural resources, including fish, wildlife, and plants; allow multipurpose uses of resources, and provide public access, where appropriate for those uses, without any net loss in the capability of an installation to support its military mission.

Related documents relevant to the Navy and Marines are: OPNAVINST 50901.C, NAVFAC P-73, and MCO P5090.2.

The Center for Biological Diversity (CBD) submitted a petition to add 83 species of coral to the Federal list of Threatened and Endangered Species and to designate Critical Habitat for those species. The National Oceanic and Atmospheric Administration (NOAA) conducted an initial review of the CBD petition. This project is being performed in response to NOAA's 10 February 2010 Federal Register Status Review notice to further evaluate 82 of the 83 species of coral and associated critical habitat. NOAA's review is still being conducted, as of this date (9 September 2010)

U.S. Navy (Navy) Integrated Natural Resource Management Plans (INRMPs) and relevant literature were reviewed to identify which Navy installations and lease areas in the near-shore zone and within U.S. Territory have, or may have, one or more of the 82 coral species proposed for listing. Near-shore is defined as all submerged marine lands titled to the military and all other submerged lands that are adjacent to installations that extend from the mean high water level, offshore to the boundary of any security areas controlled by the Navy. Non-Navy DOD facilities, such as Marine Corps Base Hawaii, and Anderson Air Force Base Guam have not been addressed.

Forty-four of the 82 species being evaluated by NOAA occur or potentially occur within Navy installations, training ranges, and Operating Areas (OPAREAs) in the US or US territories. Most of the stony coral species (84%) that are being petitioned are found within the Pacific Ocean region; seven of the petitioned species occur within the western Atlantic and Caribbean.

It is Navy policy to preclude designation of critical habitat, when appropriate, by demonstrating special management of a listed species. Special management or protection is a term that originates in the definition of occupied critical habitat in Section 3 of the Endangered Species Act (ESA). ESA does not require additional special management/critical habitat designation if adequate management and protection is already in place. Adequate special management or protection is provided by a legally operative INRMP and addresses the maintenance and improvement of the primary constituent elements important to the species and manages the long-term conservation of the species. Three criteria are used to determine if such special management and protection are provided: (1) there is a conservation benefit; (2) there are assurances that the management plans will be implemented; and (3) there are assurances that the conservation efforts will be effective. This Deliverable documents that at the installations addressed, these three criteria have been met and therefore, designation of critical habitat is neither necessary nor legally required.

Table N-1 lists all proposed species that may be present at Naval Base Guam. Commonwealth of the Northern Mariana Islands is represented in **Table N-1** as CNMI.

DEFINITION OF CORAL AND CORAL REEF

Corals from one or more taxa are present from the North Pole to the South Pole and from the intertidal zone to the abyss. Corals addressed in this document are exclusively tropical species occurring (primarily) at depths of less than 325 feet (100 m)

The Coral Reef Conservation Act of 2000 defines several related terms: coral, coral reef, and coral reef ecosystem as follows.

“CORAL- The term “coral” means species of the phylum Cnidaria, including -- all species of the orders Antipatharia (black corals), Scleractinia (stony corals), Gorgonacea (horny corals), Stolonifera (organpipe corals and others), Alcyonacea [misspelled] (soft corals), and Coenothecalia (blue coral), of the class Anthozoa; and all species of the order Hydrocorallina (fire corals and hydrocorals) of the class Hydrozoa.

CORAL REEF- The term “coral reef” means any reefs or shoals composed primarily of corals.

CORAL REEF ECOSYSTEM- The term “coral reef ecosystem” means coral and other species of reef organisms (including reef plants) associated with coral reefs, and the nonliving environmental factors that directly affect coral reefs, that together function as an ecological unit in nature.”

Section III C. of this Deliverable discusses coral taxonomy and points out that there are significant differences of opinion, even among experts. To further clarify the definition of coral and coral reef the following definition is provided. It is not intended to alter the legal definition provided in the Act, but facilitate taxonomic comparisons.

CORAL- The term “coral” means species of the phylum Cnidaria, including --

- Class Hydrozoa Order Milleporina (fire corals also known as Hydrocorallina)
- Class Hydrozoa Order Stylasterina (lace corals also known as Hydrocorallina)
- Class Anthozoa, Subclass Hexacorallia, Order Scleractinia (stony corals)
- Class Anthozoa, Subclass Ceriantipatharia, Order Antipatharia (black corals and wire corals)
- Class Anthozoa, Subclass Octocorallia, Order Alcyonacea (soft corals and Tubipora corals)
- Class Anthozoa, Subclass Octocorallia, Order Gorgonacea (horny corals/sea fans)
- Class Anthozoa, Subclass Octocorallia, Order Helioporacea (blue corals)

**Table N-1. Occurrence of Proposed Coral Species at Naval Base Guam,
Farallon De Medinilla and Tinian Military Lease Areas**

Coral Species	Pacific
<i>Acanthastrea brevis</i>	NBG Main Base and CNMI
<i>Acanthastrea ishigakiensis</i>	NBG Main Base and CNMI
<i>Acropora aculeus</i>	NBG Main Base and CNMI
<i>Acropora acuminata</i>	NBG Main Base and CNMI
<i>Acropora aspera</i>	NBG Main Base and CNMI
<i>Acropora palmerae</i>	NBG Main Base and CNMI
<i>Acropora striata</i>	NBG Main Base and CNMI
<i>Acropora vaughani</i>	NBG Main Base and CNMI
<i>Acropora verweyi</i>	NBG Main Base and CNMI
<i>Alveopora fenestrata</i>	NBG Main Base and CNMI
<i>Anacropora puertogalerae</i>	NBG Main Base and CNMI
<i>Anacropora spinosa</i>	NBG Main Base and CNMI
<i>Barabattoia laddi</i>	NBG Main Base and CNMI
<i>Euphyllia cristata</i>	NBG Main Base and CNMI
<i>Heliopora coerulea</i>	NBG Main Base and CNMI
<i>Leptoseris incrustans</i>	Pearl Harbor, PMRF, NBG Main Base and CNMI
<i>Millepora foveolata</i>	NBG Main Base and CNMI
<i>Millepora tuberosa</i>	NBG Main Base and CNMI
<i>Montipora caliculata</i>	NBG Main Base and CNMI
<i>Montipora lobulata</i>	NBG Main Base and CNMI
<i>Pavona cactus</i>	NBG Main Base and CNMI
<i>Pavona decussata</i>	NBG Main Base and CNMI
<i>Pavona diffluens</i>	NBG Main Base and CNMI
<i>Pavona venosa</i>	NBG Main Base and CNMI
<i>Pectinia alccicornis</i>	NBG Main Base and CNMI
<i>Pocillopora danae</i>	NBG Main Base and CNMI
<i>Pocillopora elegans</i>	NBG Main Base and CNMI
<i>Porites horizontalata</i>	NBG Main Base and CNMI
<i>Psammocora stellata</i>	Pearl Harbor, PMRF, NBG Main Base and, CNMI
<i>Seriatopora aculeata</i>	NBG Main Base and CNMI
<i>Turbinaria reniformis</i>	NBG Main Base and CNMI
<i>Turbinaria stellula</i>	NBG Main Base and CNMI

CORAL TAXONOMY AND BIOGEOGRAPHIC REGIONS

Taxonomic overview: Taxonomy is the branch of biology which includes the theory, principals, and process of classifying organisms into established categories. Coral taxonomy is more controversial than taxonomy relating to many other groups of organisms due to the plastic nature of coral skeletons in response to environmental factors. Taxonomic differences of opinion have significant relevance to this project. The taxonomy of many coral species, including members of the following genera (*Acropora*, *Agaricia*, *Montastraea*, *Montipora*, and *Porites*) is contested (Wallace and Willis 1994, Pennisi 2002, Shearer and Coffroth 2006, Willis et al. 2006). This can potentially alter the true number of species in the proposed listing depending on whether the questionable species are lumped or split by taxonomists.

In addition, many of the proposed species (e.g. *Acanthastrea brevis*, *Acropora acuminata*, and *Acropora striata*) are listed as rare or uncommon throughout their entire range (Veron 2000). As with terrestrial habitats, most species of trees and shrubs never reach abundance levels where they are considered common. In addition, many other species on the proposed list (e.g. *Montipora patula*) are listed as among the five “most common corals” (in Hawaii) by Fenner (2005). The fact that some of the world’s leading taxonomists, like Veron and Fenner, describe many of the proposed species as naturally uncommon or very common/dominant complicates the potential management of many coral species.

Forty-four of the species the CBD petitioned occur or potentially occur within Navy installations, training ranges, and OPAREAs in the US or US territories (see Table 1). Seventy-five of the eight-two stony coral species (91%) that are being petitioned are found within the Pacific Ocean region (Hawaii, Guam, and Commonwealth of the Northern Marianas). In the western Atlantic region, seven of the petitioned species occur or may occur within NAS Key West and SFOMF Dania, Florida.

Atlantic Biogeographic Overview: In Florida, NAS Key West and SFOMF are located in the Floridian marine ecoregion (Spalding et al. 2007). Historically, this ecoregion has supported a diverse assemblage of corals and coral reefs. In the Western Atlantic and Caribbean, Spalding et al. (2001) lists 62 scleractinian corals, 6 alcyonarian corals, and 650 fish species. Over the last 40 years the Floridian ecoregion has suffered a significant decline in the distribution, diversity and abundance of coral reef organisms (Waddell and Clarke 2008).

Pacific Biogeographic Overview: The Mariana Archipelago (which includes Guam and FDM and Tinian) falls within the Mariana Islands ecoregion, Tropical Northwest Pacific province and the Central Indo-Pacific biogeographic realm (Spalding et al 2007). This region is widely recognized as supporting the world’s most diverse assemblage of corals, fishes, and other associated coral reef organisms. For example, Richmond et al. (2008) list over 375 scleractinian corals and 1,000 fish species within the Mariana Archipelago. Spalding et al. (2001) lists 719 scleractinian corals, 690 alcyonarian corals, and 4,000 fish species within the Indo-West Pacific realm. Over the last 40 years the Indo-Pacific ecoregion has suffered a significant decline in the distribution, diversity and abundance of coral reef organisms (Waddell and Clarke 2008).

The Hawaiian Archipelago falls within the Hawaii ecoregion, Hawaiian province and the Eastern Indo-Pacific biogeographic realm (Spalding et al 2007). Jokily (2008) lists about 40 scleractinian species and Randall (2007) lists 612 fish species. As in the other regions discussed, the Hawaiian ecoregion has suffered a significant decline in the distribution, diversity and abundance of coral reef organisms during the last 40 years (NOAA and HI Coral Reef State of the Reefs).

DE-FACTO MARINE PROTECTED AREA (MPA) EFFECT OF DOD INSTALLATIONS

Daszak et al. (2000), Worm et al. (2006) and many other investigators have noted that coastal development and associated activities are having increasingly adverse impacts upon coastal ecosystems around the world. These impacts have resulted in the severe degradation of many coral reefs and their associated flora and fauna. During the last decade, ecologists have discovered that while many publicly accessible coastal areas are declining, marine natural resources in areas under DOD control, with little or no public access, are thriving and/or in significantly better condition than adjacent areas. Stein et al. (2008) demonstrated that DOD properties support three times the densities of ESA status species and imperiled species as are found on public lands. Marine resources within these DOD controlled areas are generally healthier, more abundant, and larger than those outside. These areas not only act as de-facto Marine Protected Areas (MPAs) that conserve the structure and function of the local ecosystem (Halpern 2003, Selig and Bruno 2010), but also provide beneficial “spill over” effects into adjacent marine areas related to increased fish populations (Roberts et al. 2001) and enhanced ecosystem services to the local human community, such as services related to: provisioning (food and water); supporting (nutrient cycling); cultural (recreational and aesthetic benefits); and preserving (buffering against storms and environmental uncertainties).

Many anthropogenic stressors that have highly deleterious impacts upon coral reefs and the associated flora and fauna are either completely absent in DOD controlled areas or experienced at much lower levels of intensity than in public coastal zones. Anthropogenic stressors include, but are not limited to those presented in **Table N-2**.

Table N-2. Common Coral Reef Stressors Which Are Absent or Reduced at DOD Sites

Stressors	Stressors
Reef walking	Grounding of personal watercraft
Skin /Scuba Diving	Untreated sewage discharge personal watercraft
Spear fishing	Improper/inadequate waste water disposal
Trap and net fishing	Improper/inadequate storm water runoff disposal
Hook and line fishing	Illegal dumping of hazardous materials/waste
Jet skiing	Improper/inadequate erosion control
Motorized personal watercraft	Harassment of marine life by beachgoers
Collection of corals and invertebrates for the aquarium trade	Reduced H2O quality from large volumes of Sun block
Anchor damage from commercial recreational and private boaters	Improper disposal of refuse, particularly plastics, diapers, pull tabs, bottle caps and cans

Non-consumptive recreational activities, like reef walking and skin/scuba diving can have a profound negative long-term adverse impacts to corals, coral reefs and associated marine resources; this fact has been well established by numerous investigators worldwide (e.g., Sudara and Nateekarnchanalap, 1988; Harriott, Davies and Banks, 1997; and Van Treech and Schumacher, 1998) These types of activities are banned or greatly restricted at DOD properties, thus reducing or eliminating the associated adverse impacts.

