FINAL

ENVIRONMENTAL IMPACT STATEMENT FOR THE MASTER PLAN FOR DEEP-DRAFT WHARF AND FILL IMPROVEMENTS AT APRA HARBOR



Apra Harbor, Piti, Guam

Prepared in Compliance with:
U.S. Department of Commerce, EDA,
Federal Grant No. 07-01-05196

Prepared For:
The Port Authority of Guam

Prepared By:
U.S. Army Corps of Engineers,
Honolulu District
and
Wil Chee – Planning, Inc.
1018 Palm Drive
Honolulu, Hawaii 96814

FEBRUARY 2009

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JULY 2007

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RE: EDA Award No. 07-01-05196
Design and E.I.S. Development for the Apra Outer Harbor Deep Wharf

Gentlemen:

To summarize our telephone conversation of November 17/18, 2008 to complete the issues with the Environmental Impact Statement (EIS) associated with the subject project, the Economic Development Administration (EDA) concludes:

1. The EIS prepared by the U.S. Army Corps of Engineers for the expansion of the deep draft wharf facilities at Apra Harbor cannot be finalized because EDA declines to sign the Record of Decision; and

2. Due to this situation, EDA amended the EDA Award (Amendment No. 3 dated July 24, 2007) to:

   a. Modify a portion of the scope of work to "provide funding for the U.S. Army Corps of Engineers to prepare an environmental document for the master plan in accordance with the National Environmental Policy Act of 1969"; and
   b. Modify Special Condition No. 10 "U.S. Army Corps of Engineers" to the EDA Award to "The Recipient shall provide evidence satisfactory to EDA that the U.S. Army Corps of Engineers has completed the necessary environmental document for the master plan design to develop an expansion of the deep draft wharf facilities at Apra Harbor; and, any mitigation measures developed will be identified in the master plan, as appropriate."

Therefore, EDA determines the following:

1. Completion of the EIS documents and process without a signed Record of Decision is acceptable to EDA;
2. All work conducted by the U.S. Army Corps of Engineers regarding the EDA Award is acceptable to EDA; and
3. The U.S. Army Corps of Engineers may release the appropriate project documentation to the Port Authority of Guam.

EDA hopes this is sufficient to satisfy all outstanding issues. If you have any questions or comments, please contact me.

Sincerely,

Kristine L Skrinde

Kristine L. Skrinde
Project Manager
Economic Development Administration

TABLE OF CONTENTS

TABLE OF CONTENTS i
LIST OF TABLES ix
LIST OF FIGURES xiv
ACRONYMS AND ABBREVIATIONS xvi
EXECUTIVE SUMMARY ES-1
ES-1.0 Introduction ES-1
ES-2.0 Need for the Project ES-1
ES-3.0 Description of Reasonable Alternatives ES-2
ES-4.0 Environmental Consequences and Mitigation ES-4
ES-5.0 Comparison of Alternatives and Potential Environmental Impacts ES-12
ES-6.0 Cumulative Impacts ES-13
1.0 PROJECT OVERVIEW 1
1.1 INTRODUCTION 1
1.2 ROLES AND RESPONSIBILITIES 2
1.2.1 Scope and Authority 3
1.2.2 Definition of Alternatives 4
1.3 PROJECT LOCATION AND BACKGROUND 4
1.3.1 Introduction 4
1.3.2 Apra Harbor 4
1.3.3 The Port Authority of Guam 5
1.3.4 Project Background and Description 6
1.3.5 Project Schedule and Cost 8
1.4 PURPOSE OF AND NEED FOR ACTION 8
1.4.1 Existing Conditions at Apra Harbor 8
1.4.1.1 Introduction 8
1.4.1.2 Commercial Shipping 9
1.4.1.3 Commercial Fishing 12
1.4.1.4 Cruise and Excursion Vessels 13
1.4.2 Future Demands on Apra Harbor 14

1.4.2.1 Commercial Shipping 14
1.4.2.2 Commercial Fishing 16
1.4.2.3 Cruise and Excursion Vessels 16
1.4.3 Consistency with Plans and Policies 17
1.4.4 Statement of Purpose and Need for the Proposed Project 17
2.0 PROJECT ALTERNATIVES INCLUDING THE PROPOSED ACTION 19
2.1 INTRODUCTION 19
2.2 IDENTIFICATION OF REASONABLE AND FEASIBLE ALTERNATIVES 19
2.2.1 Location, Land Area, and Access Requirements 19
2.2.2 Site Development Requirements for Container Cargo Operations 20
2.2.3 Alternative Identification Process 21
2.2.3.1 Tier 1 Evaluation to Identify Potential Project Locations 21
2.2.3.2 Results of the Tier 1 Evaluation Process 22
2.2.3.3 Tier 2 Evaluation to Identify Potential Project Locations 22
2.2.3.4 Results of the Tier 2 Evaluation Process 23
2.2.3.5 Tier 3 Evaluation of Feasible Design Alternatives 24
2.3 ALTERNATIVES CONSIDERED AND ELIMINATED FROM FURTHER CONSIDERATION 24
2.3.1 Alternate Sites Outside Apra Harbor 24
2.3.2 Alternate Sites Within Apra Harbor 24
2.3.2.1 Floating Pier Design Alternative (Site #1) 24
2.3.2.2 Renovation of Existing Wharf Facilities (Site #2) 25
2.3.2.3 Conversion of the former SRF Alternative (Site #3) 25
2.4 ALTERNATIVES IDENTIFIED FOR FURTHER ANALYSIS 26
2.4.1 No Action Alternative 26
2.4.2 Proposed Project (Preferred Alternative): Pier on Piles Deep Draft Wharf and Land Reclamation 27
2.4.2.1 Deep-Draft Wharf 27
2.4.2.2 Land Reclamation Sites 29
2.4.3 Alternate Design (Alternative 2): Cellular Sheet Pile Deep Draft Wharf and Land Reclamation 31

2.4.3.1 Deep Draft Wharf 31
2.4.3.2 Land Reclamation Sites 33
2.4.4 Alternate Location (Alternative 3): Golf Pier/Southwest Point Fixed Pier Alternative 33
3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 35
3.1 LAND USE AND COASTAL ZONE MANAGEMENT 35
3.1.1 Introduction 35
3.1.1.1 Land Use 35
3.1.1.2 Coastal Zone Consistency 36
3.1.2 Affected Environment 37
3.1.2.1 Land Use 37
3.1.2.2 Coastal Zone Consistency 41
3.1.3 Significance Criteria 43
3.1.4 Environmental Consequences 43
3.1.5 Proposed and Potential Mitigation Measures 45
3.2 SOCIOECONOMIC CONDITIONS AND ENVIRONMENTAL JUSTICE 46
3.2.1 Introduction 46
3.2.2 Affected Environment 47
3.2.2.1 Socioeconomic Conditions 47
3.2.2.2 Environmental Justice 55
3.2.3 Significance Criteria 57
3.2.4 Environmental Consequences 58
3.2.4.1 Socioeconomic Conditions 58
3.2.4.2 Environmental Justice 61
3.2.5 Proposed and Potential Mitigation Measures 63
3.3 INFRASTRUCTURE AND UTILITIES 64
3.3.1 Introduction 64
3.3.2 Affected Environment 66
3.3.3 Significance Criteria 66
3.3.4 Environmental Consequences 67
3.3.4 Proposed and Potential Mitigation Measures 69

3.4 TRAFFIC AND CIRCULATION 69
3.4.1 Introduction 69
3.4.2 Affected Environment 71
3.4.3 Significance Criteria 72
3.4.4 Environmental Consequences 73
3.4.5 Proposed and Potential Mitigation Measures 78
3.5 HISTORIC AND CULTURAL RESOURCES 79
3.5.1 Introduction 79
3.5.2 Affected Environment 82
3.5.3 Significance Criteria 88
3.5.4 Environmental Consequences 89
3.5.5 Proposed and Potential Mitigation Measures 91
3.6 AESTHETIC AND RECREATIONAL RESOURCES 93
3.6.1 Introduction 93
3.6.2 Affected Environment 93
3.6.3 Significance Criteria 95
3.6.4 Environmental Consequences 96
3.6.4 Proposed and Potential Mitigation Measures 99
3.7 PUBLIC HEALTH AND SAFETY 100
3.7.1 Introduction 100
3.7.2 Affected Environment 100
3.7.2.1 Unexploded Ordnance (UXO) 100
3.7.2.2 Explosive Safety Quantity Distance 100
3.7.2.3 Natural Disasters 101
3.7.2.4 Homeland Security 103
3.7.2.5 Hazardous Material Management and Transport 105
3.7.3 Significance Criteria 105
3.7.4 Environmental Consequences 106
3.7.5 Proposed and Potential Mitigation Measures 107
3.8 AIR QUALITY 109
3.8.1 Introduction 109

3.8.2 Affected Environment 111
3.8.3 Significance Criteria 112
3.8.4 Environmental Consequences 113
3.8.5 Proposed and Potential Mitigation Measures 115
3.9 HYDROLOGY AND DRAINAGE 117
3.9.1 Introduction 117
3.9.2 Affected Environment 117
3.9.2.1 Hydrology 117
3.9.2.2 Drainage 118
3.9.3 Significance Criteria 118
3.9.4 Environmental Consequences 119
3.9.5 Proposed and Potential Mitigation Measures 120
3.10 TOPOGRAPHY AND SOILS 120
3.10.1 Affected Environment 120
3.10.2 Significance Criteria 121
3.10.3 Environmental Consequences 121
3.10.4 Proposed and Potential Mitigation Measures 122
3.11 WATER QUALITY AND SEDIMENTS 123
3.11.1 Introduction 123
3.11.1.1 Regulatory Framework 123
3.11.1.2 Required Permits 126
3.11.2 Affected Environment 127
3.11.2.1 Coastal Waters 127
3.11.2.2 Marine Sediments 130
3.11.3 Significance Criteria 131
3.11.4 Environmental Consequences 131
3.11.4.1 Marine Sediments 132
3.11.4.2 Construction Impacts 134
3.11.4.3 Operational-Related Impacts 136
3.11.5 Proposed and Potential Mitigation Measures 138
3.12 BIOLOGICAL RESOURCES 140

3.12.1 Introduction 140
3.12.2 Terrestrial Environment 146
3.12.3 Marine Environment 151
3.12.3.1 General 151
3.12.3.2 Coral Reefs 160
3.12.3.3 Reef Fish 163
3.12.3.4 Essential Fish Habitat (EFH) 171
3.12.4 Significance Criteria 173
3.12.5 Environmental Consequences 174
3.12.5.1 Terrestrial Environment 174
3.12.5.2 Marine Environment 175
3.12.6 Proposed and Potential Mitigation Measures 182
3.12.6.1 Compensatory Mitigation 183
3.12.6.2 Compensatory Mitigation Plan Development 183
3.12.6.3 Potential Compensatory Mitigation Measures 186
3.13 PROTECTED SPECIES 188
3.13.1 Introduction 188
3.13.2 Affected Environment 190
3.13.3 Significance Criteria 192
3.13.4 Environmental Consequences 193
3.13.5 Proposed and Potential Mitigation Measures 194
3.14 NONINDIGENOUS INVASIVE SPECIES 195
3.14.1 Introduction 195
3.14.2 Affected Environment 200
3.14.3 Significance Criteria 204
3.14.4 Environmental Consequences 204
3.14.5 Proposed and Potential Mitigation Measures 206
3.15 NOISE AND VIBRATION 210
3.15.1 Introduction 210
3.15.2 Affected Environment 213
3.15.3 Significance Criteria 215

3.15.4 Environmental Consequences 216
3.15.5 Proposed and Potential Mitigation Measures 220
4.0 SUMMARY OF UNAVOIDABLE IMPACTS, COMMITMENT OF RESOURCES AND CUMULATIVE IMPACTS 222
4.1 UNAVOIDABLE ADVERSE IMPACTS OF THE PROPOSED PROJECT 222
4.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES FROM THE PROPOSED PROJECT 223
4.3 RELATIONSHIP OF SHORT-TERM USES OF MAN'S ENVIRONMENT AND LONG-TERM PRODUCTIVITY 224
4.4 CUMULATIVE EFFECTS 225
4.4.1 Introduction 225
4.4.2 Cumulative Effects Assessment Methodology 225
4.4.3 Geographic Boundaries and Timeframes 225
4.4.4 Identification of Present and Reasonably Foreseeable Future Actions 226
4.4.5 Potential Cumulative Effects 228
4.4.5.1 Land Use and Coastal Zone Management 228
4.4.5.2 Socioeconomic Conditions and Environmental Justice 229
4.4.5.3 Infrastructure and Utilities 229
4.4.5.4 Traffic and Circulation 229
4.4.5.5 Historic and Cultural Resources 230
4.4.5.6 Aesthetic and Recreational Resources 231
4.4.5.7 Public Health and Safety 231
4.4.5.8 Air Quality 232
4.4.5.9 Hydrology, Soils, and Drainage 233
4.4.5.10 Water Quality and Sediments 233
4.4.5.11 Biological Resources 234
4.4.5.12 Noise Quality 235
4.4.6 Summary of Potential Cumulative Effects 236
5.0 LIST OF PREPARERS AND REVIEWERS 237
6.0 CONSULTATION AND COORDINATION 239
6.1 INTRODUCTION 239

6.2 SCOPING 239
6.2.1 The Scoping Process 240
6.2.2 Summary of Key Issues and Concerns Raised During the Consultation and Coordination Process 241
7.0 REFERENCES 246
8.0 APPENDICES 252

Appendix A – Figures
Appendix B – Traffic Impact Assessment Report
Appendix C – Archaeological Investigation Report
Appendix D – National Historic Preservation Act Section 106 Consultation Findings
Appendix E – Coastal Zone Management Consistency Review
Appendix F – Air Quality Impact Report
Appendix G – Coastal Engineering Study
Appendix H – Marine Biological and Water Quality Survey
Appendix I – Fish and Wildlife Coordination Act Report (Draft)
Appendix J – Endangered Species Act Coordination
Appendix K – Acoustical Study
Appendix L – Project Scoping Report
Appendix M – Draft EIS Distribution List
Appendix N – Draft EIS Public Hearing Materials
Appendix O – Draft EIS Comments

LIST OF TABLES

TABLE		PAGE
Table ES-1:	Summary Comparison of Alternatives and Environmental Impacts	ES-12
Table 1-1:	Type and Percentage of Cargo Vessels Calling at Apra Commercial Port	10
Table 1-2:	Cargo Vessel Arrivals and Cargo Tonnage at Apra Commercial Port (2000 – 2005)	11
Table 1-3:	Apra Commercial Port Long-Range Forecast (FY 2000 – 2025)	14
Table 2-1:	Estimated Project Area, Dredge and Fill Volume Requirements (Preferred Alternative)	30
Table 2-2:	Estimated Project Area, Dredge and Fill Volume Requirements (Alternative 2)	33
Table 2-3:	Estimated Project Area, Dredge and Fill Volume Requirements1 (Alternative 3)	34
Table 3-1:	Guam Coastal Management Program Policies Applicable to the Proposed Action	42
Table 3-2:	Guam: Population by District	48
Table 3-3:	Guam: Household Income (1999)	49
Table 3-4:	Guam Population by Ethnic Origin and Race (2000)	55
Table 3-5:	Guam: Poverty Status (1999)	56
Table 3-6:	Levels-of Service Descriptions and Time Delays	70
Table 3-7:	Existing Levels-Of-Service Conditions - Project Vicinity	72
Table 3-8:	Trip Generation Analysis (Preferred Alternative)	75
Table 3-9:	Future Conditions A.M. Peak Hour Level-of-Service Analysis (Preferred Alternative)	75
Table 3-10:	Future Conditions P.M. Peak Hour Level-of-Service Analysis (Preferred Alternative)	76
Table 3-11:	Traffic Volume Changes Along Study Streets (Preferred Alternative)	76

LIST OF TABLES (continued)

TABLE		PAGE
Table 3-12:	Pro Rata Share of Traffic Growth – 2005 through 2025 (Preferred Alternative)	77
Table 3-13:	Submerged Historic Resources in Apra Harbor	87
Table 3-14:	Summary of National and Guam Ambient Air Quality Standards	110
Table 3-15:	Apra Heights Substation, PM10 Data (Oct. 1999 – Sept. 2000)	111
Table 3-16:	Apra Heights Substation, SO2 Data (Oct. 1999 – Sept. 2000)	112
Table 3-17:	Potential Mitigation Measures for Air Quality Impacts from General Construction Open Source	116
Table 3-18:	Summary of Selected Guam Water Quality Standards and Measured Parameters in Apra Harbor	128
Table 3-19:	Water Quality Characteristics for Apra Harbor	128
Table 3-20:	Terrestrial Flora Surveyed Within Project Area	146
Table 3-21:	Algae Species Observed Within Project Area	154
Table 3-22:	Macro-Invertebrate Species Observed Within Project Area	155
Table 3-23:	Number of Coral Colonies Identified Within Project Area	162
Table 3-24:	Coral Species and Colony Abundance Within Project Area	163
Table 3-25:	Reef Fish Species Observed Within Project Area	164
Table 3-26:	Reef Fish Species Abundance Within Project Area	169
Table 3-27:	Top ten fisheries species caught between 1990 through 2004 in area DAWR-1 (area west of Proposed Project improvements)	170
Table 3-28:	Top ten fisheries species caught between 1990 through 2004 in area DAWR-2 (area of Proposed Project improvements)	170
Table 3-29:	Benthic Habitat Areas Impacted (Preferred Alternative)	177
Table 3-30:	Benthic Habitat Areas Impacted (Alternative 2)	179
Table 3-31:	Benthic Habitat Areas Impacted (Alternative 3)	181
Table 3-32:	NIS Introduction and Dispersal Pathways in Marine Environments	200
Table 3-33:	Regulatory Oversight of NIS Control and Introduction in Guam	209

LIST OF TABLES (continued)