Consumptive recreational and commercial activities, primarily fishing and the collection of aquarium specimens adversely impact corals/coral reefs as well as the species actually captured. Raymundo et al. (2009) clearly demonstrated that functionally diverse and healthy reef-fish communities reduce the incidence of coral disease. Raymundo et al. (2009), Smith et al. (2006) and other investigators have shown that Marine Protected Areas (MPAs) and DOD de-facto MPAs support significantly higher fish diversity and biomass than adjacent public areas. These healthier, more natural fish populations play a key role in maintaining healthier corals and coral reefs on DOD properties.

The elimination and/or reduction many of the other stressors listed in **Table M-2** are discussed in Section V of this document. A review of the management and enforcement activities of MPAs worldwide will show that few, if any, actually have the level of protection, management and enforcement that is present at DOD facilities. Cook et al. (2010) stated “Comprehensive review of available evidence shows major, rapid benefits of no-take areas for targeted fish and sharks, in both reef and non-reef habitats, with potential benefits for fisheries as well as biodiversity conservation...reserves also appear to benefit overall ecosystem health and resilience...”. Many DOD properties are serving as effective de-facto MPAs. Designation of critical habitat is unnecessary and unwarranted because DOD sites are already more effective in conserving and protecting corals than many official MPAs.

Limited remarks on specific facilities follow to demonstrate the de-facto MPA effect of DOD facilities.

DOD DE-FACTO MPAS SHOWCASE DOD ECOSYSTEM-BASED MANAGEMENT

While it is clear that DOD *de facto* MPAs show the positive effects of restricted commercial and recreational activities on nearshore tropical resources, including no commercial fishing, limited recreational marine resource extraction, no commercial water-based recreational activity, and no industrial/wastewater discharges on ranges, DOD base commanders and resource managers also actively implement ecosystem-based management to magnify DOD *de facto* MPA effects on coral reef systems. This ecosystem-based management includes the following actions:

- Sustainably managing the degree of access, use and exploitation of marine natural resources;
- Effectively managing the terrestrial portion (watershed) of the military installation bordering the maritime area; and
- Influencing the management of coastal land-based ecosystems, terrestrial runoff, and coastal and upland human development outside of the DOD facility.

The minimally-impaired condition of coastal marine ecosystems within DOD facilities reflects the sum of DOD ecosystem-based environmental stewardship, compliance with applicable regulations, and the fruit of integrated natural resources management plans.

This ecosystem-based management also generates a spillover effect into non-DOD surrounding areas.

DOD DE-FACTO MPAS ENHANCE NATIONAL AND INTERNATIONAL REGULATORY AND MANAGEMENT EFFORTS

DOD *de facto* MPAs also show positive effects related to at-risk species and species of concern and national and international initiatives. DOD ecosystem-based management of coral reef systems and adjacent watersheds not only yields important science-based natural resources information important for the effective regulation and management of endangered and threatened species, but it also fosters compliance with international treaties (e.g. Convention on International Trade in Endangered Species [CITES]) and national and international initiatives (e.g. the US Coral Reef Initiative and the International

Coral Reef Initiative) These efforts also help conserve and restore critical habitat for these species and minimize the listing of additional species.

SPECIFIC EXISTING NAVY PRACTICES WHICH BENEFIT CORALS AND NEAR SHORE MARINE NATURAL RESOURCES

There are scores of environmental protection and natural resource standard practices, guidance documents and policies (hereafter referred to as practices) which the Navy routinely implements. While some of these practices were not originally designed specifically to benefit corals and coral reefs the net result has been extremely beneficial to corals, coral reefs and a myriad of associated organisms including shell fish, fin fish and sea turtles. These practices can be broadly divided into six major categories: (1) Integrated Natural Resource Management Plans (INRMPs), (2) terrestrial pollution control and land management practices, (3) vessel pollution control practices, (4) construction management practices, (5) bio-security practices and (6) installation- specific practices. It should be noted that many installation specific practices have been adopted and are funded based upon a legally operative and approved INRMP. Below is a brief example of how these practices have benefitted corals; the example is followed by abbreviated summaries of standard practices which benefit corals, coral reefs and associated marine natural resources.

Pearl Harbor provides an example of ‘indirect’ benefits these practices provide. Until the 1960s Navy vessels discharged waste water into Pearl Harbor and shore waste water received little or no treatment. No corals were present or recorded from Pearl Harbor at that time (Evans et al. 1974). With the adoption of stringent practices to control terrestrial and vessel pollution as well as the implementation of strict land management and construction management techniques water quality improved and marine resources thrived. Today there are 13 different species of coral found in Pearl Harbor, fishery target species are abundant and numerous invertebrates like the pearl oyster are returning (Smith et al. 2006 and Smith personal communication 2010)

INTEGRATED NATURAL RESOURCE MANAGEMENT PLANS PROVIDE CONSERVATION BENEFITS TO CORALS, ENSURE IMPLEMENTATION OF CONSERVATION MEASURES AND ARE EFFECTIVE MANAGEMENT MECHANISMS

All Navy installations with significant natural resources are required to prepare INRMPs, in compliance with the Sikes Act Improvement Act (SAIA) of 1997 (P.L. 105-85) INRMPs must provide for:

- Conservation and rehabilitation of natural resources
- Sustainable multi-purpose uses of resources
- Public access for use of natural resources, subject to the Navy’s mission, operational and security requirements.

Federal agencies are required by the Endangered Species Act (ESA) to manage federally listed threatened and endangered (T&E) species and their habitats in a manner that promotes their conservation and is consistent with recovery plans for such species. INRMPs serve as the key vehicle through which Navy installations meet this requirement for T&E species located on Navy facilities. Section 7 of the ESA and the SAIA require that the Navy enter into consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries whenever actions are proposed that may affect listed and proposed T&E species.

Rigorous surveys and/or investigations of corals and/or the two T&E listed coral species have been conducted at NAS Key West, SFOMF, Naval Station Pearl Harbor, PMRF, Naval Base Guam and the Farallon De Medinilla and Tinian Military Lease Areas. At many of these sites, long-term coral

assessment and monitoring coral programs have been in effect for more than five years. For those sites at which long term studies are underway, it has been shown that corals, coral reefs and associated organisms are, in fact more robust and healthy than in adjacent areas which are not under Navy control. This is due to the de-facto MPA effects discussed above.

The Navy's legal and actual ability to control navigation, anchoring, mooring, construction, diving, fishing and other activities, combined with Navy INRMPs and the myriad of additional standard environmental and natural resource practices ensure that corals, coral reefs and associated organisms at Navy facilities will benefit in many ways, including, but not limited to the following:

- The cumulative benefits of the management activities will ensure the maintenance or increase of the species population and enhance and/or restore habitat, barring uncontrollable natural disasters or events such as global sea surface temperature increases. Through implementation of the INRMPs and adherence to requirements of other practices (e.g. Clean Water Act) the Navy can ensure that all proposed actions that could potentially affect corals and coral reefs are in compliance with Section 7 of the ESA and other relevant guidance documents.
- The Navy's INRMP plans and other practices will be implemented. Personnel charged with implementing plans and practices are capable of accomplishing the objectives and have the funding and authority to do so.
- The management effectiveness of these plans and practices has been demonstrated and documented in previous sections of this document and will be further documented in following sections.

If a decision is made to include any of the coral species being proposed for T&E listing, it is clear that no Critical Habitat designation is biologically necessary or legally required at Naval Air Station Key West, South Florida Ocean Measurement Facility, Dania, FL, Naval Station Pearl Harbor, HI, Pacific Missile Range Facility Barking Sands, HI, Naval Base Guam or Farallon De Medinilla and Tinian Military Lease Areas, Commonwealth of the Northern Mariana Islands. Protection and management of corals at these locations is already being effectively performed.

TERRESTRIAL POLLUTION CONTROL AND LAND MANAGEMENT PRACTICES THAT DIRECTLY AND/OR INDIRECTLY PRESERVE MARINE WATER QUALITY AND PROTECT AND ENHANCE CORALS, CORAL REEFS AND ASSOCIATED ORGANISMS

OPNAV Instruction 5090.1D is the Environmental Readiness Program Manual from the Chief of Naval Operations dated 30 October 2007. This document discusses requirements, delineates responsibilities, and issues policy for the management of the environmental, natural and cultural resources for all Navy ships and shore activities. The Navy is committed to operating successfully in a manner compatible with the environment. The mission of the Navy's Environmental Readiness Program is to ensure the ability of the United States Navy forces to effectively operate worldwide in an environmentally responsible manner, both ashore and afloat. Navy, joint and combined operations and training must be planned and executed to fully meet operational readiness requirements and Navy environmental objectives. In order to ensure that the Navy can prepare, train and operate as required personnel must be aware of the environmental requirements established by Federal, state and local laws and regulations; Executive Orders (EO); and Department of Defense (DOD) and Navy policy. National defense and environmental protection are, and must continue to be, compatible goals. Achievement of these goals requires the leadership and personal commitment of military and civilian personnel throughout the Navy chain of command.

Sections within multiple chapters of OPNAVINST 5090.1D have direct and indirect relevance to preserving water quality in the marine environment. Maintaining and improving water quality is essential

to protecting and enhancing corals and coral reefs as well as the associated invertebrates, fishes and sea turtles.

An essential and critical difference between the Navy de-facto MPAs and non-Navy MPAs is that non-Navy MPAs have more limited (or no) legal authority to control and manage potential pollutants and other deleterious activities. This fact has made many Navy sites more effective in conserving marine resources than the officially designated non-Navy MPAs.

Portions of the OPNAVINST 5090.1D sections are reviewed below, by chapter. References made to chapters and sections refer to OPNAVINST 5090.1D.

Chapter 7: Clean Air Ashore

This chapter applies to air emissions from stationary and mobile sources at all shore facilities within the United States, Commonwealth of Puerto Rico, U.S. Virgin Islands, Guam, American Samoa, and Commonwealth of the Northern Marianas Islands.

Air quality, especially particulate matter, has direct relevance to water quality because chemicals and matter in the air easily passes to water through precipitation and runoff.

7-4 Requirements

7-4.6 Provisions for Mobile Sources, e. Fuels

Leaded Gasoline. The Clean Air Act (CAA) prohibits the use of gasoline containing lead or lead additives in motor vehicles.

Oxygenated Gasoline. States that include all or part of an area designated nonattainment for CO and having a design value of 9.5 ppm or higher must include a provision for the sale and dispensing of oxygenated gasoline in metropolitan areas within the nonattainment area. This provision is in effect during high CO portions of the year as determined by EPA. EPA may waive the requirement for oxygenated fuel if a State can satisfactorily demonstrate that imposition of such a provision interferes with the attainment of any other NAAQS.

Reformulated Gasoline. Areas classified as severe and extreme ozone nonattainment areas with a 1980 population in excess of 250,000 are required to implement the use of reformulated gasoline. Any other area (regardless of its population) that is classified under 40 CFR part 81, subpart C as a marginal, moderate, serious, or severe ozone nonattainment area may be included as a reformulated gasoline covered area on petition of the Governor of the State in which the area is located.

Gasoline. Depending on local conditions, a number of oxygen content, formulation, and sulfur content regulatory requirements exist for gasoline, as well as gasoline vapor recovery requirements (Stage I and Stage II) to prevent venting of gasoline vapors during transportation, storage, transfer, and dispensing. Installations shall not sell, offer for sale, supply, offer for supply, dispense, transport, or introduce into commerce gasoline represented to be unleaded gasoline unless such gasoline meets the local requirements for unleaded gasoline. Each gasoline pump from which unleaded gasoline is dispensed into motor vehicles shall be equipped with a nozzle required under 40 CFR 80.22. Each gasoline pump stand from which oxygenated gasoline is dispensed at a retail outlet shall be affixed with a label in accordance with 40 CFR 80.35.

Diesel Fuel Sulfur Content. EPA has established a minimum cetane index of 40 and is phasing in regulations that will reduce diesel fuel sulfur content. As of June 2006, the allowable diesel fuel sulfur

content for highway vehicles has been reduced from 0.05 percent (500 ppm) by weight to 15 ppm. The diesel fuel sulfur content for non-road equipment, marine vessels, and locomotives will be reduced from 0.5 percent (5000 ppm) by weight to 500 ppm starting in June 2007 and to 15 ppm starting in June 2010. Activities which dispense diesel fuel to non-tactical vehicle and equipment fleets are required to comply with diesel fuel standards. As low sulfur and ultra-low sulfur regulations become effective, use of military specific fuels, such as JP-5, JP-8, and F-76, in non-tactical and non-deployable equipment could be a violation of Federal law depending on the sulfur content and cetane index of the specific batch of fuel being used.

Clean Fuel Fleet/Vehicles. The CAA's clean-fuel vehicle requirements, apply to owners/operators of a "covered fleet" (a Navy owned or operated centrally fueled fleet of 10 or more vehicles) located in a "covered area." A covered area is one designated as serious, severe or extreme for O₃ or serious for CO, with a 1980 Census population of 250,000 or more. The CAA requires that at least 70 percent of new light-duty fleet vehicles acquired by a covered fleet operator when operating in a covered area be clean-fuel vehicles. For heavy-duty trucks above 8,500 lbs. and up to 26,000 lbs. gross vehicle weight rating, that percentage shall be at least 50 percent. The CAA mandates that any Federal facility that dispenses clean alternative fuels to Federal fleet vehicles must offer the fuel for sale to the public during reasonable business hours, subject to national security concerns and the commercial availability of such fuels in the vicinity of the facility.

7-4.7 Miscellaneous Provisions

Acid rain. In order to reduce the detrimental environmental effects of acid rain, the CAA mandates large-scale reductions in the emissions of SO₂ and NO_x through an innovative market-based approach aimed at electric utility plants. The goal of Title IV is to dramatically reduce SO₂ emissions and NO_x emissions.

7-5 Navy Policy

7-5.1 Stationary Sources

Shipbuilding NESHAP (National Emissions Standards for Hazardous Air Pollutants (HAPS)) Navy facilities that are major sources of HAPS and use marine coatings in excess of 264 gallons per year shall comply with 40 CFR 63 Subpart II. Navy vessels that dock at these facilities or at commercial facilities shall comply with the Navy policy in section 22-4.3.2 of Chapter 22. Navy activities required to comply with 40 CFR 63 Subpart II shall compile records of certification of the as-supplied volatile organic content (VOC) content of each batch of coating on a monthly basis and maintain those records for a minimum of 5 years. These facilities shall obtain from homeport and visiting ships information on marine coating usage while in port required for recordkeeping and reporting under 40 CFR 63 Subpart II.

7-5.2 Mobile Sources

Vehicle Inspection and Maintenance (I/M) Navy commands shall comply with State and local area vehicle emission I/M program requirements for fleet vehicles and all other vehicles operated on an installation, so long as the State's program is not discriminatory toward Federal agencies or Federally owned or Federal employee-owned vehicles. Commands shall furnish proof of compliance to the appropriate regulatory authority when required. Commands are authorized to develop I/M procedures for their fleet vehicles as a part of normal preventive maintenance programs.

Introduction of Alternative Fuel Vehicles (AFV). Per the requirements of EPACT, the Navy shall introduce light-duty AFVs into administrative vehicle fleets. Department of Navy Environmental Policy Memorandum 98-05 and Chief of Naval Operations (CNO) memo N462C2/317-99 require all new non-tactical light-duty vehicle acquisitions to be capable of operating on alternative fuel unless they

receive a waiver from CNO. The 2002 National Defense Authorization Act specifies that for installations not subject to EPACT (i.e., outside the metropolitan statistical areas), acquisitions of light duty trucks shall be hybrids. In addition, Title VII, Subtitle F, Sec 782 of EPACT requires Federal agencies operating vehicle fleets to acquire fuel cell vehicles and hydrogen energy systems to meet applicable energy savings goals. Department of Energy (DOE) will pay incremental costs, and will exempt an agency if an efficient and reliable vehicle cannot be found.

Executive Order 13423 requires that relative to the baselines for fiscal year 2005, the Navy must: (i) reduce their vehicle fleet's total consumption of petroleum products by 2 percent annually through the end of fiscal year 2015, (ii) increase the total fuel consumption that is non-petroleum-based by 10 percent annually, and (iii) use plug-in hybrid (PIH) vehicles when PIH vehicles are commercially available at a cost reasonably comparable, on the basis of life-cycle cost, to non-PIH vehicles. In addition to acquisition of AFVs, the Navy and other Federal fleets must work toward installation of the appropriate alternative fuel infrastructure. To support the use of alternative fuel in AFVs, the Navy shall, to the maximum extent practicable, arrange for fueling at commercial facilities that offer alternative fuels for sale to the public. When placing AFVs at their facilities, preference shall be given to locations that have, or will soon have, access to alternative fueling stations.

The Navy shall work with other Federal agencies to maintain compatibility and inter-operability of AFVs and refueling sites. The Navy will select implementation sites to minimize cost, maximize inter-Federal cooperative efforts and develop infrastructure. The Navy should team with State, local, and private entities to support the expansion and use of public access alternative fuel refueling stations. This effort shall include evaluating streamlining regulatory and permitting requirements associated with locating, constructing, and operating such refueling stations.

The Navy prefers original equipment manufacturer AFVs to AFV conversions. Vehicles converted shall meet, as a minimum, California Air Resources Board (or equivalent) certification requirements. AFVs must also meet the definition of a clean fuel vehicle to comply with the CAA requirements applicable to a covered fleet.

The Navy is required to provide data to both the Office of Management and Budget (OMB) and DOE to demonstrate compliance with EPACT and Executive Order 13423. An annual report is due to DOE no later than December 31 of each year, starting with the FY 2007 data and each year thereafter. This includes data to demonstrate compliance with the requirement to reduce petroleum use by 2 percent annually, through 2015, and the requirement to annually increase the use of alternative fuels by 10 percent, both relative to the 2005 baseline year. Semi-annual compliance scorecards are submitted to OMB.

Chapter 8 – Management of Ozone Depleting Substances

This chapter implements DOD and SECNAV policy concerning the management of ozone depleting substances (ODSs); incorporates the necessary changes to the U.S. Navy ODS Program under the requirements of the CAA Amendments of 1990, the accelerated production phase-out schedules for Class I ODSs (31 December 1993 for Halons, 31 December 1995 for most other Class I ODSs), and E.O. 13423 of January 24, 2007 regarding acquisition and the reduction and elimination of toxic and hazardous materials; and details specific restrictions and uses of ODSs within the Navy. OPNAVINST 5090.2A, "Management of Ozone Depleting Substances," dated 14 July 1994, was canceled.

The requirements of this chapter apply to all Navy ships, aircraft, shore activities (including nonappropriated fund activities), and GOCO facilities worldwide except as follows:

- Naval Nuclear Propulsion Program
- Medical Devices
- Small Appliances
- Laboratory and Analytical Uses
- BRAC Activities.

8-4 Requirements

8-4.1 General

The following legislative requirements apply to shore facilities within the US and US territories.

- Production of CFCs, carbon tetrachloride, methyl chloroform was prohibited as of 31 December 1995; production of halons was prohibited as of 31 December 1993.
- It is unlawful to knowingly release any Class I or Class II Ozone Depleting Substance (ODS) refrigerant or halon into the atmosphere during the service, repair, or disposal of appliances, industrial process refrigeration and air conditioning equipment and halon-containing equipment.
- Activities must reduce the use and emissions of ODSs to the lowest achievable level.
- Activities must meet labeling requirements for ODSs.
- Owners or operators of appliances normally containing more than 50 pounds of refrigerant must monitor leakage rates and repair leaks as specified by reference (a) This requirement does not apply to military equipment designed and used solely by the military as defined in Section 8-5.7.

8-5 Navy Policy

8-5.1 General. In recent years, the Navy has been involved in research and development of alternative substances and systems, and recovery and recycling equipment that decrease the Navy's dependence on ODSs. Due to the large quantities of ODSs used and the numerous applications of these ODSs, Navy personnel should carefully evaluate each situation to determine the proper course of action needed to phase out ODS usage. In all military applications, such as fire protection and shipboard chilled water air conditioning and refrigeration systems, it is essential to recycle, conserve, and properly manage these ODSs to ensure adequate availability of ODSs until suitable alternatives can be tested, qualified, and implemented. It is important that the Navy continue to reduce the use of ODSs and eliminate emissions for compliance with the requirements of the CAA.

8-5.4 Procurement of Recycled or Reclaimed ODSs. If ODS procurement is necessary, Navy activities shall procure recycled or reclaimed ODSs whenever possible.

8-5.5 Conservation Practices. Activities shall implement conservation practices to the extent practical for all ODS applications, including performing regular system leak checks, improving supply management, and recycling and reclaiming Class I and Class II ODSs.

Chapter 9 – Clean Water Ashore

This chapter identifies requirements and responsibilities for the control and prevention of surface water pollution, and ground water pollution related to Underground Injection Control (UIC) at Navy shore facilities within the United States, Commonwealth of Puerto Rico, Virgin Islands, Commonwealth of the Northern Mariana Islands, Guam, America Samoa, and the Trust Territory of the Pacific Islands.

The strict implementation of the Clean Water requirements summarized below have had, and continue to have important beneficial impacts to corals, coral reefs and associated organisms. It is the strict adherence to Clean Water requirements that has helped turn Navy properties into de-facto MPAs.

9-4 Requirements

9-4.1 General

As required by E.O. 12088 (reference (c)) and the CWA, Navy facilities comply with all substantive and procedural requirements applicable to point and non-point sources of pollution. These requirements include Federal, State, interstate, and local laws and regulations respecting the control and abatement of water pollution such as load reduction requirements resulting from the development of total maximum daily loads (TMDLs) for impaired water bodies. Navy facilities must comply in the same manner and to the same extent as any nongovernmental entity, including the payment of reasonable service charges (not payment of civil penalties or fines)

The discharge of any pollutant that does not comply with effluent standards or other procedural requirements is unlawful. The discharge of radiological, chemical or biological warfare agents or low-level radioactive waste is prohibited.

9-4.2 Surface Water Discharges

Direct Discharges. Permits are required for all point source discharges to waters of the U.S. (reference (e)). For all discharge points in States that have an EPA-approved NPDES program for Federal facilities, permits must be requested from the applicable State environmental agency. For all discharge points in States that do not have authority to issue NPDES permits for Federal facilities, permits may need to be requested from both the EPA and the State. All monitoring records must be retained as required by Federal, State and local regulations.

Wastewater Discharges. Domestic and industrial wastewater treatment plant discharges as well as other process wastewater and cooling water discharges from Navy facilities directly to waters of the U.S. must comply with all terms or conditions of EPA, State, or locally issued permits.

Storm Water Discharges. Storm water discharges must meet all applicable Federal, State and local permit requirements. Storm water discharges are a major contributor to surface water quality impairment. Significant sources of storm water discharge include urban (facility) runoff, industrial activity, and construction. These types of storm water discharges are either regulated under Phase I or Phase II of the CWA Storm Water Program. The Phase I regulations apply to municipal separate storm sewer systems (MS4s) serving a population over 100,000, as well as storm water discharges associated with regulated industrial activities as defined in the storm water regulations, including construction activities disturbing 5 acres of land or more. The Phase II regulations apply to MS4s serving a population less than 100,000, that are located in an “urbanized area”, and construction activities that disturb greater than or equal to one (1) acre of land, or as specified by an individual State. Federally operated storm sewer systems are defined as MS4s. Navy activities subject to storm water regulations must apply for NPDES permit coverage under either an individual permit or a general permit.

9-4.3 Sub-Surface Discharges. Discharges to groundwater must meet applicable requirements of the SDWA, State, and local implementing requirements, and applicable permit conditions.

Underground Injection Control. All owners or operators of Class I and V wells and all applicants for UIC permits shall comply with applicable provisions of 40 CFR 144, 146, 147.1250 subpart Z and 148. Septic systems may be considered Class V underground injection wells. New large-capacity cesspools

are banned nationwide as of April 5, 2000. Large capacity cesspools may no longer be constructed. (New large-capacity cesspools are those for which construction was started on or after April 5, 2000 (40 CFR § 144.88(a)(2))

Land Application. This includes the use and disposal of treated wastewater, sewage sludge, industrial sludge, or septage. These systems may include spray fields, tile fields, rapid infiltration basins, percolation ponds, and evaporation basins. A permit may be required from the state for land application.

9-4.4 Hazardous Pollutant Discharges. Hazardous waste may be introduced into a treatment facility only if the facility is specifically permitted to treat the type of waste introduced under a RCRA TSD permit, or a "permit by rule" (reference (i)) The Federal Facilities Compliance Act (reference (j)) provides Federally Owned Treatment Works (FOTW) with the same domestic sewage exclusion provided to Publicly Owned Treatment Works (POTW), provided no hazardous waste is introduced to the FOTW.