TABLE		PAGE
Table 3-34:	Exterior Noise Exposure Classification (Residential Land Use)	211
Table 3-35:	Summary of Building Damage Criteria	213
Table 3-26:	Traffic and Background Noise Measurements in the Apra Harbor Vicinity	214
Table 3-27:	Existing and Future Traffic Noise Levels Along Roadways in the Apra Harbor Project Area	216
Table 3-38:	Future (2025) Project and Non-Project Traffic Noise Contributions	217

LIST OF FIGURES

FIGURE	PAGE
Figure 1-1: Guam Location Map	Appendix A
Figure 1-2: Apra Harbor	Appendix A
Figure 1-3: Cargo Revenue Tons by Vessel Type (FY 94 – FY 05)	Appendix A
Figure 1-4: Total Vessels Calling at Apra Commercial Port	Appendix A
Figure 1-5: Cargo Vessels Calling at Apra Commercial Port	Appendix A
Figure 2-1: Alternative Sites Evaluated	Appendix A
Figure 2-2: Project Site and Vicinity	Appendix A
Figure 2-3: Preferred Alternative – Overall Site Plan	Appendix A
Figure 2-4: Preferred Alternative – Wharf Geometry Plan	Appendix A
Figure 2-5: Preferred Alternative – Wharf Sections	Appendix A
Figure 2-6: Preferred Alternative – Post-Panamax Ship at Berth	Appendix A
Figure 2-7: Preferred Alternative – Post-Panamax Ship at Berth (Sect)	Appendix A
Figure 2-8: Preferred Alternative – Aircraft Carrier at Berth	Appendix A
Figure 2-9: Preferred Alternative – Aircraft Carrier at Berth (Sect)	Appendix A
Figure 2-10: Preferred Alternative – Wharf Dredging Plan	Appendix A
Figure 2-11: Preferred Alternative – Wharf Dredging Sections	Appendix A
Figure 2-12: Preferred Alternative – Reclamation Sites 1 & 2	Appendix A
Figure 2-13: Preferred Alternative – Reclamation Site. 3	Appendix A
Figure 2-14: Preferred Alternative – Reclamations Sites 1, 2, & 3 Dike Sections	Appendix A
Figure 2-15: Preferred Alternative – Reclamation Sites Elevations	Appendix A
Figure 2-16: Alternative 2 – Wharf Geometry	Appendix A
Figure 2-17: Alternative 2 – Wharf Section	Appendix A
Figure 2-18: Alternative 2 – Wharf Elevation	Appendix A
Figure 2-19: Alternative 3 – Conceptual Layout	Appendix A
Figure 3-1: Land Use Map	Appendix A
Figure 3-2: Preferred Alternative – Utilities Plan	Appendix A

LIST OF FIGURES (continued)

FIGURE	PAGE
Figure 3-3: Submerged Historic Resources	Appendix A
Figure 3-4: Recreational Dive Sites – Reefs	Appendix A
Figure 3-5: Explosive Quantity Safety Distance Arcs	Appendix A
Figure 3-6: Flood Zone Map	Appendix A
Figure 3-7: Preferred Alternative – Drainage Plan	Appendix A
Figure 3-8: Soils Map	Appendix A
Figure 3-9: Water Quality Classifications and Sampling Stations	Appendix A
Figure 3-10: Wetlands Map	Appendix A
Figure 3-11: Benthic Habitat – Project Vicinity	Appendix A
Figure 3-12: Coral Species Abundance in Project Area	Appendix A
Figure 3-13: Coral Colony Abundance in Project Area	Appendix A
Figure 3-14: Reef Fish Abundance in Project Area	Appendix A
Figure 3-15: Estimated Impact Area Due to Suspension and Resuspension of Sediment	Appendix A
Figure 3-16: Benthic Habitat Impacted – Preferred Alternative and Alternative 2	Appendix A
Figure 3-17: Benthic Habitat Impacted – Alternative 3	Appendix A
Figure 3-18: Green Sea Turtle Nesting Site	Appendix A
Figure 3-19: Noise Measurement Site Locations	Appendix A
Figure 3-20: Pile Driving Noise Levels in Project Vicinity	Appendix A

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standards
AHPA	Archaeological and Historic Data Preservation Act
AIS	Aquatic Invasive Species
ANS	Aquatic Nuisance Species
APHIS	Animal and Plant Health Inspection Service
AQIR	Air Quality Impact Report
ARPA	Archaeological Resources Protection Act
BGS	Below ground surface
BMP	Best Management Practices
BMPP	Best Management Practices Plan
BRAC	Base Realignment and Closure
BWM	Ballast Water Management
CAA	Clean Air Act
CDF	Confined Disposal Facility
CDP	Census Designated Place
CEDS	Guam Comprehensive Economic Development Strategy
CEPP	Chemical Emergency Preparedness Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CRTF	Coral Reef Task Force
CSI	Container Security Initiative

CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DA	Department of the Army
DAWR	Guam Department of Aquatic and Wildlife Resources
dB	Decibel
dBA	A-Weighted Decibel
DNL	Day-Night Average Sound Level
DO	Dissolved Oxygen
EDA	U.S. Department of Commerce Economic Development Administration
EIS	Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
E.O.	Executive Order
EFDC	Environmental Fluid Dynamics Code
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
FAD	Fish Aggregation Device
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMP	Fisheries Management Plan
FWCA	Fish and Wildlife Coordination Act
FY	Fiscal Year
GAAQS	Guam Ambient Air Quality Standards
GBSP	Guam Bureau of Statistics and Plans
GCMP	Guam Coastal Management Program
GDOL	Guam Department of Labor
GEDA	Guam Economic Development Authority

GEPA	Guam Environmental Protection Agency
GHSP	Guam Harbors Sediment Project
GHRD	Guam Historic Resources Division
GIP	Gross Island Product
GISAC	Guam Invasive Species Advisory Committee
GovGuam	Government of Guam
GPA	Guam Power Authority
GPT	Guam Preservation Trust
GTA	Guam Telephone Authority
GWA	Guam Waterworks Authority
HAPC	Habitat of Particular Concern
HDOH	State of Hawaii Department of Health
HEA	Habitat Equivalency Analysis
HMEOP	Hazardous Materials Emergency Operations Plan
IMO	International Maritime Organization
ITM	Inland Testing Manual
LEPC	Local Emergency Planning Committees
Leq	Equivalent Sound Level
LOS	Level of Service
MARPOL	Marine Pollution
MBTA	Migratory Bird Treaty Act
MBWM	Mandatory Ballast Water Management
Mgd	Million Gallons Per Day
Mg/L	Milligrams per liter
MHW	Mean High Water (Mark)
MHHW	Mean High High Water (Mark)
MLLW	Mean Low Low Water Mark
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
MPA	Marine Protection Area
MPRSA	Marine Protection Research and Sanctuary Act
MSC	Military Sealift Command
MSL	Mean Sea Level
MSTA	Maritime Transportation Security Act
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NANPCA	Nonindigenous Aquatic Nuisance Prevention Control Act
NAVACTS	Naval Activities
NBIC	National Ballast Information Clearinghouse
NEPA	National Environmental Policy Act
NGL	Northern Guam Lens
NGVD	National Geodetic Vertical Datum
NIS	Nonindigenous Invasive Species
NISA	National Invasive Species Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWRC	National Wildlife Research Center

O_3	Ozone
OCRM	Office of Coastal Resources Management
PAG	Port Authority of Guam
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Poly Chlorinated Biphenyl
PM	Particulate Matter
POL	Petroleum, Oil, Lubricant
PPM	Parts per million
PPT	Parts per thousand
PPV	Peak Particle Velocity
PUAG	Public Utilities Agency of Guam
RCRA	Resource Conservation and Recovery Act
RHA	Rivers and Harbors Act
RO/RO	Roll-On/Roll-Off
RWUMP	Recreational Water Use Master Plan
SARA	Superfund Amendments and Reauthorization Act
SCUBA	Self Contained Underwater Breathing Apparatus
SEDF	Scaled Energy Distance Factor
SERC	State Emergency Response Commission
SRF	Ship Repair Facility
SPPC	South Pacific Petroleum Corporation
SWMPP	Storm Water Management and Pollution Prevention
TIAR	Traffic Impact Analysis Report
TPH	Total Petroleum Hydrocarbons
TSP	Total Suspended Particulates
TSS	Total Suspended Solids

USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard
USCS	United States Customs Service
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USNS	United States Naval Ship
UST	Underground Storage Tank
UXO	Unexploded Ordnance
WCO	World Customs Organization
WCP	Wil Chee – Planning, Inc.
WPFMC	Western Pacific Fisheries Management Council
WMRISC	Western Micronesian Regional Invasive Species Committee
WQC	Water Quality Certification
WQS	Water Quality Standards

EXECUTIVE SUMMARY

This Executive Summary includes a brief background and description of the Proposed Project and alternatives contained in the Environmental Impact Statement (EIS), a description of anticipated project-related impacts, and a brief comparison of the environmental consequences of the reasonable alternatives evaluated in the EIS.

ES-1.0 Introduction

Under a federal grant (No. 07-01-05196) from the U.S. Department of Commerce Economic Development Administration (EDA) Public Works Program, the Port Authority of Guam (PAG) is proposing Master Plan improvements to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. The Master Plan improvement projects include 1) the construction of a new 1,500 linear foot deep-draft wharf along a man-made breakwater and 2) the fill of approximately 17 acres of reclaimed land in three shallow man-made embayments within Apra Harbor. The design of the proposed projects has been funded by the Government of Guam with assistance from the Economic Development Administration, U. S. Department of Commerce and the U. S. Army Corps of Engineers (USACE).

This Environmental Impact Statement (EIS) was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, 42 United States Code (USC) §4321 et seq.; the regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500-1508) implementing NEPA.

Pursuant to NEPA this EIS identifies and evaluates a range of reasonable alternatives to accomplish the purpose of and need for the Proposed Project, and to evaluate potential effects that the alternatives may have on the environment. In addition, the federal funding provided to support the Proposed Project under the above mentioned EDA grant triggers the NEPA process and EIS preparation. Per the requirements in the EDA grant, the EIS for the Proposed Project has been prepared by the USACE, with the assistance of a third-party contractor.

Due to time and budgetary limitations this EIS was finalized without a signed Record of Decision as explained in the EDA letter dated December 4, 2008 (following the signature page of this EIS).

ES-2.0 Need for the Project

Presently, waterfront dock space at the Apra Commercial Harbor facilities is severely limited. PAG wharfage facilities comprise a total of 3,920 lineal feet with an average draft of only about 35 feet. Larger container vessels currently calling at Apra Harbor cannot enter the Port fully loaded since they would exceed the Port's draft. Deeper draft vessels are also prohibited from berthing at the existing PAG facilities.

Engineering studies have shown that the existing cargo piers cannot be dredged further as such an action would compromise the structural integrity of the existing pier structures.

While the demand for docking space has increased, there has never been an expansion of wharf infrastructure since the government of Guam exchanged land for wharf space with the federal government back in 1969. In the last few years, the PAG has averaged approximately 150-200 port calls per month, resulting in congested operating conditions, for break-bulk carrier vessels, cement carriers, container ships, cruise vessels and yachts, fishing vessels including long liners and purse seiners, research vessels, tankers, training vessels visiting the region and tugs and barges. There has been an increase in visits by large deep-draft U.S. Naval vessels, including the Kitty Hawk and Carl Vinson carrier strike forces and various support ships including Military Prepositioned vessels and Military Sealift Command supply vessels.

Apra Harbor, home to Guam's only deep-draft commercial port, operates under congested conditions, and is in need of improvements to meet anticipated future demands of the island's commercial port operations. Guam's cargo traffic will continue to grow as its population increases and as other cargo producing markets are developed. The need for wharfage space and storage area will increase with this growth in cargo. To meet this need PAG proposes to construct modern deep-draft wharf facility and creating operational backlands by filling three embayments within the Outer Apra Harbor.

The proposed wharf and fill improvements would provide modern berthing facilities capable of accommodating the newest generation of large deep-draft container vessels, and cruise ships and additional backland areas for future cargo container storage. The proposed deep-draft wharf facility would also provide contingency berthing facilities for U.S. Navy military vessels, including Nimitz Class aircraft carriers.

ES-3.0 Description of Reasonable Alternatives

A range of reasonable alternatives was considered, including the No Action or No Project Alternative. Alternatives that were carried forward include the No Action Alternative, Preferred Action Alternative: Pier on Piles Deep-Draft Wharf and Land Reclamation, Alternate Design Alternative: Cellular Sheet Pile Deep-Draft Wharf and Land Reclamation, and Alternate Location Alternative: Golf Pier/Southwest Point Fixed Pier.

No Action Alternative

Under the No Action Alternative, construction of a deep-draft wharf and land reclamation activities in Outer Apra Harbor would not occur. The No Action Alternative would not meet the project's purpose and need to provide additional wharfage and berthing facilities capable of accommodating the newest generation of large deep-draft container vessels, cruise ships, and military vessels. Additionally, this alternative would

not meet the purpose and need of increasing storage areas by creating additional backland areas.

Proposed Project (Preferred Alternative): Pier on Piles Deep-Draft Wharf and Land Reclamation

The Proposed Project would involve the construction of a deep-draft wharf consisting of a concrete deck with a piled foundation. This concept utilizes individual piles driven in a grid across the site to support a concrete deck. The proposed wharf would be approximately 1,512 feet in length and 215 feet in width providing an overall wharf deck area of approximately 325,080 square feet (7.46 acres). These dimensions include a 113-foot wide (3.92 acre) concrete deck on precast concrete piles and 102 feet (3.54 acres) of backlands on fill. The proposed wharf facility would also include roadway and utility improvements including potable water, sanitary sewer, and electrical services.

Dredging of approximately 6.54 acres of the seabed along the wharf face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required navigational depth of 55 feet below mean sea level (MSL).

In addition to construction of a deep-draft wharf, the Proposed Project involves the reclamation of three sites with containment dikes to the east of the proposed deep-draft wharf structure. At the present time PAG does not have specific development plans for the three reclamation sites. However, it is the intent that the reclamation sites remain open for the eventual use as additional operating backland and container yard space in support of the proposed adjacent deep-draft wharf facility.

Alternate Design: Cellular Sheet Pile Deep Draft Wharf and Land Reclamation Alternative

Under this alternative the proposed deep draft wharf site and the three reclamation sites would be situated in the same locations as the deep-draft wharf and reclamation site facilities proposed under the Preferred Alternative.

This design alternative involves the construction of a deep-draft wharf consisting of a concrete deck cast on top of a filled cellular sheet pile foundation. The proposed wharf would be approximately 1,526 feet in length and 230 feet in width providing an overall wharf deck area of approximately 345,000 square feet (7.92 acres). These dimensions include a 118-foot wide (4.13 acre) concrete deck on a bulkhead wall consisting of fifteen 82-foot diameter cells and fourteen interconnecting arcs. The circular cells and interconnecting arcs would be constructed from steel sheet piles and would be filled with approximately 315,470 cubic yards of select dense, gravel fill material.

Like the Preferred Alternative, the main operational objective of the proposed wharf would be to accommodate deep draft vessels and the final dredge elevation along the entire wharf face would need to be 55 feet below MSL. Similarly, navigational dredging

of approximately 6.54 acres of seabed along the face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required depth.

The design and construction elements for the proposed land reclamation component under this alternative are identical to those proposed under the Preferred Alternative.

Alternate Location: Golf Pier/Southwest Point Fixed Pier Alternative

This alternative involves the construction of a fixed pier and backland support areas in the same general location as alternatives 1 and 2. However, this alternative would encompass a slightly different spatial foot print. This alternative would be located to the east of the deep draft wharf proposed under Alternatives 1 and 2. Under this alternative the proposed improvements would occupy the area, approximately 40-acres in size, between Outhouse Beach to the west of Golf Pier and extend across the harbor to the northern shoreline of Southwest Point.

This alternative would also provide wharf facilities capable of accommodating deep draft vessels along a 1,522 linear-foot pier face. However, the design under this alternative differs markedly from the designs of alternatives 1 and 2 in that it is a fixed pier with contiguous operational backland areas. Under this alternative the proposed fixed pier and backland areas would be constructed in deeper areas of the harbor that are presently submerged. Therefore, dredging of the harbor to depth would likely not be required. However, this alternative would require an estimated 900,000 cubic yards of fill material to create the 40-acre pier and backland areas.

Planning for this alternative is only in the conceptual stages and specific design and engineering details have not been developed. However, this alternative was considered for further analysis because it remained a feasible alternative

ES-4.0 Environmental Consequences and Mitigation

The potential environmental consequences of the Proposed Project and alternatives were evaluated for the following resource areas: land use, coastal zone management, socioeconomics, environmental justice, infrastructure and utilities, traffic and circulation, cultural and historic resources, aesthetic and recreational resources, public health and safety, hydrology, drainage and soils, air quality, water quality and sediments, noise and vibration, biological resources.

Land Use and Coastal Zone Management

The Proposed Project would be consistent with the light-industrial and maritime-based operations in the Apra Harbor Commercial Port. The proposed improvements would not extend beyond the Apra Harbor Commercial Port property, and would not promote long-term land-use incompatibilities. Furthermore, the nearest residential land use areas are

located approximately 2 miles east of the Proposed Project site and would not be adversely impacted by the proposed improvements.

Potential impacts would mainly be short-term and associated with the temporary disruptions of surrounding land uses to accommodate construction activities. No significant adverse impacts on land use are anticipated as a result of the Proposed Project and mitigation would not be required.

Based upon the location and nature of the Proposed Project impacts to Guam's coastal zone are anticipated. The Proposed Project would require a Federal coastal consistency certification pursuant to Section 307 (c)(3)(A) of the CZMA since it would require federal permits from the United States Environmental Protection Agency (Clean Water Act Section 401 Water Quality Certification and Clean Water Act, Section 402 National Pollution Discharge Elimination System permits), and the United States Army Corps of Engineers (Section 10 Rivers and Harbors Act, and Section 404 Clean Water Act permits).