9-4.5 Sludge Disposal. The sewage sludge use and disposal regulation sets national standards for management and disposal of sewage sludge. The rule is designed to protect human health and the environment when sewage sludge is beneficially applied to the land, placed in a surface disposal site, or incinerated. Generally sewage sludge disposal requirements are incorporated into NPDES permits. In addition, all installations shall comply with applicable Federal, State and local sewage sludge disposal requirements. Navy facilities shall take all reasonable measures to beneficially dispose of sludge. Beneficial disposal includes a number of land application methods and composting.

9-4.6 Waste Disposal Sites. Surface water runoff and leachate from waste disposal sites will conform to applicable requirements specified for disposal of solid waste (Chapter 16) or hazardous waste (Chapter 15)

9-4.7 Dredge and Fill Operations

Permits. Applications must be made to USACE for: a) a permit to construct a structure in, or to otherwise alter or modify, navigable waters or wetlands, b) dredge operations, including maintenance dredging, and c) dredge disposal unless the disposal is permitted under a nationwide permit. In addition, applicants are required to obtain State certification that such actions comply with applicable State effluent limitations, water quality implementation plans, toxic effluent limitations, fish and wildlife protection plans, etc. State certifications may be done either as a part of the USACE permit process or independently if no USACE permit is required because of a nationwide permit. Projects covered by a nationwide permit require USACE notification even though no permit application is required. Field sampling may be required to select proposed dredge disposal sites. Other surveys, including site monitoring, may be required at disposal sites before, during, and after disposal.

It is standard Navy practice to conduct detailed surveys of corals, coral reefs and associated organisms prior to all dredge and fill operations. These surveys allow the Navy to minimize and/or eliminate potential adverse impacts to marine natural resources.

Permit Exemptions. Projects for which EISs have been written and submitted to Congress and that have specific congressional authorization do not require USACE or State permits. Projects covered by a nationwide general permit require USACE notification, but do not require individual permits. However, on a case-by-case basis, some additional individual requirements may be applied by USACE or States.

Discharges of Dredged or Fill Material. Discharges of dredged or fill material into waters under USACE jurisdiction will comply with Federal regulations. Disposal by ocean dumping requires a USACE permit and compliance with EPA requirements. Discharges to waters under the jurisdiction of States will comply with applicable permits and discharge regulations, including State fee schedules.

Disposal site selection may entail field sampling and analyses. Elutriate and/or bioassay testing may be required to determine if the proposed dredged materials should be classed as polluted or unpolluted. Other surveys, including site monitoring, may be required at disposal sites before, during, and after disposal.

9-4.8 In-water Construction. The USACE and some States require a permit for any in-water construction. Facilities proposing in-water construction will obtain applicable permits prior to award of construction contracts, and comply with all permit conditions.

9-5 Navy Policy

9-5.1 Pollutant Reduction or Elimination. Navy Policy is to reduce or eliminate pollutants from all sources. Navy activities shall explore opportunities for pollutant reduction or elimination in wastewater discharges through product substitution, wastewater reduction, reuse, and recycling. Pollutants shall be reduced or eliminated from storm water discharges by control of pollutant sources through procedural and structural Best Management Plans (BMP). The use of Low Impact Development designs is encouraged as a means of reducing storm water discharge volumes and controlling pollutants at the source.

9-5.2 Watershed Management. Installations apply a watershed approach when evaluating the impact of their overall activities on the quality of area water resources and address water impacts by reducing pollutant discharges. A watershed approach is an integrated holistic management strategy that addresses the condition of land areas within the entire watershed. It ensures that non-point sources as well as point sources of pollution are addressed. Navy water program managers consult other media experts (e.g. natural resources, RCRA/CERCLA, and air) to fully implement the watershed approach. Installations that discharge pollutants to or near impaired waters should get involved as early as possible in the State or local process that leads to the identification of impaired waters and the development of TMDLs. Even those installations with only a potential to discharge pollutants to an impaired water body should participate as stakeholders in the process. Participation should occur early in the TMDL process, including, when practicable, before the state or other authority approves or creates a schedule for establishing the applicable TMDL.

9-5.3 Pretreatment Program. NOTWs shall develop, implement, and maintain pretreatment programs for all known industrial dischargers to the NOTW that could affect treatment processes or impact compliance with permit limits. Bases shall periodically develop a list of all industrial waste discharges on the facility. This is to be accomplished no less than once every 5 years as part of an industrial wastewater management plan.

9-5.5 Water Re-Use. To support water conservation efforts, Navy commands shall ensure that all activities implement water re-use practices to reclaim, recycle and re-use wastewater to the maximum extent feasible, taking into account economic payback, process requirements and the scarcity of water resources available to the primary water supplier for the activity. Re-use of water shall be accomplished in accordance with all applicable Federal, State and local laws and requirements.

9-5.6 Perchlorate. Permitted wastewater effluent discharges at installations where the use of perchlorate is associated with processes related to the manufacture, maintenance, processing, recycling, or demilitarization of military munitions shall sample for perchlorate at permitted wastewater discharge points. Sampling shall be conducted semi-annually and if possible, in conjunction with effluent sampling already conducted under the applicable permit to each point source. Installations with confirmed results that indicate the presence of perchlorate in wastewater effluent discharges at level above the method reporting limit for the analytical method used shall consult with their Budget Submitting Office on appropriate actions. Sample results are to be reported to the permitting regulatory authority if it is required by the NPDES permit or State regulations.

Further information and policy on perchlorate, as well as other emerging contaminants issues can be found at the Materials of Evolving Regulatory Interest Team (MERIT) web site: (<http://intranet.dodmeritinfo.net/index.cfm>)

9-5.7 Spills. Spills of sewage or other substances that might be considered pollutants which endanger critical water areas, have the potential to generate public concern, become the focus of enforcement action, or pose a threat to public health or welfare shall be reported by OPREP-3 NAVY BLUE or OPREP-3 NAVY UNIT SITREP in accordance with reference (m) Spills of oil and hazardous substances shall be reported in accordance with the requirements in Chapter 12.

Chapter 10 – Safe Drinking Water Act Compliance Ashore

This chapter identifies requirements, establishes policy, and assigns responsibilities for the production, use, protection and conservation of drinking water at shore installations in the United States, commonwealth of Puerto Rico, Canal Zone, Virgin Islands, Commonwealth of the Northern Marianas Islands, Guam, American Samoa, and the Trust Territory of the Pacific Islands.

Chapter 11 – Oil Management Ashore

This chapter identifies requirements and responsibilities applicable to the prevention of oil pollution and the collection, reclamation, and disposal of oily wastes and used oils ashore. Requirements apply in all areas within the United States, Commonwealth of Puerto Rico, Virgin Islands, Guam, American Samoa, and the Trust Territory of the Pacific Islands.

It should be noted that the **effective** enforcement of oil spill prevention, control and countermeasure plans at Navy facilities is much greater than what occurs at many, if not most non-Navy MPAs. Chronic and or frequent oil pollution has been observed and is a significant problem at MPAs in Trinidad and Tobago, the Bahamas, Jamaica, and Indonesia (Smith, personal communication) Avoidance of such impacts has been and continues to be an important factor contributing to the de-facto MPA effect of Navy installations.

11-4.1 Oil Storage Facilities. Transportation-related facilities serving vessels are subject to current USCG regulations. The USCG requires facility operation manuals for applicable marine transportation-related facilities. These regulations, which apply to all components of DOD, address aspects of the design and operation of on-shore and offshore facilities that are engaged in the transfer of bulk oil to and from vessels. EPA requires spill prevention plans for applicable onshore non-transportation related facilities. The Pipeline and Hazardous Materials Safety Administration (PHMSA) requires adherence to the prevention, containment, and response planning requirements of the Department of Transportation (DOT), applicable to transport of oil by motor vehicles and rolling stock that leave naval facilities.

11-4.3 Spill Prevention Control and Countermeasure Plans (SPCC)

Facilities that are not transportation-related and that meet the applicability requirements of 40 CFR 112.1 will prepare an SPCC Plan that establishes procedures, methods, equipment, and other requirements to prevent the discharge of oil into or upon navigable waters. Plans must have full approval of management and must assess the potential for discharge of oil, as well as containment procedures and equipment to prevent oil spills into or upon a navigable waterway or shoreline of the U.S. A licensed professional engineer (PE) must initially review and certify the SPCC plan. Facilities must amend their SPCC Plans when there is a change in the facility design, construction, operation, or maintenance that materially affects its potential for a discharge. This amendment must be prepared within six months and implemented within six months following preparation of the amendment. Notwithstanding compliance

with the above requirement, facilities must review and evaluate their SPCC Plans at least once every five years. Based on the review and evaluation, facilities shall revise their SPCC Plans within six months and implement the amendment within six months following preparation of any amendment. A licensed Professional Engineer must certify any technical amendment to the Plan. Facilities must also document their completion of the review and evaluation, and must sign a statement as to whether facilities will amend the Plan. The plan shall preferably, follow regulatory sequence. If you do not follow the sequence specified, you must prepare an equivalent plan and supplement it with a section cross-referencing the location where each element of the SPCC regulation has been addressed and discuss how it is met. If the plan calls for additional details, such as procedures, methods, or equipment not yet fully operational, they must be discussed in separate paragraphs. Facilities that have experienced a spill into navigable waters of 1,000 gallons of oil in a single discharge or two discharges of more than 42 U.S. gallons of oil within any 12-month period, are required to submit relevant information to the EPA Regional Administrator within 60 days.

SPCC Plans are only required for facilities that could reasonably be expected to discharge oil into or upon the navigable waters of the U.S. or adjoining shorelines because of facility location. They are not required if the facility has an aggregate aboveground oil storage capacity (AST's and other aboveground Bulk Storage Containers) of 1,320 gallons or less, and if the total storage capacity of completely buried storage containers is 42,000 gallons or less. Only bulk storage containers and operating equipment with an oil storage capacity of 55 gallons or greater are included in the above aggregate storage calculations.

Facilities that were in operation on or before August 16, 2002 must make any necessary amendments to their SPCC Plan and implement that Plan on or before July 1, 2009. Facilities that came into operation after August 16, 2002 must also prepare and implement an SPCC Plan on or before July 1, 2009. Facilities will review SPCC plans and implement them within 6 months of a change in facility design operation or maintenance or the construction completion and acceptance of a new facility that materially affects the facility's potential for the discharge of oil to navigable waters or adjoining shoreline.

11-5.2 Oil Storage Facilities. Navy policy is to meet USCG and EPA oil pollution prevention regulations pertaining to transportation-related and non-transportation-related facilities and to exceed those regulations wherever practicable.

11-5.3 Oil Transfer Operations. Navy shore installations shall conduct transfer operations and develop an Operations Manual in accordance with USCG regulations and any applicable state regulations for oil transfer operations as described in paragraph 11-4.2.

11-5.4 Used Oil Recycling. Oil shall be recycled and reused within the Navy whenever technically and environmentally feasible and when environmentally acceptable. Navy policy is to recycle used oil per Federal, State and local regulations.

Military personnel and civilian employees shall be encouraged to collect used lube (crankcase) oil from personal vehicles for recycling via Navy installation, local, or regional used oil recycling programs.

If recycling of used lube oil is not feasible for economic reasons, the lube oil may be burned as a fuel or fuel supplement, provided appropriate chemical and economic analyses are made to determine suitability of burning as well as compliance with air pollution control requirements (chapter 7) and HW regulations (chapter 15) In addition, prior to burning, used oil shall meet requirements in reference (g)

11-5.5 Spill Plans. Navy shore installations shall develop and update SPCC plans in accordance with reference (d), and as described in paragraph 11-4.3. The plans shall also comply with appropriate state and local regulations.

11-5.6 Oily Waste/Waste Oil (OW/WO) Management. The cost and potential environmental compliance problems associated with OW/WO management both ashore and afloat necessitate a comprehensive approach that maximizes opportunities for recovery and recycling of usable products. This approach should be cost effective providing necessary support to ships and submarines considering circumstances unique to specific ports, including the State and local regulatory climate. Include management of OW/WO in activity P2 Plans or equivalent state mandated plans.

Chapter 12 – Oil and Hazardous Substance Spill Preparedness and Response

Chapter 12 describes the Navy response to oil and hazardous substance spills under the National Contingency Plan (NCP)

12-4 Requirements

OHS planning, training, exercises, reporting and response is governed by various Federal regulations. Specific regulatory applicability is dependent on a number of factors including facility location, nature of operations, and whether particular criteria and threshold requirements are met. EPA, PHMSA, USCG, MMS, and OSHA all regulate portions of OHS preparedness and response. Most of the Navy facilities fall under USCG or EPA jurisdictions, but facilities should carefully evaluate their needs to meet other regulatory requirements.