The Proposed Project may be inconsistent with a number of Guam Coastal Zone Management Program (GCMP) policies (including Federal Coastal Zone Management Act and CZM Consistency Determinations) to varying degrees. However, through compliance with future environmental permitting requirements, implementation of appropriate mitigation measures, and continued consultation with the GCMP regarding potential adverse impacts of the Proposed Project on Guam's coastal zone a consistency certification would be anticipated.

Socio-Economics and Environmental Justice

From a socio-economic perspective the Proposed Project would result in mainly beneficial impacts. Adverse impacts would be limited to short-term temporary disruptions onshore and offshore commercial businesses and/or tourist activities. These impacts would be temporary and localized in nature, and would be associated mainly with construction activities of the deep draft wharf facility.

In the short-term beneficial socio-economic impacts would be generated during the project construction phase including jobs, local purchases of goods and services, and procurement expenditures associated with supplying and maintaining the new facility. Long-term beneficial impacts would result from expanded harbor operations which would stimulate direct maritime expenditures, develop new businesses, and create port-related jobs to operate the new facilities, which in turn would stimulate a corresponding decrease in unemployment rates over the long-term. Implementation of the Proposed Projects and resultant harbor expansion would stimulate harbor related business enterprises (i.e. shipping, cargo handling, and other services) and increase local employment.

Evaluations of minority and low-income populations affected by the Proposed Project were based on US Bureau of Census, Census 2003 data. Based upon this data and

project location and characteristics, it was determined that minority and low-income communities within the potential impact area would not be disproportionately impacted by the construction and/or operation of the Proposed Project

Infrastructure and Utilities

Like many other commercial developments the Proposed Project would increase the demand on utilities such as power and water as well as increase wastewater volumes. The Proposed Project would require infrastructural and utility improvements as the proposed area of construction is presently undeveloped land. These would include improvements to potable water, sanitary sewer, and electrical systems. Through the implementation of the proposed system upgrades increased utility demand is not anticipated to result in significant adverse impacts by overburdening the existing utility system capabilities.

Traffic and Circulation

Traffic conditions were addressed for both project construction and operational conditions. Potential impacts were assessed in terms of projected future traffic conditions without implementation of the Proposed Project improvements, and projected future traffic conditions with the implementation of the Proposed Project improvements.

The results of future conditions with and without the Proposed Project indicate that there would be only negligible short-term impacts on traffic and circulation during the weekday peak commuter periods. However, traffic generated by the Proposed Project would be localized and would not contribute significantly to regional traffic nor would it result in significant long-term cumulative impacts on the environment. Mitigation measures such as roadway improvements and/or additional traffic signals would not be required as all intersections and controlled lane groups would operate at acceptable Levels-of-Service.

Cultural and Historic Resources

Within the proposed project area there are historical structures on both fast and submerged lands. Remnant historical structures in portions of the project area (Outhouse Beach) would be permanently lost as a result of deep-draft wharf construction. However, the subject structures are deteriorated and in poor condition, they have endured remodeling and modification, and have lost much of their structural integrity. As such, they are not eligible for listing on the National Register of Historic Places. Documentation of these resources would serve as a mitigation measure, and it is therefore not anticipated that the Proposed Project would result in significant adverse impacts to these resources.

In-water construction activities are not anticipated to adversely impact submerged cultural resources in the project vicinity. However, the possibility of exposing yet unidentified cultural resources (e.g., Spanish Period canons, canon balls, and other items and equipment) during dredging activities exists.

As a mitigation measure, dredging contractors would be made aware of the locations, and instructed to avoid areas with known submerged cultural resources. Furthermore, dredging contractors would be advised of the potential for their work to expose significant cultural resources spanning many centuries. Contractors would also be directed to contact the Guam (State) Historic Preservation Officer in the event anything of cultural interest is discovered.

Final mitigation measures to reduce and/or eliminate any potential adverse impacts on archaeological and historic resources are presently being formulated as part of the ongoing Section 106 consultation between the USACE and the GHRD. Consultation with GHRD regarding acceptable mitigation measures for the cultural resources of concern is ongoing and will be concluded prior to completion of the Final EIS.

Aesthetic and Recreational Resources

Potential impacts on the visual character of the project area and vicinity would mainly be associated with short-term construction-related activities. Existing unimproved areas (e.g., proposed reclamation sites and the outhouse beach area) would be replaced by modern, port facilities. However, long-term impacts on visual resources are not anticipated to occur since the Proposed Projects and their associated operations would be consistent with the overall existing maritime industrial setting in the harbor area.

Recreational SCUBA diving activities at sunken vessel and reef sites in Outer Apra Harbor would not be adversely impacted by the proposed improvements. However, recreational SCUBA diving activities within the nearshore waters at Outhouse Beach would be permanently lost as a result of the Proposed Project.

Impacts on visual resources by the Proposed Project are anticipated to be less than significant. The Proposed Projects and their associated operations would be consistent with the existing maritime industrial setting in the harbor area and no mitigation is required.

Impacts on the recreational resources at Outhouse Beach would be significant as a result of their permanent loss. As a mitigation measure, recreational users and the general public would be notified about the future loss of Outhouse Beach as a result of the Proposed Project, and the PAG would initiate a working dialog with users to identify a substitute recreational area.

Public Health and Safety

Impacts to public health and safety were assessed in the context of the following resource areas: natural disasters, explosive safety quantity distance (ESQD), unexploded ordnance (UXO), hazardous materials management and transport, and homeland security.

Within the project area potential adverse impacts could result from any of the above

listed resource areas. Potential impacts related to these resources are varied and would be minimized in a number of ways including adherence to existing emergency management plans and protocols, scheduling and /or monitoring of construction and operational activities, and adherence to existing and/or development of new security measures.

Overall, the construction and operation of the Proposed Project are not anticipated to significantly adversely affect, or be affected by, the various elements of public safety on Guam.

Hydrology and Drainage

Environmental consequences of the Proposed Project on hydrology and drainage would be related to alterations in land use, drainage patterns, volumes and rates of runoff entering nearby surface water bodies, areal extent of floodplains or inundated areas, and hydraulic conveyance of waterways in the site vicinity.

Significant adverse impacts to hydrology and drainage are not anticipated and would be minimized and/or eliminated by adherence to National Pollution Discharge Elimination System permitting requirements, and the development of operational plans such as a Best Management Practices Plan and/or a Storm Water Management and Pollution Prevention Plan.

Air Quality

Significant adverse impacts to air quality are not anticipated as a result of the Proposed Project. In the short-term, construction activities would impact air quality by generating fugitive dust as well as gaseous and particulate emissions from various fossil fuel-fired construction equipment. Short-term construction-related impacts on air quality would be reduced through the implementation of various mitigation measures that would minimize emission sources from construction equipment and/or activities such as trucks, bull dozers, pan scrapers, debris handling, cutting, grading, and filling, etc. In the long-term, increased traffic volumes in the vicinity of the project areas would contribute minimally to ambient carbon monoxide concentration levels.

Noise and Vibration

Unavoidable but temporary noise impacts may occur during the construction of the proposed harbor improvement projects. Potential impacts focused mainly on noise sensitive human receptors within the project vicinity. Construction-related noise would be generated by both on-site equipment (e.g., pumps, generators, compressors, jack hammers, rock drills, demolition equipment, and power tools) and vehicles (e.g., trucks, front loaders, backhoes, tractors, graders, pavers, concrete mixers, etc.). Pile driving would be necessary to implant piles at the site of the proposed deep-draft wharf.

The quality of the acoustic environment may be degraded to unacceptable levels during periods of construction because noise from construction activities are predicted to be audible at adjoining harbor properties. However, based on acoustical study data elevated noise levels resulting from construction activities would not adversely impact existing residential areas nearest to the Proposed Project site.

From an operational perspective, Harbor vehicles and mechanical equipment would be the primary fixed on-site noise sources located at the Proposed Project site. Significant adverse impacts from yard activities, mobile harbor equipment , and other operational sources are not anticipated

In addition to noise generated by pile driving activities, pile driving induces ground vibrations which have the potential to cause structural and architectural damage to existing structures. The intensity of vibration of pile driving activities could potentially impact only one single-story concrete structure located at Hotel Wharf. If it is determined that this structure falls within the established critical distance for pile driving vibration damage vibration monitoring at the structure would be conducted during close-in pile driving operations as a mitigation measure.

Water Quality and Sediments

Potential impacts to coastal water quality at Apra Harbor could result from either construction or operational activities associated with the proposed improvements. In particular, the impacts to water quality from dredging and/or resuspension of bottom sediments pose the greatest potential to adversely impact water quality.

Construction-related activities would temporarily increase turbidity of the water column during dredging and pier construction. Increased turbidity could potentially harm remaining coral communities in the harbors. High levels of suspended sediment in the water column may cause siltation-induced stresses to corals and filter feeding invertebrates in the outer harbor. The species-rich reef slope surrounding Piti Point and the species rich coral reef community at Jade Shoals are vulnerable to siltation impacts. Furthermore, the disturbance and mixing of bottom sediments into the water column could result in secondary impacts to the harbors benthic communities by lowering dissolved oxygen levels and increasing nitrogen and phosphorus levels.

Operational impacts on water quality could result from increased harbor traffic and/or contaminant discharges.

Vessel movement and maneuvering within Apra Harbor's waters would result in re-suspension of bottom sediments due to turbulent water motions induced by ships' screws and thrusters. As a result, water quality in the harbor would be adversely impacted. Direct impacts from harbor traffic would be the re-suspension of bottom sediments. Sediment re-suspension would result in increased turbidity and suspended solid levels in the water column, which would in turn result in an increase and decrease

in nutrient concentrations (nitrogen and phosphorus) and dissolved oxygen levels, respectively. Additionally, transport of re-suspended sediments out of the harbor could possibly have a negative impact on benthic reef communities in nearby open coastal waters.

In the longterm, the proposed improvements would result in an increased amount of impervious surface area surrounding the harbor. Increased impervious surfaces could lead to increased stormwater runoff into Apra Harbor. Stormwater from paved areas at the project sites might include dust and grit from paved areas and rooftops. Small quantities of oil and grease and Total Petroleum Hydrocarbons similar to those found in surface runoff from parking lots and roadways and washings of vehicles may also occur in the stormwater.

With the construction of a new, deep draft wharf there is always a possibility of leakage or accidental spillage of petroleum, oil, lubricant , or other contaminants into harbor waters. Discharges of such materials could have an adverse impact on coastal waters within Apra Harbor. Potential contaminant discharges from vessels could result in adverse impacts to water quality within Apra Harbor.

Significant adverse impacts to water quality are not anticipated with the implementation of appropriate mitigation measures as prescribed by NPDES authorization, DA Section 404 permit, and Section 401 of the Clean Water Act, Water Quality Certification (WQC) requirements.

Biological Resources

The Proposed Project area is highly disturbed with no permanent fauna and sparse vegetation dominated by salt-tolerant, fast-growing non-native species. Potential adverse impacts to terrestrial biota are considered less than significant because habitat quality is generally low and limited due to the highly disturbed nature of the site.

Relative to the sparse terrestrial biota, the marine biota at the project site is far more diverse and abundant. The waters within and in the vicinity of the project site contain complex benthic communities, including diverse coral reef and fish communities that would be impacted by Proposed Project construction and operational activities

Direct and indirect impacts to marine resources in the Proposed Project area are anticipated to occur as a result of construction-related disturbance of the marine environment. These impacts would result primarily from suspension of particulates in the water column during dredge and fill operations, including disturbance of the substrate from the temporary placement of anchors and mooring lines for dredges, barges and other equipment.

Construction activities would result in the direct loss of coral reef habitat and all of the environmental and ecological functions and values associated with this area of habitat.

However, limited replacement of lost ecological services and values of the marine resources in the immediate area of the wharf is anticipated due to the effects of ongoing wharf operations and vessel traffic. Indirect impacts to marine communities in the down-current areas adjacent to the Proposed Project site would also occur, but these communities are expected to recover fully or mostly over time.

An estimated total 102.9 acres of marine habitat including reef flat, reef crest, reef slope, and deep sand, would be impacted as a result of sediment suspension and resuspension during construction activities. In addition, approximately 20.58 acres would be impacted as a result of sediment deposition, and 3.3 acres are anticipated to be impacted due to temporary placement of anchors and mooring lines for dredges, barges and other equipment.

Of the total 102.9 acres of marine habitat that would be adversely impacted, 22.33 acres consists of coral reef habitat that would be permanently lost as a result of the Proposed Project. This area contains not only high live coral coverage, but also high fish diversity and biomass. Therefore, the permanent loss of this coral reef habitat constitutes a significant impact to the biological resources of the area.

Coral reef ecosystems in U.S. and Territorial waters are afforded special protection under several regulatory authorities including the Clean Water Act, Section 404. Coral reefs are designated as "special aquatic sites" and provided a higher level of protection under Section 404(b)(1) of the Clean Water Act (40 CFR Part 230.44)

Based upon the guidelines set forth as Regulation 40 CFR Part 230, the "Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines," (Mitigation MOA) was developed on February 7, 1990. The Mitigation MOA provides guidance to the USACE and the EPA by establishes a framework for compensatory mitigation in terms of loss of ecological functions and values, prescribing a minimum of one-to-one functional replacement with an adequate margin of safety to reflect the uncertainty and risk of expected success. The Mitigation MOA bases mitigation measures on the development of assessments and methodologies performed by qualified professionals and tailored to each site, as ecological characteristics of individual aquatic system are unique.

The key element in developing effective mitigation measures to address temporal and permanent loss of coral reef habitat will be the development of a Compensatory Mitigation Plan in cooperation with the US Fish and Wildlife Service, National Marine Fisheries Service, and other applicable government agencies.

Existing guidelines, policies, and procedures developed by the USACE and USEPA under section 404 of the CWA would provide a structured compensatory mitigation

planning process to guide compensatory mitigation actions to effectively replace marine resources that would be permanently lost due project-related impacts. Additionally, national technical guidance for mitigation is supported by regionally developed mitigation guidance that considers aquatic and marine resources that are of regional importance, including coral reefs.

ES-5.0 Comparison of Alternatives and Potential Environmental Impacts

This subsection presents a summary table of the environmental consequences associated with the environmental resources for each of the reasonable alternatives analyzed in this EIS. Comparative data for each alternative is presented in Table ES-1 below.

Table ES-1
Summary Comparison of Alternatives and Environmental Impacts

Environmental Resource	No Action Alternative	Preferred Alternative	Alternative 2	Alternative 3
Land Use	LS	LS	LS	SI
Socio-Economics	LS	BI/LS	BI/LS	BI/LS
Environmental Justice	LS	LS	LS	SI
Infrastructure and Utilities	LS	LSM	LSM	LSM
Traffic and Circulation	LS	LS	LS	LS
Cultural and Historic Resources	LS	LSM	LSM	LSM
Aesthetic Resources	LS	LS	LS	LS
Recreational Resources	LS	SI	SI	SI
Public Health and Safety	LSM	LSM	LSM	LSM
Coastal Zone Management	LS	LSM	LSM	LSM
Hydrology Drainage and Soils	LS	LSM	LSM	LSM
Air Quality	LS	LSM	LSM	LSM
Sediments and Dredge Material	LS	LSM	LSM	LSM
Hazardous Materials	LSM	LSM	LSM	LSM
Terrestrial Flora and Fauna	LS	LS	LS	LS
Wetlands	LS	LS	LS	LS
Marine Biological Resources	LS/SI	SI	SI	SI
Protected Species	LS	LSM	LSM	LSM
Nonindigenous Invasive Species	LSM	LSM	LSM	LSM

Environmental Resource	No Action Alternative	Preferred Alternative	Alternative 2	Alternative 3
Noise and Vibration	LS	LSM	LSM	LSM
Water Quality	LS	LSM	LSM	LSM

(LS) = Less Than Significant Impact
(LSM) = Less Than Significant Impact (with mitigation)
(SI) = Significant Impact (Requiring Mitigation)
(BI) = Beneficial Impact

ES-6.0 Cumulative Impacts

NEPA requires that the potential cumulative effects of a Proposed Project, as well as the cumulative effects of the alternatives to the Proposed Project, be analyzed in an EIS. Cumulative effects are defined as those combined effects on the human environment that result from the incremental impact of the Proposed Project when added to other past, present and reasonably foreseeable future actions, regardless what Federal or non-Federal agency or person undertakes such other actions (40 CFR 150.8.7).

The Proposed Project, when considered in the context of past, present, and future activities, can be expected to contribute, in a small yet incremental way, to the overall cumulative effects on specific resources.

Some of the potential cumulative effects could be considered beneficial, such as the increase in employment opportunities and increased tax base to Guam. Others could be considered adverse, such as the cumulative impacts to water quality due to an increase in maintenance dredging events result from various proposed harbor improvement projects (including the Proposed Project).

Overall, the construction and operation of the Proposed Project would affect in a cumulative fashion, some in a positive way and some in a negative way, the resources and ecological components addressed in this EIS. Overall, the potential cumulative effects associated with the Proposed Project are not expected to be substantial. However, cumulative affects to marine environment could potentially be significant when considering the direct and indirect project-related impacts, combined with proposed future construction and/or maintenance projects within Apra Harbor.

1.0 PROJECT OVERVIEW

1.1 INTRODUCTION

Under a federal grant (No. 07-01-05196) from the U.S. Department of Commerce Economic Development Administration (EDA) Public Works Program, the Port Authority of Guam (PAG) is proposing modifications to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. The design of the proposed action has been funded by the Government of Guam with assistance from the Economic Development Administration, U. S. Department of Commerce and the U. S. Army Corps of Engineers (USACE).

Apra Harbor, Guam's only deep-draft commercial port, operates under congested conditions, and is in need of improvements to meet anticipated future demands of the island's commercial port operations. Guam's cargo traffic will continue to grow as its population increases and as other cargo producing markets are developed. The need for wharfage space and storage area will increase with this growth in cargo. To meet this need PAG proposes to create modern deep-draft wharfage and operational backlands by increasing the land area. This would result in creating more waterfront area for docking, and free up more inland area for storage.

The proposed action consists of a master plan design for two commercial harbor improvement projects (hereafter referred to as the Proposed Project). The master plan improvement projects include 1) the construction of a new 1,500 linear foot deep-draft wharf along a man-made breakwater and 2) the fill of approximately 17 acres of reclaimed land in three shallow man-made embayments within Apra Harbor. The Proposed Project would provide additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep-draft container vessels, and cruise ships. The proposed wharf improvements would also provide contingency berthing facilities for U.S. Navy military vessels, including Nimitz Class aircraft carriers.

To implement the Proposed Project PAG will be required to submit a permit application to the USACE, Honolulu District, Regulatory Branch pursuant to Section 404 of the Clean Water Act (CWA). The purpose of the permit application will be to review the PAG's plans to construct and operate the proposed proposed deep-draft wharf facility and appurtenent backland areas. in Apra Harbor. Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act require a permit because the PAG proposes to discharge dredged or fill material into waters of the U.S. and to do work in navigable waters of the U.S.

Pursuant to the National Environmental Policy Act (NEPA) the Proposed Project qualifies as a federal undertaking based upon the the aforementioned federal grant from the EDA (i.e., a project, activity, or program funded in whole or in part under the direct

or indirect jurisdiction of a Federal agency, including federally funded, assisted, permitted, licensed, and approved actions). Additionally, issuance of future USACE permits for the Proposed Project would also constitute a Federal action that may significantly affect the quality of the environment. As a result, preparation of an Environmental Impact Statement (EIS) pursuant to NEPA has been undertaken to identify and evaluate a range of reasonable alternatives to accomplish the purpose of and need for the Proposed Project, and to evaluate potential effects that the alternatives may have on the environment. The EIS for the Proposed Project has been prepared by the USACE, Honolulu District, Programs and Project Management Civil Works Branch with the assistance of a third-party contractor (funded by the PAG).

1.2 ROLES AND RESPONSIBILITIES

PAG as the proponent for and developer of the proposed improvements would be the applicant for the Rivers and Harbors Act Section 10 permit, the Clean Water Act Section 404 permit, and the Clean Water Act Section 401 Certification. The latter of which is administered by the Guam Environmental Protection Agency (GEPA). PAG would be responsible for compliance with any permits issued and the implementation of any mitigative actions required by the permits.

PAG received a federal grant from the U.S. Department of Commerce Economic Development Administration (EDA) for the design of the proposed improvements to Apra Harbor Deep Draft Wharf. The grant requires that the grantee comply with all applicable federal and territorial laws and regulations including compliance with the NEPA process (13 CFR Part 316). Via the Intergovernmental Cooperation Act (31 USC 6505), the Corps may provide assistance to state and local governments on a reimbursable basis. Under this program, the PAG has requested the Corps of Engineers, Honolulu District, Program and Project Management Division to conduct the NEPA process on PAG's behalf for this project including: 1) determining the scope of the analysis, 2) preparation of the Draft EIS, 3) conducting a public hearing as required, 4) preparation of a Final EIS and 5) preparation of a Record of Decision following the filing of the Final EIS. The Record of Decision for this action will be prepared by the Corps on behalf of PAG and signed by the Department of Commerce EDA.

Under the Intergovernmental Cooperation Act, the project is considered to be solely that of the sponsor (PAG) and PAG must obtain all appropriate Department of the Army permits from the U.S. Army Corps of Engineers, Regulatory Branch. When work is conducted under a Corps of Engineers Cost-sharing authority, such as flood control projects authorized under the Water Resources Development Act, the action is considered a Corps action and the Corps does not issue permits to itself. Therefore Department of the Army permits are not required but the Corps is required to document that the action is consistent with the appropriate regulations.

For this project, PAG will need to obtain a Department of the Army pemit for construction and dredging in navigable waters (Section 10 of the River and Harbors Act) and for the placement of dredge and fill material in waters of the U.S. (Section 404 of

the Clean Water Act) from the Corps Regulatory Branch, a separate section of the Corps from the Corps Program and Project Management Division. This permit application process is a separate action from the NEPA process. However, within this document, issues that would be of concern under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act will be discussed.

The USACE's regulatory program is contained in 33 CFR Parts 320-331. Selection and use of disposal sites for dredged and/or fill material under permits issued pursuant to Section 404 of the Clean Water Act (CWA) is guided by regulations at 40 CFR Part 230.

The USACE is responsible for managing the EIS process including: 1) determining the scope of the analysis, 2) preparation of a Draft EIS, 3) conducting a. public hearing as required, 4) preparation of a Final EIS, and 5) preparation of a Record of Decision following the filing of the Final EIS.

Due to time and budgetary limitations this EIS was finalized without a signed Record of Decision as explained in the EDA letter dated December 4, 2008 (following the signature page of this EIS).

1.2.1 Scope and Authority

Pursuant to the National Environmental Policy Act (NEPA), issuance of the above stated permits for the proposed improvement projects would constitute a major Federal action that may significantly affect the quality of the environment. As a result, preparation of an Environmental Impact Statement (EIS) pursuant to NEPA was undertaken to identify and evaluate a range of reasonable alternatives to accomplish the purpose of and need for the Proposed Project, and to evaluate potential effects that the alternatives may have on the environment. In addition, the federal funding provided to support the Proposed Project under the above mentioned EDA grant triggers the NEPA process and EIS preparation. Per the requirements in the EDA grant, the EIS for the Proposed Project has been prepared by USACE and PAG, with assistance from a USACE contractor. EDA is the final decision maker for the NEPA process.

This EIS is a "programmatic" document, with the level of detail necessary to support an accepting authority decision on the Proposed Project. This programmatic EIS serves as the initial step of a "phased review" of the proposed Master Plan Deep-Draft Wharf and Fill improvements. Due to the conceptual nature of the proposed improvements and the extended 20-year planning time frame, appropriate supplemental, site-specific environmental reviews may be necessary as the individual Master Plan projects approach implementation.

The intent of this EIS document is to define the scope and analysis of the proposed Master Plan projects and serve to ensure that comprehensive and systematic consideration is given to potential impacts of the Proposed Project upon the natural and man-made environment.

1.2.2 Definition of Alternatives

NEPA requires that the responsible Federal agencies perform an assessment of all reasonable alternatives to the Proposed Project that would avoid or minimize adverse effects of these actions upon the quality of the human environment. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and that use common sense, rather than those that are simply desirable to the Applicant.

1.3 PROJECT LOCATION AND BACKGROUND

1.3.1 Introduction

The island of Guam was ceded to the United States following the Spanish American War of 1898 and has been an unincorporated territory since 1949. It is the largest and southernmost island in the Marianas Archipelago. The 30 mile long island ranges from 5 to 8.5 miles in width, and has a total land area of 212 square miles. It lies 3,700 miles west-southwest of Honolulu, 1,500 miles east of Manila, 1,500 miles south-southwest of Tokyo, and 3,100 miles north-northwest of Sydney. Guam is the westernmost territory of the United States, and having the finest deep draft harbor between Hawaii and the Philippines, serves as a gateway to the dynamic and rapidly growing East Asia economies. The location of Guam is shown in Figure 1-1 (Figures are attached herein as Appendix A).

1.3.2 Apra Harbor

Apra Harbor, is located on the central western side of the Guam and is home to the only deep draft commercial and military ports on the island. Apra Harbor is one of the largest protected harbors in the Pacific. The Commercial Port serves as a transshipment point for the Western Pacific region, and is equipped to handle containerized, breakbulk, fish, as well as passenger traffic, the port provides direct service to Hawaii, the U.S. mainland, Asia, and Micronesia. For all practical purposes, Apra Harbor is the commercial hub of the island of Guam It is a natural harbor, protected by Orote Peninsula on the south and Cabras Island on the north. Guam's commercial port operations are located on Cabras Island, along with other private industrial operators. Figure 1-2 shows the location of Apra Harbor, and identifies the Proposed Project location along the south shore of Cabras Island.

Apra Harbor is an improved, natural deepwater lagoon, located on Guam's west coast at approximately 13°26'N 144°40'E. The entrance to Apra Harbor is located at the west side of the lagoon and is approximately 500 yards wide and over 100 feet deep. The Orote Peninsula, which projects 3.5 miles west-northwestward from Guam's west coast, forms the southern boundary of the harbor. The northern side of the harbor is formed by a 15,000-foot-long breakwater which is partially man made.

The man made portion of the breakwater lies west of Cabras Island and is called the Glass Breakwater. The average height of the Glass Breakwater is approximately 15 feet above mean sea level. The Glass Breakwater provides the necessary protection to make Apra Harbor the most important Harbor on Guam. Agana, Guam's capitol city, is located approximately six miles east-northeast of Apra Harbor.

The harbor is further divided into Outer Apra Harbor, Inner Apra Harbor and the Commercial Port. Outer Apra Harbor measures approximately 3 miles long (east to west) by 1.5 miles wide (north to south) and is used primarily for the mooring of both commercial and Navy vessels. Inner Apra Harbor is located at the southeast portion of the lagoon and measures approximately 1 mile long (east to west) by 1.5 miles wide (north to south). Inner Apra Harbor is used exclusively by the U.S. Navy. The Apra Commercial Port is located on Cabras Island, at the northeast end of outer Apra Harbor.

The Outer Harbor is large and contains several mooring buoys and piers. Although the Outer Harbor has many areas where depths exceed 100 feet, it also contains several clearly marked shoal or reef areas. They are located primarily in the eastern portion of the harbor, close to the entrance to the Inner Harbor. These shallow areas pose only a limited threat to normal commercial port operations. However, they remain a significant hazard that must be considered while navigating in the harbor. Buoys and anchorages in the Outer Harbor are used by both military and commercial vessels. Inner Apra Harbor extends southward from the eastern part of the Outer Harbor. Hills east and southeast of the port provide a limited windbreak for winds from those directions, but Apra Harbor is not a sheltered port.

Almost all of Apra Harbor, with the exception of the commercial port operations, is under the jurisdiction of the United States Navy at the adjacent Apra Harbor Naval Reservation. Most of the US Navy berthing facilities at Apra Harbor are located at Naval Activities (NAVACTS) on the west side of Inner Apra Harbor.

The Inner Harbor is entered from the southeast portion of the Outer Harbor through a passage between Polaris Point on the east and the Naval Ship Repair Facility (SRF) on the west which provides repair and maintenance for Naval vessels. Local harbor personnel refer to this passage as the "SRF Cut." Vessels entering the Inner Harbor are limited to a maximum draft of -32 feet below mean sea level (MSL).

There are a few Naval berthing facilities are not located within Inner Apra Harbor. These facilities include a submarine tender that is home ported at Apra Harbor and moored at Wharf A at the southwest end of Polaris Point; Navy Wharves D and E on the western end of Drydock Point in the Outer Harbor; and Ammunition Wharf Kilo which is located on the south side of the Outer Harbor, approximately 0.5 miles east of the main harbor entrance. The berths along Kilo wharf have undergone dredging and presently have depths between 40 – 50 feet below MSL.

1.3.3 The Port Authority of Guam

Guam's Organic Act established local self-government in 1950. Until then, the U.S. Navy administered the island. With the passage of the Act, the people of Guam became United States citizens but, because Guam is a territory, citizens lack voting rights in the federal government—they cannot vote in Presidential elections. Guam does not have a representative in the U.S. Senate. Guam's congressional representative in the U.S. House of Representatives does not have the authority to vote on the House floor but does have authority to vote in House Committees.

Guam's Port Authority was organized in March 1950 as a division of the Department of Commerce within the Government of Guam. It was originally located on 24.5 acres of U.S. Navy property in the Inner Apra Harbor region. In 1966, the Commercial Port was established as a separate department of the Government of Guam and in October 1975, the Commercial Port was renamed the Port Authority of Guam, and reestablished as a public corporation and autonomous agency of the Government of Guam.

1.3.4 Project Background and Description

As previously mentioned, the PAG is proposing modifications to Apra Harbor under a federal grant from the U.S. Department of Commerce Economic Development Administration. The design of the Proposed Project has been funded by the Government of Guam with assistance from the Economic Development Administration, U. S. Department of Commerce and the U. S. Army Corps of Engineers.

The principal objective of the proposed modifications are to provide infrastructural improvements to the commercial port at Apra Harbor. Commercial shipping is the primary means of supplying materials to the island of Guam and underlies the importance of improving the current infrastructure at the island's only commercial port.

Post-Panamax vessels are large container cargo ships that have been entering the world fleet since 1980. They obtained their name based on their large size which precludes them from traversing the Panama Canal. Post-Panamax vessels are deep-draft vessels requiring a draft depth of 55 feet and they are capable of transporting 4,500 TEUs.

At the present time Apra Harbor is unable to accommodate Post-Panamax vessels due to navigational and landside facility limitations. The primary purpose of the Proposed Project is to provide a deep-draft wharf facility and operational backlands in Apr Harbor that would allow for the berthing of Post-Panamax cargo vessels. In addition, the proposed wharf facility would be able to service deep-draft cruise ships, and US Navy aircraft carriers and other large naval vessels on a contingency basis.

In addition to providing Apra Harbor with new facilities to accommodate today's largest cargo vessels, the Proposed Project would ultimately provide additional wharf space and operational backlands to reduce vessel congestion, increase efficiency of cargo distribution at the commercial port and increase Port revenues.

There are three major elements that comprise the proposed improvements. The major project elements are as follows: (1) The construction of a deep-draft wharf approximately 1,500 feet x 215 feet in dimension to the east of Hotel Wharf. Improvements would include construction of a pier on piles, deposition of approximately 83,525 cubic yards of fill material over approximately 7.5 acres, and construction and installation of mechanized cargo container handling equipment; (2) Placement of approximately 285,762 cubic yards of fill material over approximately 17 acres of submerged lands in three reclamation sites along the east end of the Glass Breakwater. Improvements would also include construction of rock revetments, and the eventual development of operational backland facilities; and (3) Dredging of submerged lands to a depth of 55 feet in the waters adjacent to the proposed 1,500 foot deep-draft wharf face to meet the navigational requirements of deep draft commercial and military vessels.

As mentioned above the Proposed Project would require the filling of approximately 17 acres of submerged lands. At the present time, the source of the fill material has not been determined. There are two possible sources from which the fill material could be obtained. The first would be from a yet to be identified upland quarry. Under this scenario the fill material would be trucked in from a quarry, temporarily staged onsite, and subsequently placed into the three proposed land reclamation sites. The second source of fill material would be to use the dredge spoils from the ongoing US Navy Alpha and Bravo Wharf improvement project in Inner Apra Harbor.

On April 12, 2001 the Government of Guam (GovGuam) and the U.S. Department of the Navy entered into a Memorandum of Understanding (MOU). The MOU promotes the beneficial use of US Navy dredge material by GovGuam as fill material for proposed PAG construction projects. The MOU specifically addresses the use of dredge material from the subject Navy construction dredging project in Inner Apra Harbor.

Dredging activities for the Navy's Alpha and Bravo Wharf improvement project commenced in December 2006, and the dredge material is being stockpiled in a confined disposal facility (CDF) located on Naval Base Gaum (Main Base), across from the Orote Power Plant. The Navy estimates a total dredge spoil quantity of approximately 407,000 cubic yards to be generated by this project. Per the MOU, it has been proposed that a portion of the US Navy's construction dredge spoils (approx. 188,665 cubic yards) could potentially be utilized by PAG for the proposed Master Plan improvements.

The Navy's environmental assessment identifies "beneficial reuse" of their dredged material as a potential disposal alternative, noting the dredged material "could be retained for Navy use (e.g. landfill cover, removed by GOVGUAM, or sold to another party" (USDN, 2006). However, additional geotechnical and chemical analyses of the dried dredge material would need to be conducted to determine its suitability as a fill material for the proposed Master Plan projects.

As noted in their environmental assessment, the Navy has not yet determined the viability of beneficial reuse as a reasonable disposal alternative for their Alpha/Bravo Wharf dredge material. suitability of the Alpha/Bravo Wharf dredge material for beneficial reuse. Therefore, PAG will continue to collaborate with the US Navy to determine the feasibility of and explore possible reuse of their dredge spoils as fill material for the proposed Master Plan projects.
Since the use of the Navy project dredge material as suitable fill material has not been determined this EIS does not address potential Navy dredge spoil related impacts. Rather, this EIS assumes that fill material to be used for the proposed land reclamation sites would meet all environmental and design criteria for use as such (i.e., does not contain unacceptable levels of chemical contaminants and has the physical characteristics necessary to meet acceptable fill material design criteria) regardless of it's source (i.e., U.S. Navy project dredge spoils vs. upland quarries). Therefore, for the purposes of impacts analysis this EIS assesses potential impacts of the Proposed Project on the environment as a result of construction and operational activities.

In addition to obtaining fill material from either an upland quarry site or from U.S. Navy construction dredging, the dredge material generated from the deep-draft wharf construction would be used as fill material for the proposed reclamation sites along the east end of the Glass Breakwater. Utilization of the deep-draft wharf construction dredge material would be considered a beneficial use. If possible, direct in-water placement of the dredge material into the proposed reclamation site areas would be preferred. Otherwise, the dredge material would be temporarily staged on land.

1.3.5 Project Schedule and Cost

The cost for the construction of the deep-draft wharf facility is estimated at approximately $36,800,571. Construction costs for the filling of submerged lands is estimated at approximately $30,742,116. The total overall project cost is estimated at approximately $67,542,687 (PAG, 2005).

Specific start dates for project construction have not been determined due to present funding uncertainties. However, for the purposes of this EIS and to maintain some consistency with other Guam planning documents, the projected buildout year for the Proposed Project was set as the year 2025. It is anticipated that project construction would likely be phased and take approximately two to four years to complete. Therefore, the projected construction period for the Proposed Project would be between the years 2021 – 2025.

1.4 PURPOSE OF AND NEED FOR ACTION

1.4.1 Existing Conditions at Apra Harbor

1.4.1.1 Introduction

The commercial marine traffic and harbor activities are concentrated in Outer Apra

Harbor. The commercial port, operated by the PAG, is located on approximately 74 acres on Cabras Island. The PAG owns and operates cargo handling piers, fuel piers, marinas, and a harbor of refuge. Maritime operations occurring in Apra Harbor include cargo shipping operations, commercial fishing activities, cruiseship and excursion vessel operations, and military operations. Specific harbor uses and facility locations are discussed in more detail in Section 3.1.