12-4.1 Planning

All Navy facilities shall maintain contingency plans to combat releases of hazardous substances or discharges of oil. Depending on a facility's size and the nature of its operations, it may come under the jurisdiction of several Federal, State and local contingency planning laws and regulations. Under some of these laws and regulations, contingency plans require regulatory approval. Facilities shall review the appropriate regulations to determine if they meet the criteria to prepare and submit plans.

Facility Response Plans (FRP)

Those facilities that store, transport, or handle oil and meet the specific threshold requirements of any of the OPA 90 regulations must submit an FRP to the appropriate regulatory agency (EPA, USCG, MMS, or PHMSA). Each agency has established criteria that define which facilities fit this description. Table IIIE-1 (12-1) shows a brief description of these criteria. The actual regulations shall be reviewed to determine applicability.

Most Navy facilities fall under either USCG or EPA jurisdiction. Facilities meeting the criteria for more than one type of facility are "complex facilities." Many Navy facilities fall under this category. A few Navy facilities with pipelines that leave the facility may also fall under the PHMSA's jurisdiction. Additionally, Navy facilities with mobile sources may also fall under PHMSA's jurisdiction. No facility requires more than one FRP. However, each facility must submit an FRP to each Federal agency that has jurisdiction over it. The requirements for the FRP vary widely depending on the type of facility. There are certain essential elements common to all. These include:

- An individual who can be reached on a 24-hour basis and has the authority to take necessary response action.
- An emergency section of the plan that provides concise response direction.
- Extensive drills and exercises with specified documentation and record-keeping.
- A provision for regular update and review of FRPs.
- Provisions for responding to spills up to and including WCD.

Table 12-1. FRP Threshold Requirements

Facility Type	FRP Threshold Requirement	Regulatory Agency	Citation
Non-Transportation-Related Onshore Facilities	<p>(1) The facility, because of its location, could be reasonably expected to cause "substantial harm" to the environment;</p> <p>(2) The facility transfers oil over water to or from vessels and has a total oil storage capacity greater than or equal to 42,000 gallons; or</p> <p>(3) The facility's total oil storage capacity is greater than or equal to 1 million gallons, and one of the following is true:</p> <ul style="list-style-type: none"> (a) The facility does not have secondary containment for each aboveground storage area sufficiently large to contain the capacity of the largest aboveground oil storage tank within each storage area plus sufficient freeboard; (b) The facility is located at a distance such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments; (c) The facility is located at a distance such that a discharge from the facility would shut down a public drinking water intake; or (d) The facility has had a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years. 	EPA	40 CFR 112 (reference (b))
Marine Transportation-Related (MTR) Facilities	<p>(1) The facility, because of its location, could be reasonably expected to cause "substantial harm" to the environment;</p> <p>(2) Fixed MTR onshore facilities capable of transferring oil to or from a vessel with a capacity of 250 barrels or more;</p> <p>(3) Mobile MTR facilities used or intended to be used to transfer oil to or from a vessel with a capacity of 250 barrels or more; and</p> <p>(4) Those MTR facilities specifically designated as substantial harm facilities by the COTP.</p>	USCG	33 CFR 154 (reference (c))
Non-Transportation-Related Facilities; Offshore Platforms and Pipelines	Each owner or operator of an oil handling, storage, or transportation facilities, located seaward of the coastline, must submit a spill-response plan to MMS for approval.	MMS	30 CFR 254 (reference (d))
Onshore Pipelines	<p>Each operator of an onshore pipeline facility shall prepare a response plan and submit the response plan to PHMSA.</p> <p>NOTE: PHMSA allows numerous exceptions to this rule based on factors such as pipe size, operating pressure, age, and construction type. Consult reference (e) for specific criteria.</p>	PHMSA	49 CFR 194 (reference (e))

“Substantial harm” facilities shall submit FRPs to the cognizant regulatory agency for information, and “significant and substantial harm” facilities shall submit FRPs to the cognizant regulatory agency for review and approval.

Navy barges are considered public vessels and are not required to have vessel response plans. However, these vessels may represent considerable spill risk and should be addressed in response plans. Facilities owning barges that are used only at that facility and are used to store, transfer, or handle oil for that facility should include these barges in their response plans.

Spill Contingency Plans. Any Navy facility that stores petroleum or HS and does not meet Federal requirements for preparing an FRP shall maintain an OHS SCP (see Section 12-5.1.1)

NOSC OHS Response Plans. DOD will act as the FOSC and direct the response to HS spills on, if the sole source of the release is from DOD facilities or vessels. In the case of HS spills on or from Navy facilities or vessels, the NOSC will act as the FOSC. As such, the NOSC shall prepare plans that address this contingency. In addition, NOSC plans, in combination with individual facility FRPs, must provide sufficient detail to ensure that the Navy can respond to oil spills up to the WCD and to spills beyond facility boundaries.

Other Planning Requirements. Facilities may be subject to additional HS contingency planning laws and regulations including RCRA, EPCRA and the CAA. Additionally, State and local jurisdictions may have planning requirements. Facilities shall review the requirements for the area in which they are located and develop and submit plans accordingly.

12-4.4 Reporting

a. Reporting OHS Spills Within the U.S. Federal law requires OHS spills within U.S. jurisdiction (including waters of the U.S. EEZ, territories and possessions) that meet or exceed the quantities listed below be immediately reported to Federal authorities. Federal law provides criminal penalties for failure to report OHS spills. These reports shall be submitted to the National Response Center (NRC) at 1-800-424-8802 or 202-267-2675. State and local jurisdictions may impose reporting requirements that differ from Federal requirements. Facilities must be cognizant of the reporting thresholds for the State and local area. This may be particularly true for oil spills that do not reach or threaten to reach navigable waterways.

(1) Quantities to Report. Navy commands shall report to the NRC:

- Any discharge of oil which causes a film or sheen upon, or discoloration of, the surface of navigable water or adjoining shorelines, or causes a sludge or emulsion to be deposited beneath the surface of navigable water or upon adjoining shorelines;
- Any discharge of oil, which threatens to reach the navigable waters of the United States;
- Any release of a hazardous substance in the United States (its territories, possessions or navigable waters) in excess of quantities proscribed by reference (h);
- When in doubt, call the NRC.

(2) Vessels. While public vessels are generally exempt from State and Federal reporting requirements, commanding officers and masters of Navy vessels shall immediately report the fact and nature of an OHS spill from their vessels to the NRC.

(3) Hazardous and Extremely Hazardous Substances. In addition to the reporting requirements set forth above, EPCRA and Chapter 6.5.1(d) require all activities to report to SERC and LEPC any release of a reportable quantity of a HS or an EHS that crosses the facility boundary or escapes to the atmosphere. See Chapter 6 and/or EPCRA for additional information.

b. Reporting OHS Spills Outside the U.S. For host nation reporting requirements, facility commanders should refer to FGS applicable to overseas installations and subsequent SPCR plans. Commanding officers and masters of Navy vessels shall follow policy as described in Chapter 22 of this instruction.

12-4.5 Response

OHS Spill Response. Reference (a) describes the roles and responsibilities of DOD in responding to DOD OHS spills. They are outlined here:

- In the event of an OHS spill from a Navy facility or vessel, the Navy will always assume initial responsibility for clean-up.
- In the case of a HS release that is on, or the sole source of the release is from, any facility or vessel under the control of the Navy, the NOSC assumes the role of the FOSC. As the FOSC, the NOSC will direct the Federal response effort, including coordination with the AC and with other Federal, State, and local authorities.
- In the case of oil, the EPA or the USCG assumes the role of the FOSC—depending upon the location of the spill. Typically, the EPA or USCG FOSC will monitor the Navy response effort and advise appropriate action, if necessary. If the EPA or USCG FOSC determines, however, that Navy response is inadequate or inappropriate, then the FOSC has the authority to assume command of response efforts.

Non-DOD Spill Response. Navy personnel may also respond to non-DOD spills. As one of 16 Federal agencies that comprise the National Response Team (NRT), DOD and its component Services must provide any response assistance they can upon request of the FOSC, insofar as such assistance would not impair DOD mission readiness. Additionally, SUPSALV is one of several National Special Teams named in the NCP as available to provide assistance to the FOSC. In the case of a large or salvage-related pollution incident, the FOSC may specifically request SUPSALV personnel, equipment, and expertise. To facilitate mobilization and funding of SUPSALV equipment and personnel for a non-DOD spill, SUPSALV and USCG have established an Interagency Agreement for Pollution Response.

Natural Resource Trusteeship. The NCP assigns responsibilities to certain Federal and State agencies for protecting natural resources held in trust for the U.S. public. In the aftermath of an OHS spill, the Secretary of Defense is responsible for protecting natural resources within Navy management and control. For further details on Natural Resource Trusteeship, see Chapter 26. The extensive planning, equipment and training requirements that the Navy meets place the Navy in a much stronger position to protect, safeguard and cleanup natural resources in the event of an oil or hazardous substance spill. The net result benefits corals, coral reefs and associated organisms.

12-5.1 Planning. The Navy shall prepare to respond to Navy OHS spill incidents and undertake immediate, direct action to minimize the effect of a Navy OHS spill upon the environment. The Navy's OHS pollution contingency planning and response organization executes this policy. This organization uses existing chains of command and regional coordination authorities to satisfy the requirements and intent of applicable statutes and regulations.

Facility Planning

All Navy facilities shall develop a response plan either an FRP or SCP depending upon regulatory requirements size and location of the facility.

Facilities meeting the threshold requirements of the OPA 90 regulations, outlined in Table 12-1, shall develop an FRP. Although the OPA 90 regulations cited here only describe requirements for oil FRPs, Navy facilities may incorporate HS planning into FRPs or SCPs. Regardless of whether HS planning is included in these plans, or a separate planning document, Navy facilities shall ensure HS planning is accomplished. COMNAVFACENGCOM shall be responsible for providing technical assistance to facilities for developing response plans. COMNAVFACENGCOM shall provide guidance to facilities on the minimum essential planning elements and stay abreast of planning developments and changing guidance in order to provide facilities with accurate information.

Any Navy facility that stores petroleum or hazardous substances and does not exceed the oil storage threshold requirements of the OPA 90 regulations shall maintain an OHS SCP. OHS SCPs should be tailored to the specific size and operations at the facility. At small facilities, the SCP must, at a minimum, be sufficient to protect employee safety and allow the facility to quickly contact external spill responders, the NOSC, and the facility's chain-of-command. At facilities that use their own personnel for emergency spill responders, the SCP must address all of the emergency response plan elements of OSHA's HAZWOPER regulations. In most cases, SCPs do not need to be submitted for agency approval; however, such plans should be readily available for agency review if requested.

SUPSALV is designated as the Navy's corporate oil spill response organization. SUPSALV shall maintain and operate an oil discharge containment and recovery equipment with the requisite knowledge and expertise to support large spill response operations. Facilities shall consider these assets when planning WCD response.

In addition to response assets available from local Navy activities, commercial oil pollution response assets, available through Basic Ordering Agreements (BOAs) pre-negotiated by the USCG, may be a commanding officer's best means of meeting the response requirements of more significant spill scenarios. Planning efforts should consider these assets and where appropriate, include these assets in response plans. BOA activation is addressed in 12-5.5(b)

Membership in oil spill cooperatives potentially exposes the Navy to the risk of significant liability. Accordingly, Navy activities considering membership in an oil spill cooperative shall forward a request to participate to CNO (N45) via their chain of command.

Facilities shall maintain plans in accordance with applicable regulations. At a minimum each plan shall be reviewed and updated annually. Depending on personnel turnover rate, responsibility and notification sections shall be updated more frequently, at least quarterly. Each plan shall be updated and resubmitted as required by regulations, or, at a minimum, every five years or after any major spill event.

Shoreside NOSC Plans. Shoreside NOSCs are required to develop NOSC plans to combat oil or hazardous substance spills that exceed facility capabilities or occur outside of facility boundaries. This shall be a comprehensive response plan, similar to an FRP, but more general in nature. It shall cover notifications, responsibilities, initial actions, resources, sensitive area prioritization, disposal, natural resource damages, etc. It shall be based on WCD scenarios of facilities within the assigned AOR, as well as scenarios that occur beyond facility boundaries. Facilities may rely on their NOSC for WCD response, and FRPs submitted to regulators may reflect this fact. Therefore, when applicable, NOSC plans shall

address the WCD support required by these facilities within the NOSC's assigned AOR. Status of NOSC plans shall be forwarded by assigned NOSCs annually to CNIC.