Guam's port is a major transshipment center for the Western Pacific. It is equipped to move containerized, break-bulk, and tuna cargo. Presently, ten shipping lines serve the Port Authority, providing service to Hawaii and the U.S. mainland, the Far East, and Micronesia. As promulgated, the "Jones Act" restricts shipping between Guam and other U.S. ports to U.S. registered ships. Currently only CSX Lines (formerly Sealand) and Matson (which took over American President Lines) service U.S. ports from Guam. Because the restrictions of the Jones Act are widely believed to be a serious impediment to trade within the region, the Government of Guam is seeking an exemption to the Act from the U.S. Congress.

PAG serves vessels from around the world. In Fiscal Year (FY) 1999, approximately 350 foreign-flagged cargo vessels and 1,919 foreign-flagged fishing vessels called on Guam's port. The majority of these fishing vessels were Japanese and Taiwanese long-liners serving Asian sashimi markets, taking advantage of the island's proximity to these markets as well as the efficiency and ease of access provided by Guam's highway system and the Guam International Air Terminal.

At present, waterfront dock space at the Port is severely limited with a total of 3,920 lineal feet with an average draft of only about 35 - 38 feet. Containerized cargo operations are currently supported at wharves F-3 through F-6. These wharves share space with the sometimes conflicting requirements of the fishing fleet, cruise ships, and break bulk cargo. A number of warehouses and other support structures are interspersed within the 26-acre container yard immediately adjacent to Wharves F-3 through F-6.

1.4.1.2 Commercial Shipping

Because it is an Island the commercial shipping industry is of paramount importance not only to Guam's economy, but for its day-to-day life in general. The Apra Harbor Commercial Port handles approximately two million tons of cargo per year and operates as a vital link in shipping routes, including those between Asia, Hawaii, and the U.S. mainland.

Cargo is shipped either in bulk, individual units, or in containers. The major categories of cargo passing through the Apra Commercial Port are described below.

- Containerized Cargo – Movements of general cargo arriving and departing the Apra Commercial Port are primarily containerized. Shipping containers range in size from 8'x8'x20' to 8'x8'x45'. Containers arriving at the Port are generally unloaded from

the ship or barge and stacked in the container yard of the terminal. From the container yard, the container may be reloaded to a barge at the same facility for other overseas destinations, trucked to another facility for barge transshipment to other inter-island destinations in CNMI, trucked directly to consignees on Guam, or emptied and its contents delivered by truck on Guam.

- Automobiles – Some automobiles arrive and depart Apra Commercial Port in 40-foot containers and the remainder arrive on ships with RO/RO (roll-on/roll-off) capabilities. RO/RO cargo is cargo which is rolled or driven on and off ships, as opposed to cargo which is physically loaded onto a vessel. All arrival and departure modes require automobile storage at the terminal. For containerized movements, automobiles require parking before or after devanning, and for RO/RO movements, they require parking for short-term storage.

- Neobulk – Includes cargo moving in large, unitized loads to promote efficient handling and storage of the commodity. Neobulk cargo includes lumber, steel, construction equipment/vehicles, and newsprint.

- Break Bulk/General Cargo - Break bulk general cargo can include almost any type of "small lot" commodity which can be shipped on a pallet as an individual unit.

- Dry Bulk – Includes dry good commodities which can be shipped in bulk (non-unitized) form. Examples of dry bulk cargo are grain, sugar, cement, and coal.

- Liquid Bulk – Includes fuel oil, diesel, gasoline, jet fuel, etc., which are typically transported in vessels with capacities ranging from 10,000 to 35,000 dead weight tons.

Table 1-1 below summarizes the four main cargo vessel types that call on the Apra Commercial Port and the approximate percentage of cargo they bring into Port.

Table 1-1
Type and Percentage of
Cargo Vessels Calling at Apra Commercial Port

Type of Cargo Vessel	Percent of Cargo
Container Ships	65%
Container/Break Bulk Ships	20%
RO/RO Carriers	5%
Inter-Island Barges/Vessels	10%

Source: PAG, 1999

PAG currently maintains three containerized cargo berths with depths of 38 feet. To service these berths, the port utilizes three 40-ton gantry cranes. For larger cargo items, a 150-ton heavy lift crane is used. To support its cargo activities, the port also

maintains a 26.5-acre container yard. In FY1999, more than 1.9 million tons of cargo moved through the port.

Table 1-2 below summarizes the number of vessel arrivals and cargo tonnage moved at the Apra Harbor Commercial Port between the FYs 2000 through 2005.

Table 1-2
Cargo Vessel Arrivals and Cargo Tonnage at Apra Commercial Port (FY 2000 – 2005)

PAG Cargo Operations	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05
Total Vessel Calls	2529	2693	2139	1983	1648	1327
Total Containers Handled	77,728	80,635	78,328	82,310	78,224	83,867
Total Cargo Vessel Breakdown	532	533	506	536	486	408
Total Cargo Revenue Tons	1,970,117	1,836,814	1,850,380	2,164,116	2,067,528	2,041,807

Source: PAG, 2006

Figure 1-3 provides a graphical representation of the importance of containerized cargo to the Island of Guam. As shown, on average revenue tons of containerized cargo exceeds that of break bulk cargo by a factor of 7.

Figures 1-4 and 1-5 provide a graphical representation of all vessel types of cargo vessel types calling at the Apra Commercial Port, respectively. The figures also illustrate the competition for existing wharfage between container and other types of vessels that result in the existing congested conditions.

Modern larger container vessels currently calling the Port of Guam cannot enter the Port fully loaded since they would exceed the Port's draft. Similarly, modern deeper draft vessels, such as Post-Panamax container vessels, are also precluded from berthing at the existing Port facilities. A factor that compounds this problem is that the existing cargo piers cannot be dredged to depths that could accommodate such vessels because such an action would compromise the existing pier structures.

In addition to cargo and fishing operations Guam is currently called upon approximately 30 times per year by an average of 15 separate international passenger cruise ships. According to the Guam Visitor's Bureau, most of the visits are academic in nature.

Many of the cruise vessels calling at Apra Harbor bring students to Guam during their winter vacation who spend five days in various classroom or marine study activities. In spite of the tendency of these cruises to concentrate arrivals in just a few months of the

year, the possibility of a future increase in demand and/or visits by larger cruise vessels remains.

It should also be noted, that the implementation of heightened security due to the Maritime Transportation Security Act (MTSA) has complicated the arrival of cruise vessels. Under the MSTA, passenger cruise operations must be separated from other waterfront operations. Since the Port of Guam has limited wharf facilities capable of accommodating larger passenger cruise vessels, it requires temporary suspension of other cargo handling activities.

Therefore, aside from servicing large commercial cargo vessels, the new wharf facilities would reduce competition between cruise and cargo vessels, while also allowing for the berthing of larger, modern, deep-draft cruise ship vessels.

In addition to commercial harbor users, Outer Apra Harbor is also used for recreational activities including scuba diving, snorkeling, sightseeing submarines, jet skiing, and windsurfing. Some sport fishing occurs in and around the harbor. Businesses obtain permits from the Guam Department of Parks and Recreation to provide recreational services to residents and tourists at sites along the Glass Breakwater side of Outer Apra Harbor. There are several Navy-operated recreational beaches along the southern shores of Outer Apra Harbor. Recreational beaches and dive sites also exist to the west of Orote Peninsula, along the coast of the Philippine Sea.

Non-military use is not allowed within Inner Apra Harbor. Military harbor activities include home porting of Navy vessels such as U.S. Naval Ship (USNS) Military Sealift Command (MSC) vessels with contracted merchant marine crews and the USS *Frank Cable*, a Navy submarine tender berthed at Polaris Point. The proposed deep-draft wharf facility would be designed to also accommodate Nimitz Class Aircraft Carriers on a contingency basis.

1.4.1.3 Commercial Fishing

The importance of commercial fishing in Guam lies mainly in the territory's status as a major regional fish transshipment center and re-supply base for domestic and foreign tuna fishing fleets. Among Guam's advantages as a home port are well-developed and highly efficient port facilities in Apra Harbor; an availability of relatively low-cost vessel fuel; a well-established marine supply/repair industry; and recreational amenities for crew shore leave (Hamnett and Pintz 1996).

In addition, the territory is exempt from the Nicholson Act, which prohibits foreign ships from landing their catches in U.S. ports. Initially, the majority of vessels calling in Apra Harbor to discharge frozen tuna for transshipment were Japanese purse seine boats and carrier vessels. Later, a fleet of U.S. purse seine vessels relocated to Guam, and since the late 1980s, Guam has become an important port for Japanese and Taiwanese longline fleets. The presence of the longline and purse seine vessels has created a demand for a range of provisioning, vessel maintenance and gear repair services.

By the early 1990s, an air transshipment operation was also established on Guam. Fresh tuna is flown into Guam from the Federated States of Micronesia and elsewhere on air cargo planes and out of Guam to the Japanese market on wide-body passenger planes (Hamnett and Pintz, 1996). A second air transshipment operation that began in the mid-1990s is transporting to Europe fish that do not meet Japanese sashimi market standards.

Guam is an important re-supply and transshipment center for the international tuna longline fleet in the Pacific. However, the future of home port and transshipment operations in Guam depends on the island's ability to compete with neighboring countries that are seeking to attract the highly mobile longline fleet to their own ports. Trends in the number of port calls made in Guam by various fishing fleets reflect the volatility of the industry. The number of vessels operating out of Guam decreased by almost half from 1996 to 1997, and further declined in 1998 (Hamnett and Anderson 2000).

1.4.1.4 Cruise and Excursion Vessels

Passenger vessels using the Commercial Port fall into two separate categories. The first are cruise ships, with overnight accommodations, that offer cruises that last from several days to two months or more. These vessels range in size from about 300 feet long with accommodations for 120 to 150 passengers, to ships that are over 800 feet long with about 2,000 passengers (PAG, 1999).

The second category costs of day excursions and evening dinner cruises for tourists staying at hotels. Vessels servicing this industry may range from big yachts carrying up to 150 passengers, to large multi-hull design vessels with capacities in the neighborhood of 750 passengers (Ibid).

Cruise Vessels

During FY 1995, twenty passenger vessels arrived in Guam carrying slightly over 8,000 passengers. These vessels originated in Japan, Europe, or in the U.S. In previous years, both the number of vessels visiting Guam and the total passenger count has varied widely. In 1989, approximately 9,150 cruise boat passengers visited the island, and in 1992 a record high was achieved with 13,668 passengers. Since then, the number of passengers has fluctuated between 9,000 and 10,000 (PAG, 1999).

Excursion Vessels

The local excursion traffic is very different from the extended cruise market. Day cruises and dinner/dance cruises are included in many tour packages and are very popular. The industry is very robust and is growing in proportion to tourism counts. At the present time, a few larger boats, each with a capacity of 149 passengers, and several smaller boats (excluding dive boats, charter fishing boats, and the submarine) with an average capacity of 49 passengers are engaged in this market (PAG, 1999).

This fleet has a total capacity of almost 1,000 passengers and these vessels may sail once or twice each daily. Although no accurate statistics appear available with respect to this industry, the sheer numbers of passengers carried dwarfs those figures for the cruise vessel industry. It has been reported that close to 25 percent of all visitors enjoys one of these excursions (Ibid).

1.4.2 Future Demands on Apra Harbor

1.4.2.1 Commercial Shipping

As discussed in the previous section, much of the Commercial Port's waterfront areas usable for docking are already in use. Additional areas, such as areas fronting Golf Pier and within the inner harbor, are in shallow waters with ocean depths in some areas less than 30 feet. To accommodate ships that currently use Apra Harbor, the ocean depth must be at least 35 feet.

For Guam to develop into a transshipment center, Apra Harbor must be able to accommodate larger ships with drafts from 40 to 46 feet. Ocean depths are between 36 to 38 feet at the main commercial port wharves (Wharves F-4 through F-6) and 26 to 35 feet deep in the inner harbor area east of these wharves. At the present time, Wharves F-4 through F6 are operating at near capacity.

While the demand for docking space has increased at the Apra Commercial Port, there has never been an expansion of wharf infrastructure since the government of Guam exchanged land for wharf space with the federal government back in 1969. In the last few years, the Port Authority has averaged approximately 150 to 200 port calls per month, resulting in congested operating conditions, for break-bulk carrier vessels, cement carriers, container ships, cruise vessels and yachts, fishing vessels including long liners and purse seiners, research vessels, tankers, training vessels visiting the region and tugs and barges.

In addition to commercial operations in Apra Harbor, there has also been an increase in visiting U.S. Naval vessels, including the Kitty Hawk and Carl Vinson carrier strike forces and various support ships including Military Prepositioned vessels and Military Sealift Command supply vessels. Table 1-3 summarizes the intermediate to long range forecast for major users of the Apra Commercial Port over the next 25 years.

Table 1-3
Apra Commercial Port
Long-Range Forecast (FY 2000 – 2025)

Year	Tourism Industry[1]	Military Traffic[1]	Construction Activity[1]	Local Consumption[1]	Trans-Shipment[1]	Tuna Shipment[2]	Cruise Vessels	Passenger Count
2000	442,891	226,042	463, 713	1,084,710	246,025	10,000	30	15,000
2010	648,437	234,180	501,938	1,281,202	285, 522	12,000	35	17,500

Year	Tourism Industry[1]	Military Traffic[1]	Construction Activity[1]	Local Consumption[1]	Trans-Shipment[1]	Tuna Shipment[2]	Cruise Vessels	Passenger Count
2025	863,070	241,276	532,661	1,451,596	356,969	15,000	38	19,000

Notes: (1) In Revenue Tons, (2) In Metric Tons Source: PAG, 1999

Based upon the most recent PAG estimates the overall revenue tonnage for all cargo handled at Apra Commercial Port is anticipated to increase by approximately 58% over the next 20 years. For 2005, estimated revenue tonnage was 2,041,807. The estimate for the year 2025 is 3,461,000. This implies that in 2025, Apra Harbor will handle an additional 1,419,193 revenue tons of cargo annually.

As cargo traffic increases, additional wharfage areas would be required. Inevitably, areas of usable water frontage will become exhausted. To increase docking capacities, one option is to expand the docks by creating additional wharves. The logical areas to create new wharfage would be within deep waters to minimize the amount of dredging for navigational purposes. These areas include Hotel Wharf, Golf Pier, and the area between these two docks where the ocean bottom ranges from 60 to 100 feet below sea level.

To accommodate the projected increases in cargo to Guam in the coming years, PAG has initiated planning studies for an orderly expansion of the storage capability of Commercial Port. The availability of a deep-draft wharf facility in Apra Harbor capable of accommodating Post-Panamax vessels would provide Guam the opportunity to actively market such facilities, and along with it, the potential for Apra Harbor to become a desirable transshipment center for the Asia-North America trade.

Aside from servicing large commercial vessels and cargo transshipments, the new wharf would also allow for an increase in Cruise Ship Travel to and from the island. Guam is currently called upon approximately 30 times per year by an average of 15 separate international passenger cruise ships. According to the Guam Visitor's Bureau, most of the visits are academic in nature. The vessels bring about 600 students during their winter vacation who spend 5 days in various classroom or marine study activities. In spite of the tendency of these cruises to concentrate arrivals in just a few months of the year, this would be an increase in demand that would likely need to be met with improvements by PAG.

The proposed deep wharf project would be critical to the future economic development of Guam. The private sector economy of Guam lives and dies by its connections with the outside world. Guam's fundamental economic advantages lie in trade facilitation (such as through Guam's air and sea ports) and the sale of services into Asia (such as tourism, and to a lesser extent education and healthcare). Previous interests to establish a duty free zone as well as cargo pre-clearance zone (for goods destined for the US mainland) at the Port Authority are being revisited. This will position Guam as a staging area for shipments of goods to the US mainland for vessels of any size originating out of Asia, significantly increase the flow of goods through Guam and, in

turn, encourage US companies to set up service centers in Guam to manage these facilities. The Deep Wharf Project, therefore, is the centerpiece to the expansion of trade with and through Guam, and a key driver of Guam's future economic prosperity.

1.4.2.2 Commercial Fishing

Presently, a large fleet of longliners uses Guam for air shipment of their tuna catches. However, this industry is governed much more by the relative costs at Guam, air freight limitations, and licensing policies of other countries, than by such variables as the growth of the market or the overall harvests versus potential yields. In addition, some have cited other restraints upon growth which threaten Guam's position. These include limits on the number of Japanese vessels allowed to land fish outside of Japan, investments by Taiwanese entrepreneurs in alternative transshipment facilities, and technology changes, such as blast freezing to super cold temperatures that would remove the time constraint on getting the fish to market. Because of these continued competing factors, it is not impossible to envision the departure of chilled tuna transshipment as quickly as it arrived.

Over the past several years the metric tonnage of tuna shipped has been very unpredictable. Consequently, it is extremely difficult to forecast the future transshipment levels of chilled tuna. Due to the industry's unpredictability and based on the many variable described above there remains a possibility of the departure of chilled tuna transshipment as quickly as it arrived (PAG, 1999).

However, existing operation levels or potential growth of the industry also remain a possibility. As illustrated in Figure 1-4 the number of fishing vessels far exceeds the number of cargo vessels. These fishing vessels would continue to compete for the same port facilities as commercial cargo vessels and existing congested port conditions would continue.

1.4.2.3 Cruise and Excursion Vessels

Past forecasts have predicted that cruise vessel passenger counts would grow roughly in proportion to the total number of visitors. This has not occurred, however. While visitor counts has climbed significantly over the long term, cruise vessel traffic has been flat, and has even declined during some periods. For the short-term, therefore, cruise vessel traffic is predicted to grow only slightly.

If excursion vessel traffic grows at the same rate as tourism (10 percent annually) as expected, then nearly half a million visitors would be sailing annually on one of the day excursions by the year 2000. Unfortunately, accurate statistics are not available to track what has become the fastest growing activity in the Commercial Port. Unlike the tuna industry which could decline quite rapidly, day excursions exhibits good stability, and should remain a Commercial Port user for the foreseeable future (PAG, 1999).

1.4.3 Consistency with Plans and Policies

In April 0f 2003 the Guam Economic Development and Authority (GEDA) and the Guam Bureau of Statistics and Plans (GBSP) jointly completed the Guam Comprehensive Economic Development Strategy (CEDS). The CEDS is a strategic planning document with an overall purpose of providing direction, focus, and priority of local efforts, guide federal assistance, and private investment in an effort to stabilize and grow Guam's economy and improve the quality of life and public services (GovGuam, 2003)

The CEDS document describes the Guam's economic problems, needs, potentials and resources; presents the community's vision and goals; sets a strategic direction for action; and establishes priority programs and projects for implementation. The projects and programs recommended for implementation in the CEDS are categorized into either low, medium, or high priority projects based on several established policy investment guideline criteria. The Proposed Project has been identified in the CEDS as a High Priority project.

In addition to consistency with the CEDS the Proposed Project is also consistent with the Administration's economic policies as contained in the policy plan entitled "Ten Strategic Initiatives to Stabilize and Grow Guam's Economy. This report was updated in May of 2004 and indicates that the Proposed Project as still being listed as a high priority project for the island. Furthermore, the Proposed Project is also consistent with the Department of Interior's Strategic Plan, which supports increased economic development and private sector employment.

1.4.4 Statement of Purpose and Need for the Proposed Project

The alternatives analysis required under NEPA are based on the overall project purpose. The proponent of an action must ensure that the overall project purpose is not defined in an overly narrow manner which might preclude the possible existence of practicable alternatives. The proponent must consider a wide range of views on the proper definition of overall project purpose, regarding a Proposed Project's appropriate size, need, and configuration. Therefore, the proponent must independently determine the proper definition of overall project purpose to ensure that the range of potential practicable alternatives is not unduly restricted and, at the same time, not so broad that an inordinately large number of alternatives would have to be considered (33 CFR 325, Appendix B).

Based on the above considerations the following statement of Purpose and Need for the Proposed Project has been developed:

> "The purpose and need for the Proposed Project is to provide Guam with a wharf facility capable of accommodating today's largest deep-draft commercial cargo, passenger, and military vessels and to increase operational backland capacity for containerized cargo operations to meet the future demands for these services within the Apra Commercial Harbor"

In summary, upon completion of the project, congestion at the at the Apra Commercial Port would be alleviated, room for additional economic activity could be created, thereby generating additional jobs. New wharf construction, especially in the proposed area which is characterized by deep water will also provide the U.S. Navy with the opportunity to utilize wharf facilities that can accommodate larger military vessels such as aircraft carriers, that are unable to enter the inner harbor due to their size.

2.0 PROJECT ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This section addresses National Environmental Policy Act (NEPA) requirements to identify a range of reasonable, feasible, and practicable alternatives, including the No Action Alternative, for further analysis. This chapter describes:

- The process used to identify reasonable, feasible, and practicable alternatives for a new deep-draft wharf and cargo/container yard facility
- Alternatives considered but eliminated from further analysis;
- Alternatives identified for further analysis

2.2 IDENTIFICATION OF REASONABLE AND FEASIBLE ALTERNATIVES

As an objective, each of the alternatives would need to accommodate two main uses. The first would be the capacity to off-load/dock one Post-Panamax class container vessel which requires a minimum berth length and depth of approximately 1,100 linear feet, and 50 feet below mean sea level (MSL), respectively and to provide 16 acres or greater of operational backland area. The second use would be to berth a Nimitz Class aircraft carrier which requires a minimum berth length and depth of 1,300 – 1,325 linear feet, and 49.5 feet below MSL, respectively.

2.2.1 Location, Land Area, and Access Requirements

The requirements of modern Post-Panamax container vessels and increased cargo throughput significantly influence physical requirements for a new cargo facility. The future berth to accommodate such vessels would require a minimum length of 1,500 linear feet, with a wharfside depth of 55 feet below MSL, and channel dimensions sufficient to accommodate these modern container vessels. In addition, the proposed deep-draft wharf facility would require adequate backland area, for eventual container storage, processing and support operations and infrastructure (such as stormwater management, and maintenance facilities). For efficient cargo operations, operational backland areas should be located either directly behind and contiguous to or in the immediate vicinity of the proposed cargo berth.

At the present time containerized cargo shipped through the Apra Harbor commercial port, are carried by Panamax class cargo ships or smaller. Panamax class cargo vessels include the largest ships able to transit the Panama Canal. The largest Panamax vessels are approximately 960 feet long and 105 feet wide, are able to operate in water depths of 40 feet, and are able to carry up to 4,000 TEUs Cargo vessels operations at the Apra Commercial Port occur at Wharves F-4, F-5, and F-6.

As previously discussed in Section 1.4.1 these existing wharves are unable to accommodate the larger Post-Panamax vessels which require operating depths of 55 feet.

For logistical and operational purposes the new deep-draft wharf would also require a proximal location and an efficient linkage system to existing PAG commercial port infrastructure as well as to Guam's roadway systems since the majority of landside container movements would be by truck.

2.2.2 Site Development Requirements for Container Cargo Operations

The proposed deep-draft facility would need to meet several important operational requirements. The facility would need to have a berth of sufficient size to accommodate projected Post Panamax and Nimitz Class aircraft carrier vessel traffic. These vessels require that the berth have a minimum length of 1,500 linear feet, a minimum width of 200 feet, and a minimum depth of 55 feet. The backland areas to support the berth operations should be 16 acres or greater for container storage and processing, support operations, and support infrastructure. The deep-draft wharf facility should also have a sufficient number of container cranes to meet the throughput requirements of proposed cargo operations, and those cranes should have the outreach sufficient to reach across the full width of a Post-Panamax cargo vessel.

The backland areas proximal or behind the berthing area would primarily provide for the storage and staging of containers transiting the new deep-draft facility. Additionally, backland areas may include operational support facilities such as warehouses for loading or unloading cargo from containers, and administrative offices, and maintenance facilities for container-handling equipment.

The deep-draft wharf facility must have utilities such as electric power, fresh water, and wastewater/sanitary sewage collection to meet the operational requirements of ships, cranes, cargo processing facilities, maintenance facilities, and administrative facilities. It also must include facilities for collection and treatment of stormwater. Wharf operational and backland areas must be illuminated to meet applicable safety requirements, and both lighting and utility services must be designed to allow the greatest practical flexibility in the use and layout of the container storage areas. An internal roadway system would be needed to allow for efficient flow of traffic between the deep-draft wharf facility, backland container storage/processing areas, and the commercial port main gate facility.

As previously discussed in section 1.4.1.2, the implementation of heightened security due to the MTSA has complicated the arrival of cruise vessels at Apra Harbor. At the present time, due to required separation of cruiseship and other waterfront operations the temporary suspension of cargo handling activities is necessary. Therefore the proposed facility's area nd location in the harbor would need to accommodate applicable homeland security requirements.

2.2.3 Alternative Identification Process

To identify reasonable alternatives the statement of need was utilized to develop a set of basic criteria against which potential project sites and designs could be evaluated. These criteria reflected the site development requirements presented above. Based upon existing container cargo handling volumes at the Apra Commercial Port, it was determined that each reasonable alternative would need to accommodate container throughput capacities between 1,700 to 3,296 TEU per week or 88,400 to 171,392 TEU annually. To meet operational requirements, each alternative considered must provide a – 55-foot MSL draft depth, 1,500 linear feet of berth for container vessels and approximately 16 acres or greater of backland suitable for eventual container operations and related infrastructure.

A three-tiered approach for identifying potential locations and designs for the proposed facilities was undertaken. This approach is described briefly below and in more detail in the following sections:

- A Tier 1 evaluation applied a broad set of basic siting criteria to identify a range of possible locations for the proposed deep-draft wharf facility and backlands.
- A Tier 2 evaluation applied a set of basic operational criteria to identify which of the possible locations could be eliminated from further consideration.
- A Tier 3 evaluation considered (to the extent possible) feasibility of facility design alternatives at locations remaining after the Tier 2 evaluation.
- The sites remaining after the Tier 3 evaluation formed the set of alternative deep-draft wharf facility designs and locations considered in this study.

Berth length and backland area for cruise vessels were not considered in this analysis as cruise operations and container operations are not dependent on each other. However, berth length and draft requirements for US Navy Nimitz Class aircraft carriers were considered due to the operational requirements of these vessels.

2.2.3.1 Tier 1 Evaluation to Identify Potential Project Locations

A Tier 1 set of criteria was developed to identify a list of preliminary sites for new deep-draft wharf facility. Criteria included:

- Accessibility to an existing deep-draft channel by either an existing or new channel.
- The potential to develop a minimum of 1,500 linear feet of berth and wharf with a minimum draft depth of 55 feet at the wharf face.

- The availability or potential to develop between 16 to 20 acres of operational backland area.
- Location in the Apra Harbor vicinity (the general operating vicinity of the PAG).

2.2.3.2 Results of the Tier 1 Evaluation Process

A limited number of possible locations were evaluated using the Tier 1 criteria. The main factor limiting the number of feasible geographic locations is the operational requirement of the Proposed Project to be proximal to existing PAG commercial port operations and infrastructure. Consequently, sites outside the Apra Harbor area were initially considered, but were subsequently omitted due to basic geographical limiting factors further discussed in Section 2.3.1 below.

Three preliminary sites were identified for further analysis using the Tier 2 criteria. These were Site 1: The area between Hotel Wharf and Outhouse Beach and the shallow lagoon areas along the east end of Cabras Island, Site 2: The existing Commercial Port Wharves F-4 through F-6, and Site 3: the former Naval SRF. The location of these sites is shown on Figure 2-1.

2.2.3.3 Tier 2 Evaluation to Identify Potential Project Locations

Each of the four preliminary sites identified through the Tier 1 evaluation were evaluated against a set of Tier 2 criteria to determine which sites should be eliminated from further consideration. Tier 2 criteria included:

- Navigational access
- Dredging and fill requirements
- Available or developable backland area
- Access to roads and proximity to existing commercial port infrastructure
- Land development constraints associated with existing land use

These criteria are presented in greater detail below.

Navigational Access

This criterion considered the proximity of each site to an existing deepwater channel, preferably a channel already at, or approved for, a depth that would meet the needs of modern Post-Panamax container vessels and U.S. Navy aircraft carriers. Other issues addressed for sites considered included:

- Does the site provide for ship maneuverability with sufficient clearance for vessels to dock and turn?
- Does the site location contribute to navigational safety?

Therefore, based on the project purpose and need and vessel operational

requirements each of the sites considered provided sufficient frontage for development of a minimum of 1,500 linear feet of berth and draft depth of 55 feet as identified in the Tier 1 evaluation.

Dredging and Fill Requirements

This criterion addressed the relative requirement for construction dredging and/or land reclamation associated with development of the navigational features of a deep-draft wharf and backland areas at each site. In cases where there were no formal design plans for such facilities, estimates of dredging volumes (minor, moderate, substantial, or very substantial) were developed.

Available or Developable Backland Area

This criterion addressed the available backland for the eventual development of container processing facilities and supporting infrastructure at each site. PAG has estimated that 16 acres or more of backland would be necessary to support a new deep-draft container berth. Thus, for site planning purposes, this minimum acreage of backland was considered essential for each Tier 2 site. In addition, each site was evaluated for the availability of a compact landmass compatible with efficient container yard operations. The preferred configuration would provide substantial areas for operational backlands to be located either directly adjacent to or in the immediate vicinity of the proposed wharf.

Access to Roads and Existing Commercial Port Infrastructure

This criterion considered accessibility to Guam's public roadway system and the relative magnitude of obstacles and costs involved in providing access if it did not exist. This criterion also considered whether access to the public roadway system would require crossing of federal and/or private lands.

Land Development Constraints Associated with Existing Land Use

This criterion addressed the requirement for demolition or relocation of existing structures at a potential site, and the potential for cleanup of potentially contaminated property required for development of deep-draft wharf and backland facilities at each site.

2.2.3.4 Results of the Tier 2 Evaluation Process

Evaluation of the three potential project sites identified using the Tier 2 criteria resulted in the elimination of Sites 2 and 3 from further consideration. The potential locations at Sites 2 and 3 met some of the Tier 2 evaluation criteria. However, these locations were deemed infeasible based upon their limitations with regard to dredging and land development constraints. These limitations and constraints are discussed in further detail in Section 2.3 below.

2.2.3.5 Tier 3 Evaluation of Feasible Design Alternatives

After the Tier 2 evaluation only the general area encompassing Site #1 remained as a feasible project location alternative. The Tier 3 evaluation addressed the feasibility of various facility design alternatives with regard to meeting operational design requirements. Based upon the Tier 3 criteria one design alternative was eliminated from further consideration and is discussed in further detail in Section 2.3.2 below.

2.3 ALTERNATIVES CONSIDERED AND ELIMINATED FROM FURTHER CONSIDERATION

2.3.1 Alternate Sites Outside Apra Harbor

Alternate locations outside of Apra Harbor for the Proposed Project were initially considered, but were eliminated from further consideration due to economic and environmental considerations. Apra Harbor is the only commercial deep-draft harbor facility on the island of Guam. The Island has no other coastal locations that would provide a technical or economically feasible alternative for the proposed locations within Apra Harbor. Apra Harbor provides the only feasible location alternative for implementing the Proposed Project in terms of location, existing port facilities, infrastructure, economic, and environmental considerations.

2.3.2 Alternate Sites Within Apra Harbor

2.3.2.1 Floating Pier Design Alternative (Site #1)

Under this alternative it was proposed that a floating pier and support facilities would be constructed between Golf Pier and Hotel Wharf. This location was deemed the most suitable since it minimized the length of required access bridges. The floating pier facility would consist of a 1,350 foot floating pier, 1 container crane, 2 access bridges, and a container conveyance system.

A floating dock, conceptually similar to the proposed floating pier alternative for Apra Harbor, was constructed at the Port of Valdez in Alaska as a container terminal. At Valdez, a fixed pier was originally envisioned, but was found to be impractical due to potential failure during earthquakes. Hence a floating pier, anchor system, and two articulated access bridges were designed, fabricated, towed to the site, and installed. As designed the pier accommodates ocean carriers up to 50,000 gross registered tons and barges with capacities up to 15,000 tons. The pier was originally designed to accommodate a 40-ton container crane with a maximum outreach of approximately 100 feet. However, during the design phase it was discovered that the floating pier would not be able to accommodate such a large crane. Therefore, ship cranes or mobile cranes are presently being used. The inability of a floating pier to accommodate large container cranes limits its viability as an alternative. Large, high capacity, 60-ton container cranes with an outreach of 150 feet or greater are required to efficiently off load a post-Panamax vessel. The floating pier alternative would not meet the purpose

and need for the Proposed Project because of its inability to accommodate the required high-capacity container cranes.

2.3.2.2 Renovation of Existing Wharf Facilities (Site #2)

Under this alternative the renovation of existing cargo pier structures was considered as a means of meeting the overall, project purpose and need. The only existing wharf structures that could be considered for reconstruction would be the existing cargo Wharves F-4 through F-6. These three wharves are located adjacent to each other and provide a combined total wharfage of 1,953 linear feet.

The wharves can accommodate two full cargo container vessels, three smaller breakbulk and container vessels, a number of the smaller vessels (between 60 to 200 feet) that serve the other islands, or any combination of these vessels. The wharves themselves consist of a steel sheet pile bulkhead. Wharf F-5 was extensively damaged during an earthquake event in August of 1993 and as a result sees only minimal use.

Renovation of the existing wharves to accommodate a Post-Panamax cargo vessel or a Nimitz Class aircraft carrier proved to be infeasible because of the following:

First, Preliminary engineering analyses have shown that dredging at the face of the wharves and renovating/retrofitting the existing wharves would to accommodate larger vessels would compromise the structural integrity of the existing pier structures.

Second, for Post-Panamax and/or Nimitz Class aircraft carrier vessels to access the F-4 – F-6 wharf area they would be required to navigate through the Cabras Island Channel. Water depths within the channel are approximately 30 – 35 feet below MSL. Therefore, navigation dredging requirements would be "very substantial" as the Cabras Channel would need to be dredged to a depth of – 55 feet MSL to accommodate these deep-draft vessels.

Lastly, from an operations standpoint, it would not be feasible for the Commercial Port to propose berthing of additional large deep-draft vessels at a location where the existing wharfage and operational backlands are already operating at near capacity and vessels already compete for space.

2.3.2.3 Conversion of the former SRF Alternative (Site #3)

The Naval Ship Repair Facility which was closed by the Base Realignment and Closure (BRAC) decision of 1995. In July of 1997, the Navy executed a lease with GovGuam through GEDA for the operation of the former SRF industrial facility as a commercial repair yard.

The former SRF is located across Outer Apra Harbor approximately 1 mile south of the Proposed Project site. The former SRF currently re-employs 200 former SRF employees and encompasses approximately 100 acres of land area. It is presently

functioning as a privatized ship repair facility which provides vital shore industrial support, repair, maintenance, overhaul and drydocking services to visiting Seventh Fleet units, the submarines of Commander Submarine Squadron 15 and resident tender, USS Frank Cable, as well as Military Sealift Command ships, two coast guard ships and local federal agencies on island. The shipyard also provides authorized repair to commercial ships such as Matson Navigation and Sealand Services and shore support services to GovGuam agencies.

The former SRF has facilities and capabilities not found elsewhere in the Western Pacific including a foundry, the largest motor rewind facility, a special building for environmentally controlled sandblasting and painting, micro-miniature circuit board repair, corrosion control and an industrial laboratory. It is the only facility in the Western Pacific certified by the US Department of Transportation to perform re-certification requirements on breathing air and high pressure air cylinders (Global Security, 2005).