Fleet NOSC Plans. Fleet NOSCs are required to develop contingency plans to combat Navy ship oil or hazardous substance spills that occur outside the AORs of shoreside NOSCs. As fleet units typically have minimal response assets, fleet NOSC plans shall focus on assigned responsibilities, notifications, and initial actions. Information regarding foreign nations within assigned AOR that may be affected by Navy spills shall be included. Plan coverage shall provide for all Navy vessels (including MSC and U.S. Maritime Administration (MARAD) regardless of Fleet operational control within their AOR. These plans shall be consistent and aligned with shoreside NOSC plans within the AOR. Delineation of responsibility between fleet and shoreside NOSCs shall be clear.

NOSC plans shall be signed by the NOSC (typically a Flag officer) to ensure management endorsement and awareness. NOSC plans shall be reviewed and maintained for currency annually, with notification sections validated quarterly. Plans shall receive a thorough review and update, including a new signature, every five years. Status of NOSC plans shall be forwarded by assigned NOSCs annually to COMNAVSEASYSKOM.

Spill Prevention, Control, and Reporting Plan. Overseas facilities are governed by both DOD guidance and applicable local laws and regulations. All overseas facilities shall develop and maintain an SPCR plan in accordance with the FGS for the country where the facility is located. If an FGS does not exist for a particular country, the plan shall be developed in accordance with reference (k)

Integrated Contingency Plan. A facility may choose to develop an ICP per NRT guidance published 5 June 1996, reference (n) This is not an additional plan. The guidance was intended for facilities that wanted to integrate response plan requirements found in various EPA, DOT, USCG, and OSHA regulations. An ICP is not a suitable solution for all cases, and the added complexity and potential cost of maintenance should be considered when determining appropriateness of this option. ICPs may also be used in locations that have facilities that share response resources. Areas with a high concentration of Navy facilities may benefit from having a single plan with appendices that cover each facility. Consultation with regulators regarding acceptance of such an arrangement shall be conducted prior to combining plans into a single plan.

Non-Navy Ports Planning. Navy vessels (including MSC vessels regardless of OPCON and MARAD vessels as assigned) calling on non-Navy ports, shall arrange (through Logistics requirements (LOGREQ), contract, or other means for necessary spill preparedness consistent with generally accepted industry standards and practices for operating within the port in question. NOSCs shall provide technical assistance for determining necessary preparedness measures which could potentially arise during vessel operations in a non-Navy port called upon by USN, United States Naval Ship (USNS), and or MARAD vessels in their respective AOR's. Preparedness measures shall address all accepted operations (e.g., fueling) and shall include meeting all criteria set forth in the OEBGD, FGS, and respective NOSC plans.

Chapter 13 – Storage Tanks

This chapter provides information and guidance applicable to the regulation of storage tanks (STs) This includes both underground storage tanks (USTs) and aboveground storage tanks (ASTs) It includes those containing petroleum products, and/or hazardous substances (HS) however, excludes those containing hazardous waste (HW) at Navy shore facilities within the United States, the Commonwealth of Puerto Rico, U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Marianas Islands.

13-4.1 General Operation and Maintenance Requirements

- a. Installations with STs will monitor transfer operations to ensure that spilling or overflowing does not occur. They will install and maintain overflow protection equipment in order to prevent releases.
- b. Installations will maintain and inspect corrosion protection measures, including coatings and cathodic protection systems. Cathodic protection systems will be tested according to Federal, State, and local laws and regulations.
- c. Installations will install ST systems and make repairs to existing ST systems according to Federal, State, and local requirements.
- d. Installations will conduct temporary or permanent closure of STs in a manner ensuring protection of soil, surface water, and groundwater. In addition, such closures shall be conducted according to Federal, State and local regulations.
- e. The installation will maintain written records demonstrating compliance with operational requirements.
- f. Installations will operate, monitor, and test release detections systems according to Federal, state, and local laws and regulations.

13-4.2 Aboveground Storage Tanks

General Operating Requirements. ASTs containing petroleum are not regulated by

RCRA. For ASTs containing petroleum, current Federal regulation is limited to the petroleum pollution prevention and discharge reporting requirements. Some States or local governments have developed AST, containing petroleum, regulatory standards, which may not apply to the Navy. In the event of discrepancy, installations shall obtain assistance from their Region/REC environmental staff or legal counsel to determine applicability of regulations.

Release Detection, Testing, and Inspection. Whenever possible, installations will install release detection systems on AST, containing petroleum systems. Such release detections devices, storage tank's tank supports, and alarms, will be routinely inspected to ensure they are operating properly and are in good condition. Inspections will be documented and inspection records kept for at least three years.

Spill Prevention Devices. ASTs will have over fill prevention devices or operating procedures in place that prevent overfilling the tank. A secondary containment system will be in place for each petroleum storage tank or container of 55 gallons, or greater, capacity. Spill prevention devices and secondary containment will be routinely inspected to ensure they are operating properly and are in good condition. Inspection reports will be kept for at least three years.

Release Reporting, Investigation, and Confirmation. Installations will report releases of petroleum or HS from ASTs according to the guidance in chapter 12. Installations will immediately investigate suspected releases from ASTs by reviewing storage records, conducting integrity testing, and/or by performing a subsurface investigation. If regulated substances are found in adjacent properties not known to have previously contaminated, then installations shall conduct a release investigation of suspect ASTs in accordance with EPA or respective state regulations.

Out-of-Service ASTs and Closure. Installations will conduct permanent closure of ASTs per applicable State or local regulations. At a minimum, installations will empty and clean ASTs and associated pipelines and place locking caps on fill lines/risers. For permanent closure, if the AST is not removed, installations will also cap, blank flange, or grout affected pipelines, and maintain associated closure

records. Installations will record site conditions, pipelines affected, actions taken, and maintain correspondence records with state and Federal regulators.

13-4.3 Underground Storage Tanks

General Operating Requirements

Installations will ensure all UST systems have corrosion protection, and spill/overflow prevention equipment combined with an approved method of release detection. These systems must meet applicable Federal and State regulations, and be installed per nationally recognized standards. Underground piping that conveys regulated substances must be properly designed and constructed to ensure protection from corrosion. Installations must provide automatic leak detection on pressurized piping and some types of suction piping and must conduct either annual tightness testing or monthly monitoring. After any repairs, the system must be tested for tightness and records of all repairs maintained for at least 5 years.

Installations may be required to replace or upgrade existing USTs that are either exempt or deferred from Federal, State, or local UST regulations per the installations SPCC plan or per best management practices.

Release Detection, Testing, and Inspections. Note that any UST system that stores fuel solely for emergency power generators is exempt from Federal regulatory release detection requirements. Some State or local regulations may be more stringent. However, these USTs are covered by the SPCC regulation (40 CFR 112) All completely buried metallic tanks require regular leak testing for release detection (40 CFR 112.8(c)(iv))

Installations will install release detection systems on petroleum and HS UST systems as required by Federal, State, or local regulations. Installations will also install release detection systems on non-regulated USTs whenever possible.

Installations will maintain records demonstrating compliance with release detection, testing and inspection requirements.

Release Reporting, Investigation and Confirmation

Installations will report releases and suspected releases from USTs to the EPA or State agency within 24 hours of discovery. The installation will report petroleum, HS releases into surface waters from USTs according to the guidance in chapter 12.

Installations will immediately investigate suspected releases from USTs by conducting integrity testing and/or by performing a subsurface investigation. If regulated substances are found in adjacent properties, then the EPA or State agency can require an installation to conduct a release investigation of suspect STs.

Release Response and Corrective Action for UST

The installation must stop any further releases from the UST, and mitigate fire, explosion, and vapor hazards, by preventing any further release through the emptying of the UST system. The installation will take steps to prevent further migration of any above ground or exposed below ground releases. If the source of an underground release is not known, conduct subsurface sampling in order to determine the source. Investigate the possible presence of free product and recover free product as soon as practicable. UST releases into surface waters require installations to take the response actions described in chapter 12 or in chapter 15, as appropriate, in addition to the requirements described in this section, paragraph 13-4.3.d.

UST releases require an initial abatement report, initial site characterization report, and free product recovery report to be submitted by the installation to the EPA or State agency in accordance with their respective regulations. In addition, a release investigation report and/or corrective action plan may be required by the EPA or State agency.

Installations will clean up soil and groundwater contamination resulting from UST releases per approved corrective action plan or as otherwise authorized or requested by the EPA or State agency. Prior to any cleanup, the installation will notify the EPA or State agency.

Installations will remove free-floating product to the maximum extent practicable.

Out-of-Service UST Systems and Closure

Installations will maintain corrosion protection systems during temporary closure of UST system even if the system is empty. Continue to operate release detection systems unless the system is emptied.

When temporarily closing USTs for 3 months or more, leave vent lines open and functioning and cap and secure all other lines, pumps, manways, and ancillary equipment.

Installations will either meet the standards for USTs by upgrading or replacing them or will permanently close USTs that do not meet the standards within 12 months of temporary closure unless the EPA or State agency grants an extension.

Installations will notify the EPA or State agency at least 30 days in advance of UST permanent closure. For a permanent closure, empty, clean, and either fill USTs with a solid inert material or remove them from the ground. Preferably, installations will remove associated pipings and ancillary equipment associated with USTs; if not, they shall cap, blank flange, and keep records of actions taken during closure. The installation shall conduct a site assessment at the time of permanent closure per local, state and Federal regulations. If contamination is encountered during closure, the installation will initiate corrective action. For USTs regulated under SPCC regulations, the UST cannot be considered "permanently closed until all product and sludge have been removed from the tank and associated lines, all connecting lines, and piping have been disconnected from the container and blanked off; all valves, except ventilation valves, have been closed and locked; and conspicuous signs have been posted on each container stating that it is a permanently closed container and the closure date.

13-5 Navy Policy

13-5.1 The Navy's ST Program policy is to comply with all applicable Federal, State, and local regulations pertaining to the management of ASTs and USTs. However, because of the limited waiver of Federal sovereign immunity to the regulation of ASTs (e.g., the requirement that the AST could have an impact on "navigable water of the U.S." (see 40 CFR §. 112), legal counsel should be contacted if there are any questions concerning compliance with state or local AST regulations.

13-5.2 Whenever possible, the Navy shall replace older, unprotected steel tanks with state-of-the-art ASTs or state-of-the-art double-wall fiberglass USTs with continuous interstitial monitoring. Preferred method of UST system closure is by removal. Installations shall leave a UST system in the ground and fill it with an inert material only when extenuating circumstances preclude the removal of a UST system.

13-5.3 Navy installations with STs shall have a tank management plan containing the following information:

- Listing of all STs at the installation.

- Regulatory requirements for each ST.
- A plan of action for achieving and maintaining compliance through monitoring, testing, inspection, removal, repair, retrofit, and replacement, of ST systems.
- Testing, inspection, maintenance, and repair schedules for ASTs and USTs.
- Include or reference compliance inspection records of ASTs and USTs. Installations should include in the ST management plan all STs that have potential to cause environmental damages and/or health hazards, as well as non-regulated ASTs that are likely to be included in future Federal, State, or local regulations.

13-5.4 SPCC Plans. Installations will determine if a SPCC Plan is required. If so the installation will ensure that a Plan is in place that complies with EPA SPCC regulations. SPCC Plan requirements are covered in greater detail in Chapter 11 of this instruction.

13-5.5 Training. Commanders of shore installations shall ensure that all personnel involved in design, construction, installation, management and operation of storage tanks, receive appropriate storage tank training. They shall include the following topics in this training as applicable: Contents of the installation SPCC Plan; Federal, state, and local regulations pertaining to storage tank inspection and maintenance requirements; spill response procedures; standard operating procedures for transfers of oil or filling tanks; corrosion protection measures; compliance records; release detection reporting, investigation, and confirmation; corrective action plans; closure, site assessment, , monitoring, removal, repair, retrofit, replacement, remediation, leak detection and product inventory requirements, record keeping, and operation of monitoring systems.

Chapter 17 – Pesticide Compliance Ashore

This chapter provides policy, safety and compliance requirements relative to the procurement, storage and use of pesticides at Navy shore installations. The requirements apply within the United States, possessions, and trust territories. Responsibility for Navy pest management program oversight is assigned jointly to NAVFAC and BUMED, which is responsible for disease vector surveillance and control, and safety matters.

17-4.4 Wastewater Discharges. Installations shall prohibit the discharge of any wastewater from any pesticide mixing, or equipment cleanup area. Rinsate from triple-rinsed containers shall be applied to the application site in accordance with the pesticide label.

17-4.11 Pesticide Spill Management

Spill Management. The installation IPM Plan shall address a plan for pesticide spill management, coordinated with the installation's HM/HW programs, and included in the installation's Oil and Hazardous Substance spill contingency plans (see chapter 12) Ready to-use pesticide spill kits must be present in every storage and mixing facility, and in vehicles used to transport or apply pesticides. Contractors shall be responsible for providing their own spill kits.

Chapter 22 – Environmental Compliance Afloat

OPNAVINST 5090.1D, Chapter 22 – Environmental Compliance Afloat contains clear guidelines for the management and discharge of waste from naval vessels. As a general rule, “While transiting National Marine Sanctuaries, ships and submarines shall avoid any adverse impacts on Sanctuary resources and qualities. Ships and submarines shall minimize, to the maximum extent practicable, any solid waste, sewage, or bilge water discharges (OPNAVINST 5090.1D 22-9)

In the 0 to 3 nm zone, specific Navy vessel pollution control discharge restrictions include, but are not limited to: sewage (black water), gray water, oily waste, garbage (non-plastics), garbage (plastics), hazardous materials, and medical waste. The rigorous waste management practices implemented by the Navy have very significant long-term beneficial effects for coral, coral reefs, shell fish, fin fish, sea turtles and nearly all forms of marine life.

Ballast Water Exchange Regulations

As per OPNAVINST 5090.1c part 22-15.11.25, this information is logged on an individual ship basis in the ship's engineering log; there is no central repository for ballast loading and unloading locations for Navy ships. The engineering log entries include geographical position and the amount of ballast water loaded or unloaded.

Ships operating in nearshore waters: In some instances, it is necessary for ships to load ballast water within 3 nm from land (e.g. amphibious ships operating in nearshore waters ballasting to operate landing craft, tankers ballasting to replace offloaded cargo) In such cases, ballast water is unloaded in waters outside 12 nm from shore. The procedure then calls for taking on clean seawater outside the 12 nm distance and two ballast tank discharges prior to entry within 12 nm zone.

The procedures in OPNAVINST 5090.1c allow for two exceptions:

- (1) For localized operations, ballast water may be released in the same waters because ballast water unloaded would essentially be the same as the ballast water taken on. Amphibious vehicles fall under this exception.
- (2) Ballast water exchange is also not required when a vessel reenters within 12 nm the same locale as the ballast water was initially loaded. OPNAVINST 5090.1c defines "same locale" as water taken from within 12 nm, of the mouth of the same harbor, port, river, estuary, or bay, or from the same landlocked waterbody.

Transiting ships operating as part of major exercises: Vessel movements to Guam as part of major exercises adhere to ballast water exchange procedures, as described in COMNAVMARIANAS INSTRUCTION 3500.4 (Marianas Training Handbook) After departing from the last extra-regional (e.g., Hawaii, Okinawa) port of call, vessels flush ballast tanks and associated equipment a minimum of three times while en route to Guam and CNMI waters. A final ballast tank flush is required when the vessel is between 200 and 50 nm from the Guam or CNMI coastlines. After this final flush, a notification is sent to the Combined Exercises Support Group (CESG), which coordinates all of the environmental monitoring for activities that occur during major exercises. For planned major exercises, (e.g., RIMPAC 2010), MBP awareness and COMNAVMARIANAS INSTRUCTION 3500.4 are being staffed to major exercise coordinating offices.

Routine training and exercises at sea: Routine training and exercises at sea generally are associated with transits, maneuvering, safety and engineering drills, replenishments, flight operations, and shipboard or airborne gunnery, missile, or torpedo firings. The ballast water protocols are the same for ships and subs participating in major exercises, with the exception that there is no CESG reporting requirement.

Bio-security

The ballast water practices just described obviously enhance bio-security and reduce the likelihood that corals or coral reefs are adversely impacted by alien or invasive species. In addition to ballast water, fouling communities which grow on the hulls of all ships can be a vector for alien and/or invasive species. The NAVSEA 005C Underwater Ships Husbandry (UWSH) group allows the Navy to increase the

frequency of anti-fouling treatments, thereby decreasing the successional stages of fouling community development and increasing protection for corals and associated organisms. Full scale hull cleaning is routinely conducted in dry docks and the effluent is treated and disposed off in compliance with all applicable Federal, State and local regulations.

Bio-security is taken very seriously at all Navy installations. A key element of the Navy's fish and wildlife management programs is to prevent the introduction of new non-indigenous aquatic species into its harbors in order to avoid detrimental impacts to the ecosystem. The most significant case of an alien species adversely impacting corals and coral reefs at Navy installations can be found in Hawaii. In that case Red algae (*Gracillaria salicornia*) was intentionally introduced by the State of Hawaii for aquaculture purposes. The algae spread rapidly throughout the Main Hawaiian Islands and in many cases has over grown, smothered and killed corals. To help ensure that the Navy does not inadvertently introduce alien and/or invasive species, Bio-Security Plans are currently being prepared for various installations. When implemented, these plans are expected to provide an additional and significant level of protection to corals and coral reefs at Navy facilities. It must be remembered, however, that the Navy has no control over the introduction of alien and invasive species to adjacent areas via commercial vessels, aquarium collectors and so on.

REFERENCES

INTRODUCTION

- Carpenter KE, Abrar M, Aeby G, Aronson RB, Banks S, Bruckner A, Chiriboga A, Cortés J, Delbeek JC, DeVantier L, Edgar GJ, Edwards A, Fenner D, Guzmán HM, Hoeksema BW, Hodgson G, Johan O, Licuanan WY, Livingstone SR, Lovell ER, Moore JA, Obura DO, Ochavillo D, Polidoro BA, Precht WF, Quibilan MC, Reboton C, Richards ZT, Rogers AD, Sanciangco J, Sheppard A, Sheppard C, Smith J, Stuart S, Turak E, Veron JEN, Wallace C, Weil E, Wood E. 2008. One-third of reef-building corals face elevated extinction risk from climate change and local impacts. *Science*, 321:560-563.
- Dollar SJ, Hochberg EJ. 2009. *Assessment of benthic community structure in the vicinity of the proposed turning basin and berthing area for carrier vessels nuclear (CVN) Apra Harbor, Guam*. Tec Inc, Honolulu, HI, 33 pp.
- DoN. 2007a. *Naval Air Station Key West maritime areas benthic survey results*. Final Report. Prepared for Ecology and Environment, Inc., Tallahassee, FL, by CSA International, Inc., Stuart, FL.
- DoN. 2007b. *Post-dredging resource impact assessment monitoring survey final report for the Key West Harbor dredge project*. Final Report. Naval Facilities Engineering Command, North Charleston, SC, by CSA International, Inc., Jupiter, FL.
- Fenner D. 2005. *Corals of Hawaii: A Field Guide to the Hard, Black and Soft Corals of Hawaii and the Northwest Hawaiian Islands, Including Midway*. Mutual Publishing: Honolulu, HI. 143 pp.
- Kar JR, Chu EW. 1999. *Restoring life in running waters: better biological monitoring*. Island Press, Washington, DC. 206 pp.
- Minton D, Foster K, Kessler C, Suhkraj N, Brown V, Kolinski S, Dugger K, Schils T, Flores T, Tenorio M, Trianni M, Houk P, Iguel J, Starmer J. 2009. *Marine Resource Survey of Tinian, Commonwealth of the Northern Mariana Islands (Volume 1)* Headquarters United States Marine Corps Technical Report, 55 pp.
- Pennisi E. 2002. A coral by any other name. *Science, New Series*, 296:1949-1950.

- Riegl B, Moyer RP, Walker BK, Kohler K, Gilliam D, Dodge RE. 2008. *A tale of germs, storms and bombs: geomorphology and coral assemblage structure at Vieques (Puerto Rico) compared to St. Croix (U.S. Virgin Islands)*. *J. of Coastal Research* 24:1008-1021.
- Shearer TL, Coffroth MA. 2006. Genetic identification of Caribbean scleractinian coral recruits at the Flower Garden Banks and the Florida Keys. *Marine Ecology Progress Series*, 306:133-142.
- Smith SH. 2007. *Ecological assessment of stony corals and associated organisms in the eastern portions of Apra Harbor, Guam*. Naval Facilities Engineering Command Technical Report, Pearl Harbor, HI, 32 pp.
- Smith SH. 2006. *Marine ecological reconnaissance of selected shoal areas within Apra Harbor, Guam*. Naval Facilities Engineering Command Technical Report, Pearl Harbor, HI, 19 pp.
- Smith SH, Marx DE. 2006. *Assessment of stony corals between Orote Point and Sumay Cove Apra harbor, Guam*. Naval Facilities Engineering Command Technical Report, Pearl Harbor, HI, 31 pp.
- Smith SH, Deslarzes KJP, Brock R. 2006. *Characterization of Fish and Benthic Communities of Pearl Harbor and Pearl Harbor Entrance Channel Hawai'i*. Naval Facilities Engineering Command Technical Report, Pearl Harbor, HI, December, 73 pp.
- Veron JEN. 2000. *Corals of the world* (Volumes 1-3) Australian Institute of Marine Science, Queensland, Australia, 1382 pp.
- Wallace CC, Willis BL. 1994. The systematics of *Acropora*: the effect of new biological findings on species concepts. *Annual Review of Ecology, Evolution, and Systematics*, 25:237–62.
- Willis BL, van Oppen MJH, Miller DJ, Vollmer SV, Ayre DJ. 2006. The Role of Hybridization in the Evolution of Reef Corals. *Annual Review of Ecology, Evolution, and Systematics*, 37:489-517

DEFINITION OF CORAL, CORAL REEF, AND CORAL REEF ECOSYSTEM

- Spalding MD, Green EP, Ravilious C. 2001. *World Atlas of Coral Reefs*. University of California Press. 423 pp.
- Veron JEN. 2000. *Corals of the world* (Volumes 1-3) Australian Institute of Marine Science, Queensland, Australia, 1382 pp.

BRIEF REVIEW OF CORAL TAXONOMY AND BROAD CORAL BIOGEOGRAPHIC REGIONS

- Carpenter KE, Abrar M, Aeby G, Aronson RB, Banks S, Bruckner A, Chiriboga A, Cortés J, Delbeek JC, DeVantier L, Edgar GJ, Edwards A, Fenner D, Guzmán HM, Hoeksema BW, Hodgson G, Johan O, Licuanan WY, Livingstone SR, Lovell ER, Moore JA, Obura DO, Ochavillo D, Polidoro BA, Precht WF, Quibilan MC, Reboton C, Richards ZT, Rogers AD, Sanciangco J, Sheppard A, Sheppard C, Smith J, Stuart S, Turak E, Veron JEN, Wallace C, Weil E, Wood E. 2008. One-third of reef-building corals face elevated extinction risk from climate change and local impacts. *Science*, 321:560-563.
- Dollar SJ, Hochberg EJ. 2009. *Assessment of benthic community structure in the vicinity of the proposed turning basin and berthing area for carrier vessels nuclear (CVN) Apra Harbor, Guam*. Tec Inc, Honolulu, HI, 33 pp.
- DoN. 2007a. *Naval Air Station Key West maritime areas benthic survey results*. Final Report. Prepared for Ecology and Environment, Inc., Tallahassee, Florida, by CSA International, Inc., Stuart, Florida.

- DoN. 2007b. *Post-dredging resource impact assessment monitoring survey final report for the Key West Harbor dredge project*. Final Report. Naval Facilities Engineering Command, North Charleston, South Carolina, by CSA International, Inc., Jupiter, Florida.
- Fenner D. 2005. *Corals of Hawaii: A Field Guide to the Hard, Black and Soft Corals of Hawaii and the Northwest Hawaiian Islands, Including Midway*. Mutual Publishing, Honolulu, HI. 143 pp.
- Kar JR, Chu EW. 1999. *Restoring life in running waters: better biological monitoring*. Island Press, Washington, DC, 206 pp.
- Minton D, Foster K, Kessler C, Suhkraj N, Brown V, Kolinski S, Dugger K, Schils T, Flores T, Tenorio M, Trianni M, Houk P, Iguel J, Starmer J. *Marine resource survey of Tinian, Commonwealth of the Northern Mariana Islands* (Vol. 1) Headquarters US Marine Corps Technical Report, 55 pp.
- Pennisi E. 2002. A coral by any other name. *Science, New Series*, 296(5575):1949-1950.
- Riegl B, Moyer RP, Walker BK, Kohler K, Gilliam D, Dodge RE. 2008. A tale of germs, storms and bombs: geomorphology and coral assemblage structure at Vieques (Puerto Rico) compared to St. Croix (U.S. Virgin Islands) *Journal of Coastal Research*, 24(4):1008-1021.
- Shearer TL, Coffroth MA. 2006. Genetic identification of Caribbean scleractinian coral recruits at the Flower Garden Banks and the Florida Keys. *Marine Ecology Progress Series*, 306:133-142.
- Smith SH. 2007. *Ecological assessment of stony corals and associated organisms in the eastern portions of Apra Harbor, Guam*. Naval Facilities Engineering Command Technical Report, 32 pp.
- Smith SH. 2006. *Marine ecological reconnaissance of selected shoal areas within Apra Harbor, Guam*. Naval Facilities Engineering Command Technical Report, 19 pp.
- Smith SH, Marx DE. 2006. *Assessment of stony corals between Orote Point and Sumay Cove Apra Harbor, Guam*. Naval Facilities Engineering Command Technical Report, 31 pp
- Smith SH, Deslarzes KJP, Brock R. 2006. *Characterization of Fish and Benthic Communities of Pearl Harbor and Pearl Harbor Entrance Channel, Hawaii*. Final Report- December. Contract Number: N62470-02-D-997; Task Order Number: 0069. (Funded by: Department of Defense Legal Resource Management Program, Project Number 03-183 – Naval Facilities Engineering Command) 73 pp.
- Spalding M. 2007. Marine Ecoregions of the World, *Bioscience*, 57(7):573-584.
- Veron JEN. 2000. *Corals of the world* (Vols 1-3) Australian Institute of Marine Science, Queensland, Australia. 1382 pp.
- Waddell JE and Clarke A. eds. 2008. *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States:2008*. 569 pp.
- Wallace CC, Willis BL. 1994. The systematics of *Acropora*: the effect of new biological findings on species concepts. *Annual Review of Ecology, Evolution, and Systematics*, 25:237–62.
- Willis BL, van Oppen MJH, Miller DJ, Vollmer SV, Ayre DJ. 2006. The Role of Hybridization in the Evolution of Reef Corals. *Annual Review of Ecology, Evolution, and Systematics*, 37:489-517.