The BRAC decision of 1995 which closed the former SRF, would have transferred approximately 3,251 lineal feet of wharf space to the government of Guam. This additional wharfage could have been considered as a potential site for deep-draft wharf construction. However, constructing a deep-draft wharf facility at this location would present challenges in meeting the Tier 2 criteria of access to roadways and existing Commercial Port infrastructure, and land development constraints associated with existing land use. Ultimately, the Navy decided to retain the wharfage for defense and security purposes. Due to the Navy's retention and subsequent unavailability of wharfage at the SRF, this location was no longer considered a feasible alternative site.

2.4 ALTERNATIVES IDENTIFIED FOR FURTHER ANALYSIS

2.4.1 No Action Alternative

For a project being reviewed under NEPA it is required that a No Action Alternative be evaluated. Under the No Action Alternative, PAG would not construct the new deep draft wharf facility and container yards areas at either of the two location alternatives. As such, none of the impacts identified as a result of constructing and operating the proposed facilities at either of the alternative locations would occur.

Current land uses and development trends within the study area would continue without the construction of the Proposed Project. This no build scenario is used to establish the baseline against which projected impacts of the proposed build and design alternatives alternative are compared.

It has been assumed that under the No Action Alternative, the Proposed Project location site would not be developed to accommodate other types of port facilities similar to those presently located in existing areas of Apra Commercial Harbor. However, future unrelated developments consistent with current land use designations, with their associated impacts, could occur in existing areas of Apra Commercial Harbor

2.4.2 Proposed Project (Preferred Alternative): Pier on Piles Deep Draft Wharf and Land Reclamation

The Proposed Project site is located on the west end of Cabras Island in the northeast quadrant of Apra Harbor. The deep draft wharf and three reclamation sites are located approximately 2 nautical miles northeast of the harbor entrance. The Proposed Project site location and overall site plan are shown in Figures 2-2 and 2-3, respectively.

The proposed deep-draft wharf site is situated on the South side of The Glass Breakwater and Luminao Reef and is bounded by Hotel Wharf to the west, Route 11 to the North and Mobil Tank Farm to the east. Reclamation site 1 is bounded by Outhouse Beach to the east, Route 11 to the north and Golf Pier to the east. Reclamation site 2 is bounded by Golf Pier to the west, Route 11 to the north and Seaplane Ramp to the east. Reclamation site 3 is bounded by Seaplane Ramp to the west, Route 11 to the north, the South Pacific Petroleum Corporation and Mobile Tank Farms to the east, and Shell's Wharf F-1 Terminal to the south.

2.4.2.1 Deep-Draft Wharf

The preferred action alternative involves the construction of a deep-draft wharf consisting of a concrete deck with a piled foundation. This concept utilizes individual piles driven in a grid across the site to support a concrete deck. The concept includes a protected slope under the wharf deck rising up to a shallow sheetpile wall and fill placed behind the wall and extending to the adjacent Route 11 roadway. Figures 2-4 and 2-5 show the proposed deep draft wharf layout and design.

The proposed wharf would be approximately 1,512 feet in length and 215 feet in width providing an overall wharf deck area of approximately 325,080 square feet (7.46 acres). These dimensions include a 113-foot wide (3.92 acre) concrete deck on precast concrete piles and 102 feet (3.54 acres) of backlands on fill. Waters in the outer harbor are generally deep varying between 100 and 150 feet below Mean Sea level (MSL), and the depth at the proposed wharf outer face varies between 14 and 55 feet below MSL. The proposed wharf would be able to accommodate deep draft vessels and the final dredge elevation along the entire wharf face would be 55 feet below MSL.

The foundation of the wharf would consist of 24-inch octagonal precast, prestressed concrete piles, spaced at 24 feet apart in the longitudinal direction and 16'-8" apart in the transverse direction. Piles supporting the two rail girders on the concrete deck would be spaced at half the spacing (i.e. 12 feet apart). Dredge depth at the most seaward row of pilings would be –55 feet MSL.

An embankment would be cut into the existing sea bed beneath the wharf at a slope of 1.75 horizontal to 1 vertical. The slope would be overlain by a 4-foot thick layer of rip rap. A grid system of longitudinal and transverse girders would be constructed to provide continuous pile caps. The girders will be 3'-0" wide with a total depth of 3'-10". A 16-inch thick concrete slab will be cast on top of the girders.

Two rail girders would run along the length of the concrete slab on its landward (inboard rail girder) and seaward (outboard rail girder) sides. Behind the inboard rail girder a sheet pile cut off wall would be installed to retain the backfill supporting the backland area. The sheet pile tip elevation and structural section will vary along the length of the wharf, to accommodate the existing bathymetry. Crushed rock fill would be placed behind the cut-off wall for a distance of approximately 10 feet. Dredge material would be placed behind the crushed rock fill extending to the existing shoreline. The dredge material fill would be overlain by a sub-base and asphalt layer to comprise the backland area of the wharf.

The rail girders would house 100-foot gauge crane rails that would run for an approximate length of 1,400 feet on which three gantry cranes would operate to offload containers from Post-Panamax cargo ships. To avoid aerial encroachment onto the adjacent leasehold property at Hotel Wharf, the crane rails will be stopped short of the west end of the wharf. Figures 2-6 through 2-9 depict the proposed wharf with a Post-Panamax cargo ship and Nimitz Class aircraft carrier berthed.

The proposed wharf facility would also include roadway and utility improvements including potable water, sanitary sewer, and electrical services. Utility and roadway improvements are discussed in further detail in Sections 3.3 and 3.4, respectively.

Dredging:

Dredging of the seabed along the wharf face and directly beneath the proposed wharf will be required to deepen the existing sea floor to the required navigational depth of -55 feet MSL. The size and volumes of areas to be dredged are minimized under this design alternative because the proposed facility would be constructed such that the wharf face is built outward from the exiting shoreline to the required –55-foot MSL depths to the extent possible.

The total in-situ area that would require dredging is approximately 285,146 square feet (6.54 acres). 168,487 square feet (3.86 acres) of which would be seaward of the wharf face and 116,659 square feet (2.67 acres) of which would be beneath the wharf structure to be dredged to slope. The areas that would require dredging are shown in Figures 2-10 and 2-11. The total volume of dredge material excavated would be approximately 180,621 cubic yards. Approximately, 83,524 cubic yards of this excavated dredge material would be used to backfill the undersea portion between the wharf's landside sheet pile cut off wall and the existing shoreline. The remaining 97,097 cubic yards of dredge spoils would be used as fill material for the proposed land reclamation sites.

Though the Proposed Project is not a dredging project per se, as previously noted, some dredging for navigational purposes would be necessary during the construction of the deep-draft wharf facility. There are two basic dredge method options that could be implemented. These are mechanical dredging and hydraulic dredging.

Mechanical dredging utilizes equipment such as drag buckets, clamshell buckets and barge-mounted excavators. Hydraulic dredging uses hydraulic suction to remove sediment. Mechanical dredging minimizes the amount of water contained in the dredged material compared to hydraulic dredging. However, mechanical measures generate substantially larger silt plumes that could adversely impact adjacent near shore waters.

Dredging activities for the Proposed Project would likely utilize hydraulic dredging methods. Compared to mechanical dredging, hydraulic dredging involves less auxiliary equipment, has higher production rates, minimizes dredge sediments generated by dredging activity, and tends to have lower labor costs.

2.4.2.2 Land Reclamation Sites

In addition to construction of a deep-draft wharf, the Proposed Project involves the reclamation of three sites with containment dikes to the east of the proposed deep-draft wharf structure. At the present time PAG does not have specific development plans for the three reclamation sites. However, it is the intent that the reclamation sites remain open for the eventual use as additional operating backland and container yard space in support of the proposed adjacent deep-draft wharf facility.

Presently, the use and development of the proposed operating backland/container yards areas are only in the conceptual stages, the facilities would include the following general construction elements:

- Clearing, Paving and Grading of Backland Areas - The design of each paved area would be consistent with the proposed use. For example, areas slated for container cargo yard development would be designed consistent with requirements for heavy industrial pavement areas utilized for container storage and handling.

- Utilities - New utility lines, such as drain lines, water lines, and electrical duct trenches for utilities would be excavated in the surface fill materials encountered at each reclamation site. As required, below-ground transmission lines for liquid bulk cargo (e.g. petroleum) would be installed within new paved areas.

- Sheds - Sheds in harbors are for industrial uses and are generally of steel and concrete construction. The purpose of sheds would be to provide various operational support functions such as equipment storage, restroom facilities, offices, etc.

- Access Roads - Internal roadway improvements would be needed to serve the newly developed backland/cargo yard areas. These roads would generally be approximately 40 feet in width. Access roads would be subjected to heavy vehicles. Based on heavy truck traffic, flexible pavement sections consisting of asphalt concrete over asphalt treated base may be used for design of the access

roads. For other areas that would be light duty (for passenger cars, light trucks and occasional heavy trucks) as opposed to heavy duty, pavement could be constructed with a thinner layer of asphalt concrete over an aggregate base. To prevent drainage problems, new pavement would be slightly sloped to carry surface water off the pavement into appropriate drainage structures.

The layout and design of the proposed reclamation sites are shown in Figures 2-12 and 2-13. Reclamation Site 1 is located directly to the east of the proposed deep draft wharf and has an approximate area of 1.17 acres. Reclamation Site 2 is located east of Golf Pier and has an area of approximately 2.26 acres. Reclamation Site 3 located to the east of Seaplane Ramp is the largest of the three reclamation sites comprising an area of approximately 13.24 acres. The total area proposed to be filled is approximately 16.67 acres.

The front face of the dikes would have a 2:1 horizontal-to-vertical slope and would be revetted with two layers of rip rap armor stone or concrete cubes. The existing armor stone at or near the reclamation sites will be inventoried. Armor stone suitable to be reused (i.e. meet size and tonnage requirements) will be incorporated into dike construction.

The dike at Reclamation Site 1 will have a crest (top) elevation of 11 feet above MSL and bottom elevations of 4 to 7 feet below MSL. The dike at Reclamation Site 2 will also have a crest elevation of 11 feet above MSL but will have bottom elevations of 4 to 5 feet below MSL The dike at Reclamation Site 3 will be the largest of the three with a crest elevation of 13 feet above MSL and a bottom elevation of 25 feet below MSL. Typical sections and elevations of the proposed dikes are shown in Figures 2-14 and 2-15, respectively

Water depths at Reclamation Sites 1 and 2 are generally shallow measuring about 6-7 feet below MSL, The amount of fill material required for Reclamation Site 1 is 10,019 cubic yards, and the amount of fill required for Reclamation Site 2 is 24,677 cubic yards. Water depths at Reclamation Site 3 have a wider range varying from 6 feet to 25 feet below MSL. The amount of fill material required for Reclamation Site 3 is 251,066 cubic yards, The total amount of fill material required for all three reclamation sites is approximately 285,762 cubic yards. Table 2-1 below provides a summary of estimated areas, fill volumes and dredge volumes for each of the Proposed Project components under the Preferred Alternative.

Table 2-1
Estimated Area, Dredge and Fill Volume Requirements
(Preferred Alternative)

Project Component	Dredge Requirement (in Cubic Yards)	Fill Requirement (in Cubic Yards)	Area Requirement (in Acres)
Deep Draft Wharf	180,621	83,524	7.46
Reclamation Site 1	-	10,019	1.17

Project Component	Dredge Requirement (in Cubic Yards)	Fill Requirement (in Cubic Yards)	Area Requirement (in Acres)
Reclamation Site 2	-	24,667	2.26
Reclamation Site 3	-	251,066	13.24
Totals	**180,621**	**369,276**	**24.13**

Fill Material:

As previously noted dredging of the seabed along the wharf face and directly beneath the deep-draft wharf structure would be necessary to deepen the existing sea floor to the required depth of –55 feet MSL. The total volume of dredge material excavated would be approximately 180,621 cubic yards. Approximately, 83,524 cubic yards of this excavated dredge material would be used for construction purposes to backfill an undersea portion of the deep-draft wharf. The remaining 97,097 cubic yards of dredge material would be used as fill material for the proposed Reclamations Sites. The dredge material would either be temporarily staged in an upland CDF or placed directly into the three adjacent land reclamation sites. If construction of an upland CDF is required it's location would likely be on the open Commercial Port lands directly east of Wharf F-6.

In addition to the dredge spoils from the deep-draft wharf construction an additional 188,665 cubic yards of fill material would be required to complete the construction of the proposed reclamation sites. As previously discussed in Section 1.3.4 either the beneficial use of US Navy construction project dredge spoils or select fill from upland quarries, or a combination thereof, would be used for this purpose.

2.4.3 Alternate Design (Alternative 2): Cellular Sheet Pile Deep Draft Wharf and Land Reclamation

Under this alternative the proposed deep draft wharf site and the three reclamation sites would be situated in the same locations as the deep-draft wharf and reclamation site facilities proposed under the Preferred Alternative. Under this alternative an alternate design for the deep-draft wharf facility is proposed.

2.4.3.1 Deep Draft Wharf

This design alternative involves the construction of a deep-draft wharf consisting of a concrete deck cast on top of a filled cellular sheet pile foundation. Figures 2-16 through 2-18 show the proposed deep draft wharf layout and design.

The proposed wharf would be approximately 1,526 feet in length and 230 feet in width providing an overall wharf deck area of approximately 345,000 square feet (7.92 acres). These dimensions include a 118-foot wide (4.13 acre) concrete deck on a bulkhead wall consisting of fifteen 82-foot diameter cells and fourteen interconnecting arcs. The circular

cells and interconnecting arcs would be constructed from steel sheet piles and would be filled with approximately 315,470 cubic yards of select dense, gravel fill material. Preliminary analysis of seabed soils within Apra Harbor indicate that dredge spoil material would not be suitable as structural fill inside and surrounding the back side of the sheetpile cells. Therefore, fill material for the cells would need to be imported from quarries yet to be identified.

This alternative would also include a rail girder system on the wharf that would run along the length of the concrete deck slab on its landward (inboard rail girder) and seaward (outboard rail girder) sides. The rail girders would house 100-foot gauge crane rails that would run for an approximate length of 1,400 feet on which three gantry cranes would operate to offload containers from Post-Panamax cargo ships. To avoid aerial encroachment onto the adjacent leasehold property at Hotel Wharf, the crane rails will be stopped short of the west end of the wharf.

It should be noted that the soils underlying the project site may not be optimal for a cellular sheet pile wharf design. However, the absence of optimal soil composition does not preclude construction of the deep draft wharf using a cellular sheet pile design. Furthermore, the cellular sheet pile design was the original wharf design taken under consideration, and its engineering and design specifications were evaluated through the 35% design stage. For this reason, this alternative design has been retained for further impact analysis in this EIS.

Dredging:

Like the Proposed Project alternative, the main operational objective of the proposed wharf would be to accommodate deep draft vessels and the final dredge elevation along the entire wharf face would need to be -55 feet below MSL. Similarly, navigational dredging of the seabed along the face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required depth. Dredging methods under this alternative would be the same as those proposed under the Proposed Project alternative.

The estimated total in-situ area that would require dredging is approximately 285,146 square feet (6.54 acres). 168,487 square feet (3.86 acres) of which would be seaward of the wharf face and 116,659 square feet (2.67 acres) of which would be beneath the wharf structure. The areas to be dredged are shown in Figures 2-16 and 2-18.

Under this alternative design the proposed wharf facility would also be built out to –55 foot MSL depths to minimize the amount of dredging required. Preliminary engineering estimates indicate that the approximate amount of material that would be dredged under this alternative is approximately 160,000 cubic yards. Approximately 83,500 cubic yards of the excavated dredge material would be used to backfill the undersea portion between the wharf's landside sheet pile cofferdam and cell fill and the existing shoreline. The remaining 76,500 cubic yards of dredge spoils would be used as fill material for the proposed land reclamation sites.

2.4.3.2 Land Reclamation Sites

The design and construction elements for the proposed land reclamation component under this alternative are identical to those proposed under the preferred action alternative. Table 2-2 below provides a summary of estimated areas, fill volumes and dredge volumes for each of the Proposed Project components under the Alternative 2.

Table 2-2
Estimated Area, Dredge and Fill Volume Requirements
(Alternative 2)

Project Component	Dredge Requirement (in Cubic Yards)	Fill Requirement (in Cubic Yards)	Area Requirement (in Acres)
Deep Draft Wharf	160,000	315,470	7.92
Reclamation Site 1	-	10,019	1.17
Reclamation Site 2	-	24,667	2.26
Reclamation Site 3	-	251,066	13.24
Totals	**160,000**	**601,222**	**24.59**

2.4.4 Alternate Location (Alternative 3): Golf Pier/Southwest Point Fixed Pier Alternative

This alternative involves the construction of a fixed pier and backland support areas in the same general location as alternatives 1 and 2 (i.e., Site #1 identified in the previous Section). However, this alternative would encompass a slightly different special foot print. This alternative would be located in the area between Outhouse Beach to the west of Golf Pier and the northern shoreline of Southwest Point. The conceptual layout for this alternative is shown in Figure 2-19.

This alternative would also be able to provide wharf facilities capable of accommodating deep draft vessels along a 1,522 linear-foot pier face. Under this alternative a fixed pier and backland areas would comprise a mostly submerged area approximately 40-acres in size between Golf Pier and Southwest Point.

The design for this alternative differs markedly from the designs of alternatives 1 and 2 in that it is a fixed pier with contiguous operational backland areas. Planning for this alternative is only in the conceptual stages and specific design and engineering details have not been developed. However this alternative was considered for further analysis because it remained a feasible alternative after meeting the Tier 3 analysis criteria.

The main features of this alternative involves the filling approximately 900,000 cubic yards of submerged lands along the eastern end of Cabras Island, to create

approximately 30 acres of operational backland directly behind and contiguous to a proposed fixed pier structure. The fixed pier structure would be comprised of a deep-draft wharf approximately 1,522 feet in length along the pier's northern portion.

The proposed layout of the deep draft wharf and backland area under this alternative would facilitate efficient container yard operations. The proximity and size of the proposed backland area to the proposed wharf would more easily allow the use of traditional container handling equipment. In addition the layout would eliminate much of the double handling of containers since containers would generally not have to be moved over large distances to be stored. Minimization of double handling of containers would aid in keeping operational costs down to maintain cost competitive advantages gained by accommodating Post-Panamax vessels. Like alternatives 1 and 2 three Post-Panamax class container cranes would be located at the pier to expedite loading and unloading of Post-Panamax vessels.