DE-FACTO MARINE PROTECTED AREAS

- Deslarzes, KJP; Evans DJ and S.H. Smith. 2005. Marine biological survey at United States Navy Support Facility Diego Garcia British Indian Ocean Territory, August 2005. 149 pp.
- Deslarzes KJP, Nawojchik R, Evans DJ, McGarrity CJ, Gehring P. 2006. The condition of fringing reefs off former military training areas at Isla de Culebra and Isla de Vieques, Puerto Rico: preliminary results. *Proceedings of 10th International Coral Reef Symposium*, 11152-1159.

- DOD. 2005. *An assessment of the condition of coral reefs off the former Navy bombing ranges at Isla De Culebra and Isla De Vieques, Puerto Rico*. Department of Defense Legacy Program. Contract Number: USACE DACA87-03-H-0014. Prepared by Geo-Marine, Inc., Plano, TX.
- DoN. 1999. Ecological assessment of the potential consequences of the Military Sealift Command's ship husbandry activities at Diego Garcia. October 1999, by SH Smith. 150pp.
- DoN. 2001. *Navy lands on Vieques Final Draft INRMP. Plan Years: 2003-2012*. Prepared for Naval Facilities Engineering Command Atlantic by Geo-Marine, Inc., Plano, TX.
- DoN. 2005. *Coral reef monitoring protocol development Naval Station Guantanamo Bay (GTMO), Cuba*. Final Report. Contract N62470-02-D-9997, CTO 0011. Prepared for Naval Facilities Engineering Command, Norfolk, by Geo-Marine, Inc., Plano, TX.
- DoN. 2007. *Coral reef monitoring at Naval Station Guantanamo Bay (GTMO), Cuba*. Contract N62470-02-D-997, CTO 0089. Prepared for Naval Facilities Engineering Command, Norfolk, by Geo-Marine, Inc., Plano, TX.
- DoN. 2003. *Marine Natural Resource Survey White Beach Naval Complex Okinawa, Japan October 28 – November 4, 2003*, by Smith SH. NAVFAC Technical Report. 36 pp.
- DoN. 2004. *Integrated Natural Resources Management Plan Commander Fleet Activities Okinawa, Japan*. Naval Facilities Engineering Command Pacific. September.
- DoN. 2008. Corals and sediment in Diego Garcia lagoon and the effects of ship anchoring, by C Sheppard, SH Smith, J Turner, DE Marx Jr. May. 26pp.
- Evans DJ, Nawojchik R, Deslarzes KJP. 2006. The status of coral reef fish populations off former military ranges at the islands of Culebra and Vieques, Puerto Rico: preliminary data. *Proceedings of 10th International Coral Reef Symposium*, 1105-1109.
- Halpern BS. 2003. The impact of marine reserves: do reserves work and does reserve size matter? *Ecological Applications*, 13: S117–S137.
- Harriott VJ, Davies D, Banks SA. 1997. Recreational diving and its impacts in marine protected areas in Eastern Australia. *Ambio*. 26. 173-179.
- Riegl B, Moyer RP, Walker BK, Kohler K., Gilliam D., Dodge RE 2008. A tale of germs, storms, and bombs: geomorphology and coral assemblage structure at Vieques (Puerto Rico) compared to St. Croix (U.S. Virgin Islands) *Journal of Coastal Research*, 24(4), 1008–1021.
- Roberts CM, Bohnsack JA, Gell F., Hawkins JP, Goodridge R. 2001. Effects of marine reserves on adjacent fisheries. *Science*, 294: 1920–1923.
- Selig ER, Bruno JF 2010. A Global Analysis of the Effectiveness of Marine Protected Areas in Preventing Coral Loss. *PLoS ONE*, 5(2): e9278. doi:10.1371/journal.pone.0009278.
- Van Treech P, Schumacher H. 1998. Mass diving tourism-a new dimension calls for new management approaches. *Marine Pollution Bulletin*. 37:8-12, 499-504.
- Sudara S. Nateekarnchanalap S. 1988. Impact of tourism development on the reefs of Thailand. *Proc. 6th Int. Coral Reef Symposium*. Townsville. Australia 2. 273- 278.

APPENDIX O

INFORMATION SUPPORTING INVASIVE SPECIES MANAGEMENT

BTS Research by USGS-BRD and USDA-NWRC on JRM Lands

Below are finite projects that have taken place or will take place on DOD lands (NBG and AAFB) on Guam. The only project that is directly NAVFAC Marianas funded is project #2 below. The other projects were initiated and funding secured by the performing agencies with field work conducted on DOD lands (NBG and/or AAFB).

1. TITLE: Targeted aerial application of acetaminophen for Brown treesnake control on Guam.

PERFORMING AGENCY: USDA-NWRC/USDA-WS (Dr. Pete Savarie)

TIME FRAME: Beginning of FY12 (18 months)

FUNDING SOURCE: DOD/Environmental Security Technology Certification Program (**ESTCP**)

LOCATION: Andersen AFB (MSA1) and NBG TS

PURPOSE: The purpose of the proposed action is to further develop the aerial delivery of oral toxicants used in controlling BTS populations on Guam, to facilitate population suppression in larger, undeveloped landscapes across the island.

PROJECT:

To further the development of aerial delivery of oral toxicants for controlling BTS, the USDA, WS, National Wildlife Research Center (NWRC) and the Guam WS operational program are proposing an approximately 16-month long joint research-operational aerial toxicant project on northern Guam. The proposed project would occur on the Habitat Management Unit (HMU) within the Munitions Storage Area of Andersen Air Force Base and adjoining DOD property. Two blocks of forest, totaling 110 hectares, would be exposed to intermittent application of toxicants via a commercially-leased helicopter, with 55 hectares of adjacent property serving as a control (or baseline) site. The HMU is surrounded by a barrier which blocks immigration by BTS; the second forest block is not surrounded by a barrier, and therefore is open to BTS immigration and emigration.

Specific results expected from the ESTCP project include: the development of a functional navigational system needed to ensure even landscape-level coverage of baits; refinement of the delivery process for applying baits via a helicopter; an understanding of the population-level impacts bait application will have on a contained and uncontained BTS population; and improved processes for ensuring bait flaggers are effectively suspended from forest canopies.

The potential benefits from this effort will greatly increase the capacity of operational BTS control programs, subsequently reducing the impacts of snakes on Guam and the risk of BTS dispersal from Guam (Savarie et al. 2001). However, the addition of aerielly-delivered oral toxicants to existing control programs is not expected to facilitate complete BTS eradication from Guam.

2. TITLE: Brown Treesnake on U.S. Navy Facilities on Guam research to inform large-scale population suppression efforts.

PERFORMING AGENCY: USGS BTS Project (Dr. Robert Reed)

TIME FRAME: OCT 2010 to MAR 2012 (18 months)

FUNDING SOURCE: NAVFAC MARIANAS

LOCATION: 3 Sites on Naval Base Guam and 3 Sites on Andersen AFB

PURPOSE: To investigate the length of time for recovery after suppression of Brown treesnakes on Guam and a baseline study of population structure in various habitats on Navy lands on Guam that will enable better management and control of the species.

PROJECT:

Assess the effects of a large-scale knockback of Guam's Brown Treesnake population

1. Develop a plan of action and milestones to precisely estimate the depth of the Brown Treesnake (BTS) population decline and the duration of population reduction using a fenced (12.5 acre) area containing a population of totally enumerated Brown Treesnakes on Andersen Air Force Base, Guam
2. Conduct pre-treatment monitoring of the enclosed BTS population to establish absolute numbers within the enclosure and mark previously unmarked individuals as needed. Monitoring will follow standard operating protocols previously established for this population
3. Conduct population reduction of BTS within enclosure to specified levels.
4. Conduct immediate monitoring of BTS within enclosure to enumerate the post-treatment population.
5. A final report will be in the form of a USGS Administrative Report tallying the results of the first two monitoring efforts, and will quantify the depth of the population reduction.
6. A final briefing will be made to Navy staff at the completion of the project.

Brown Treesnake surveys on U.S. Navy lands to inform plans for suppression

1. Conduct an assessment of BTS size distributions, body conditions, dietary composition and reproductive status of snakes in three limestone forest habitats: Northwest Field, Naval Ordnance Site, and a third site on Navy lands to be determined.
2. Conduct an assessment of BTS size distributions, body conditions, dietary composition and reproductive status of snakes in two pure *Leucaena* stands: AAFB Communication Annex and Orote Point or other suitable areas.
3. Conduct an assessment of BTS size distributions, body conditions, dietary composition and reproductive status of snakes in scrub forest habitat: AAFB Marbo Annex or other suitable area.
4. Conduct an assessment of BTS size distributions, body conditions, dietary composition and reproductive status of snakes in savanna complex habitat Navy lands to be determined
5. Conduct an assessment of BTS size distributions, body conditions, dietary composition and reproductive status of snakes in ravine forest habitat on the Naval Ordnance Site

3. TITLE: Investigation of a protein substrate for BTS Attraction and baits

PERFORMING AGENCY: USDA-NWRC

TIME FRAME: March 2011 (3 weeks) (Dr. Tom Mathies)

FUNDING SOURCE: Dept. of Interior

LOCATION: 1 Site on Naval Base Guam and 2 Sites on Andersen AFB

PURPOSE: To develop effective BTS bait that can be used in traps or in an aerial delivery system. Dead neonatal mice (DNM), which are currently being used, are effective bait for BTS, but pose many logistical challenges that reduce effectiveness and greatly increase costs. Alternative bait that eliminates, or mitigates, these problems could significantly reduce the cost of BTS control operations on Guam. However, alternative to DNM as bait for BTS have been difficult to identify because the sensory attributes (taste and odor) of DNM are not easily replicated with non-prey food items.

PROJECT: Bait cubes prepared from dead neonatal mice (DNM) pelts will be field tested in Guam by bioassay with free-ranging brown treesnakes (BTS). At the same time, characterization of DNM pelts will be used to identify alternative sources of similar proteins. One or two proteins that share the greatest flavor attributes with DNM will then be subjected to a second round of field testing in Guam.

4. TITLE: Development of non-prey baits for delivery of acetaminophen to brown treesnakes (*Boiga irregularis*) on Guam.

PERFORMING AGENCY: USDA-NWRC (Dr. Pete Savarie)

TIME FRAME: July 2011 (3 weeks)

FUNDING SOURCE: DOD/Strategic Environmental Research and Development Program (SERDP)

LOCATION: 2 Site on Naval Base Guam and 2 Sites on Andersen AFB

PURPOSE: For logistical and economical reasons, there is a need to develop an effective bait matrix to replace dead neonatal mice (DNM) for control and eradication of BTS. DNM are relatively expensive, have to be shipped frozen and maintained frozen until applied in the field, and have a field life of only 2-3 days. An artificial bait matrix that is less expensive, can be stored at room temperature before application in the field, and has a longer field life would be more efficient for operational use.

PROJECT: Field testing bait take of beef cubes treated with decomposition products of dead neonatal mice. Two types of DNM decomposition products will be tested.

THIS PAGE INTENTIONALLY LEFT BLANK