Though navigational dredge volumes for this alternatives have not been quantified, based upon the qualitative evaluation criteria described in Section 2.2.3.3 dredge volumes could fall in the "moderate" range because the proposed pier design would be built out to required navigational depths. However, the fill material requirements for this alternative would be considered "very substantial".

Therefore, of all the alternatives presented for further analysis this alternative would the least desirable primarily due to the large amounts of fill material that would be required to construct the wharf facility and backland areas. Table 2-3 below provides a summary of estimated areas, fill volumes and dredge volumes for each of the Proposed Project components under the Alternative 3.

Table 2-3
Estimated Area, Dredge and Fill Volume Requirements[1]
(Alternative 3)

Project Component	Dredge Requirement (in Cubic Yards)	Fill Requirement (in Cubic Yards)	Area Requirement (in Acres)
Fixed Pier (Deep Draft Wharf)	N/A	100,000	8.0
Contiguous Backland	-	800,000	32.0
Totals	**N/A**	**900,000**	**40.0**

(1) This alternative is based on a conceptual plan and quantitative requirements have not been determined and quantities shown are approximations only. Where volumes could not be estimated it has been noted as Not Available (N/A)

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The potential environmental consequences of the Proposed Project and alternatives were evaluated for the resource areas described in this section. In assessing the environmental consequences on these resources, in the context of each alternative, both positive and negative impacts were considered. The type, intensity, and duration of impact were characterized as follows:

No impact: No impacts are anticipated when subject resources are not present or activities are not expected to affect those resources that are present.

Less than significant impact: Impacts that have a measurable effect but may or may not require avoidance or minimization to mitigate that effect.

Significant impact: Significant impacts are those that have a measurable effect and, individually or cumulatively, and require avoidance or minimization to mitigate the effect.

Indirect impact: An impact that continues following project construction

Direct impact: An impact that occurs during the construction process only.

Adverse impact: Impacts that create a negative effect on the resource.

Beneficial impact: Those that create a positive benefit for the resource

3.1 LAND USE AND COASTAL ZONE MANAGEMENT

3.1.1 Introduction

3.1.1.1 Land Use

Prior to 1969, all land around Apra Harbor was owned and controlled by the U.S. Navy. In that year the Navy transferred 62 acres to the Government of Guam for port uses. About half of this original area is occupied now by the Commercial Port; the remainder is leased to various private firms for periods of up to 50 years. Most of the income from these leases goes to the GEDA, though the Port shares in the rent. Among the lessees are the three petroleum companies in Guam, the Island's sole cement importer, a vessel and fishnet repair firm, and a trucking company.

In 1983, a 32-acre parcel north of the Port was transferred to the Government of Guam by the Navy, which permitted expansion of the Port's container yard in accordance with the 1981 Master Plan. East of these parcels is a 133 acre parcel that was transferred in 1985 and includes much of the rest of Cabras Island. This parcel accommodated Phase I of the container yard expansion and is planned to further expand the yard to 50

acres. Most of the remaining area has been leased out and will be used for the proposed Cabras Island Industrial Park.

In recent years, the Navy has also transferred land lying south of the Glass Breakwater and a 208-acre parcel that includes the Piti Channel and Sasa Bay, areas lying west of Marine Drive and south of the Navy and Cabras Island Power Plants, and much of the Dry Dock Point, to the Government of Guam for use by the PAG. Much of this 208-acre parcel contains environmentally sensitive areas and shallow inlets (including the Harbor of Refuge and the Sasa Bay Wetlands) that cannot be developed.

Section 3.1.2.1 describes general existing land uses within and around the Apra Harbor area for each of the alternatives. Also discussed are uses of existing usage of wharf facilities within the commercial port. Section 3.1.4, Environmental Consequences, discusses the projected effects of the proposed alternatives on existing land uses within and around the Apra Harbor vicinity.

3.1.1.2 Coastal Zone Consistency

The Coastal Zone Management Act (CZMA) of 1972, as amended (16 U.S.C. 1451 et. Seq.) affects all federal projects within the coastal zone and requires federal agencies to conduct their planning, management, development and regulatory activities in a manner consistent with the State or Territory CZM program. The CZMA establishes a Federal-State/Territorial partnership to provide for the comprehensive management of coastal resources.

Coastal states and territories develop management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs. The Federal consistency provisions require that all Federal activities (including direct Federal actions, private activities requiring Federal licenses or permits, and Federal financial assistance to state, territorial and local governments) be consistent with the enforceable policies of a state's or territory's Federally-approved coastal management program.

The main purpose of the CZMA is to preserve, protect, restore, or enhance the resources of the Nation's coastal zone for this and succeeding generations to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and aesthetic values as well as the need for compatible economic development.

The CZMA was amended in 1990 to establish a generally applicable rule of law that any federal agency activity (regardless of its location) is subject to the Federal Consistency requirement if it will affect any natural resources, land uses, or water uses in the coastal zone.

At the Federal level, the CZMA is administered by the Office of Coastal Resources Management (OCRM) within the National Oceanic and Atmospheric Administration's (NOAA's) National Ocean Service. Within Guam, the Guam Bureau of Statistics and Plans (GBSP) retain coastal permit jurisdiction over such activities under the federally approved Guam Coastal Management Program (GCMP).

The main mission of the GCMP is to protect and enhance the quality of Guam's coastal environment from mountain tops to deep sea while maintaining a balance of sustainable uses of resources and environmental capabilities, and the main function of the program are to (GBSP, 2003):

- Certify in writing that proposed federal actions and projects receiving federal funding or federal permits are consistent with the GCMP.
- Conduct Guam Federal Application Clearinghouse reviews for the GBSP.
- Coordinate federally funded projects on pollution control, environmental protection, natural and historic resources use and conservation, development, management, hazard management and planning.
- Review and recommend actions on seashore protection and land use on Guam through application review committees.
- Research information for and produce public educational materials on coastal management issues.
- Network with other government agencies and non-governmental organizations to coordinate activities and enhance related programs.
- Assist with temporary GSBP assignments such as the hazard mitigation Program and disaster damage assessment programs.

On Guam the CZMA Federal Consistency review requires any federal action that could have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone must be consistent with the enforceable policies of the GCMP. Therefore, the GCMP has Federal consistency review authority, to evaluate the Proposed Project for conformity with the policies of the GCMP.

3.1.2 Affected Environment

3.1.2.1 Land Use

Land uses within the Apra Harbor environs include commercial port operations, a US Navy military installation, industrial operations, fuel facilities, fishing facilities, dinner cruise operations, water recreation areas, natural preserves, and open space. Major

land use areas in the Proposed Project vicinity are shown in Figure 3-1 and discussed in further detail below.

Commercial Port Land Use

The Apra Harbor Commercial Port is a series of wharves and facilities that were started in 1964 and completed in 1969. Originally, the facilities constituted an extension of other Naval facilities in Apra Harbor and the numbering system for the Commercial Port berths reflects the old Navy designations (ex. Wharf F(oxtrot) – 1, 2, 3, etc.). Commercial Port facilities (shown in Figure 2-2) are discussed in further detail below.

- Wharf F-1 – Wharf F-1 was originally built for the now defunct GORCO and is still often referred to as GORCO Pier. It is now leased and operated by Shell Oil Guam, Inc. The pier is 550 feet in length and has a depth of 70 feet below MSL.

- Tank Farm - A large storage tank farm, utilized by Mobil Oil Guam, Southern Pacific Petroleum Company, and Shell Oil Guam is located within the Industrial Area north of Berths F-1 and F-2. The total capacity provided by this tank farm is approximately 625,270 barrels of petroleum products.

- Wharf F-3 - Wharf F-3 is a 750-foot long wharf that consists of a steel sheet pile bulkhead that was placed in front of an earlier deteriorated sheet pile wall and a concrete cap that extends below the water line. Maintenance dredging was conducted in this area in 1992 and the water depth at the berth has been increased. The pier has a 85-foot wide paved apron fronting the wharf shed and has a depth of 34 feet below MSL.

  The Wharf is currently occupied almost exclusively by fishing vessels. Vessels utilizing this wharf are a mix of purse seiners and longliners, awaiting provisions, refueling, and in the case of the longliners, discharging their catches of tuna. Wharf F-3 is a heavily used pier and during the peak of the fishing season, up to 10 to 12 fishing vessels can be seen tied up abreast, offloading their catch. Fishing vessels utilize these commercial port facilities, primarily for transshipment of tuna.

- Wharves F-4, F-5, and F-6 – These wharves make up the heart of the Commercial Port. Running West to East, these berths total 1,953 feet in length and can accommodate two full cargo container vessels, three smaller breakbulk and container vessels, a number of the smaller vessels (between 60 to 200 feet) that serve the other islands, or any combination of these vessels. The total berthing area for the three wharves combined is 1,970 feet, and the draft depth ate the wharves ranges between 34 – 38 feet below MSL.

  The wharf itself consists of a steel sheet pile bulkhead with a concrete cap that extends below the low water mark. In the westernmost portion of the wharf, there is a 100-foot wide apron extends back into the container yard. Maintenance

dredging of this area was conducted in 1992 to increase depths. There is an obstruction 150 feet in front of Berth F-6. At Wharf F-6 Coral heads are present at depths of 22 feet below the water's surface. This obstruction makes it very difficult for certain vessels to berth at Wharf F-6.

Three 50-foot gauge rail-mounted container cranes service the usable space along these wharfs. However, Wharf F-5 was severely damaged during the August 1993 earthquake and it is currently unable to support vessel operations. The damage to Wharf F-5 limits offloading operations and renders a large section of landside wharf space useless.

- Container Yard – The Commercial Port container yard encompasses approximately 26.5 acres. The container yard was originally laid out for a chassis operation for 20-foot and 40-foot containers. Because of increasing traffic and a sharp rise in the number of containers handled, the PAG has converted it to a stacked operation. Containers are typically block-stacked, in blocks that are five or six containers wide and two or three high. While the PAG has changed over to a different mode of operation, the lines of dolly blocks used for the chassis operation remain in place and act as a restraint to the development of a more suitable layout. Also, there is no system for numbering cells for containers and marking the pavement and light standards accordingly. As a result, while the general location of a container is posted as it comes in, it is not always easy to retrieve them.

In addition to the Commercial Port itself there are other facilities within Apra Harbor that are used for port purposes or allied functions. These other facilities are briefly discussed below.

- Hotel Wharf – Hotel Wharf is a former Navy ammunition wharf located on the sheltered side of the Glass Breakwater about a mile west of the Commercial Port. This 500-foot long structure is composed of fill bounded by a steel sheet pile bulkhead with a concrete cap that extends below the low water mark. The Navy formally transferred this facility, together with the remains of Dog Leg Pier to the Government of Guam in October 1989, but retained the right to use the wharf with 72 hours advance notice if it is perceived a need for it. Draft depth at Hotel Wharf is 34 feet below MSL.

- Over the years PAG has leased out portions of Hotel Wharf for various commercial activities, including passenger/cruise ship docking and administrative offices, diving and jet ski recreational rentals, and net repair and storage for fishing boats. Smaller cruiseships accommodating 120 to 800 passengers cruise ships and dinner excursion vessels also use this wharf. In addition, Hotel Wharf is used for exports of scrap metal and for the import of vehicles when space in the Commercial Port is unavailable. Water depth at this Hotel Wharf is approximately 35 feet deep. The rocky shoreline area immediately to the east of

Hotel Wharf is known as Outhouse Beach. By way of a PAG Use Permit, divers are authorized to conduct activities in this area for educational purposes only.

Tenants currently leasing space at Hotel Wharf include, Guam YTK Corporation, Dong Yang Steel (Guam) Co., Guameco Corporation, and the dinner excursion company Micronesian Dream.

- Golf Pier – Golf Pier is a petroleum handling facility presently being managed by Mobile Oil Guam, Inc. On occasion Golf Pier is used to moor purse seiner fishing vessels while they await reprovisioning. The pier is 370 feet in length and has a depth of 50 feet below MSL.

- Seaplane Ramp – Seaplane Ramp is a small landing located to the east of Golf Pier. Seaplane Ramp has been utilized by the general public for the purposes of launching recreational watercrafts. PAG also provides occasional open space leases to accommodate users for various purposes. There are no open space leases at the present time.

- Family Beach – The inner harbor portion of the Glass Breakwater just west of Dog Leg Pier is known as Family Beach. It is an open, sandy beach primarily used by local residents for recreational activities such as picnics, jet skiing, and swimming. Access to the beach is limited to a coral road, and there are no paved parking lots. Commercial water recreation enterprises such as dive companies, and jet ski operators have established their business in this area.

- The Piti Channel - With its large protected water area, Apra Harbor has recently become the venue for a variety of water-oriented recreational activities. These activities include both commercial and privately-owned boats and other mechanized water crafts. The commercial activities include tourist jet skiing, SCUBA diving, and banana-boating as well as day and evening dinner cruises.

  Commercial vessels are berthed in one of two areas in the Piti Channel—Aqua World or the Harbor of Refuge. Both areas are at the eastern end of the Piti Channel, east of the Commercial Port. The Piti Channel east of the Commercial Port, is only 60 to 70 feet wide, has a depth of 8 feet or less at mean low water, and in places, shoaling limits usable depths to only 4 feet. Crafts with 8 foot draft can pass for the most part, but on occasion have had to remain outside the harbor.

Non-Commercial Port Land Use

The PAG leases portions of several buildings and open spaces within the Commercial Port area to a variety of tenants—primarily shipping line agents under operating lease agreements. The PAG grants leases on both a short and long-term basis. The PAG has also leased various open space areas on Cabras Island to non-commercial port

users. These include water recreation activities, passenger ship docking, dinner cruises, and net repair/storage.

GEDA is the lessor for the fuel facilities located on Cabras Island. These facilities include the tank farm areas for South Pacific Petroleum Corporation (SPPC), Mobil, Shell and their associated fuel pipelines. In addition to the petroleum companies, GEDA leases properties include Kaiser Cement, Casamar Guam (which provides net repair services), and the Guam United Warehouse Corporation trucking company.

Another major industrial land use not directly involved in commercial port-related activities is the Cabras Island Power Plant located approximately 2 miles to the east of the Proposed Project site. The Guam Power Authority (GPA) has jurisdiction over the Cabras Island Power Plant area. The fuel tanks between the power plant and the Harbor of Refuge are also under the jurisdiction of the GPA. The former Navy Piti Power Plant, which lies between the Cabras Island Power Plant and Route 1, was also turned over to the GovGuam as part of the Navy/Government of Guam Customer Service Agreement and is also under the jurisdiction of the GPA.

The Apra Harbor Naval Reservation occupies the entire southern portion of Apra Harbor. Inner Apra Harbor, which is entered from the southeast portion of the Outer Harbor through a passage between Polaris Point on the east and the U.S. Navy SRF on the west, is under exclusive use of the US Navy. Most of the US Navy berthing facilities at Apra Harbor are located at NAVACTS, Guam on the west side of the Inner Apra Harbor.

Some U.S. Naval operations occur outside of the Inner Apra Harbor area including, a submarine tender that is home ported at Apra Harbor and moored with its stem to Wharf A at the southwest end of Polaris Point; Wharves D and E on the western end of Drydock Point in the Outer Harbor; and the Kilo Ammunition Wharf located on the south side of the Outer Harbor, approximately 0.5 miles east of the main harbor entrance and approximately 2 miles southwest of the Proposed Project site.

3.1.2.2 Coastal Zone Consistency

The proposed project design is funded by a federal grant issued by EDA. In accordance with the CZMA, "Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs (16 USC 1456)" As such, while PAG is the proponent of the proposed activity, as funded by federal dollars the activity must be consistent with Guam's Coastal Zone Management Plan.

The GCMP sets forth specific objectives and policies which serve as the guidelines to which Proposed Projects are evaluated for Federal Consistency. A listing and brief description of GCMP development and resource policies that would be applicable to the Proposed Project are provided below in Table 3-1

Table 3-1
Guam Coastal Management Program Policies
Applicable to the Proposed Action

Type	Name	Intent	Description
DP	Shore Area Development	To insure environmental and aesthetic compatibility of shore area land uses	Only those uses shall be located within the Seashore Reserve which: • enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or • can demonstrate dependence on such a location and the lack of feasible alternative sites.
DP	Major Facility Siting	To include the national interest in analyzing the siting proposals for major utilities, fuel and transport facilities	In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, Guam shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites
RP	Air Quality	To control activities to insure good air quality	All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.
RP	Water Quality	To control activities that may degrade Guam's drinking, recreational, and ecologically sensitive waters	Safe drinking water shall be assured and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuaries, reef and aquifer areas.
RP	Fragile Areas	To protect significant cultural areas, and natural marine and terrestrial wildlife and plant habitats	Development in the following types of fragile areas including Guam's Marine Protected Areas (MPA) shall be regulated to protect their unique character. • historical and archeological sites • wildlife habitats • pristine marine and terrestrial communities limestone forests • ravine forests • mangrove stands and other wetlands coral reefs
RP	Living Marine Resources	To protect marine resources in Guam's waters	All living resources within the waters of Guam, particularly fish, shall be protected from over harvesting and, in the case of corals, sea turtles and marine mammals, from any taking whatsoever
RP	Visual Quality	To protect the quality of Guam's natural scenic beauty	Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws. Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails
RP	Recreational Areas	To encourage environmentally	The Government of Guam shall encourage development of varied types of recreational facilities located and

Type	Name	Intent	Description
		compatible recreational development	maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and urban areas and protect beaches and such passive recreational areas as wildlife, marine conservation and marine protected areas, scenic overlooks, parks, and historical sites
RP	Public Access	To ensure the right of public access	The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Guam recreation areas, parks, scenic overlooks, designated conservation areas and their public lands. Agreements shall be encouraged with the owners of private and federal property for the provision of releasable access to and use of resources of public nature located on such land

Notes: DP = Development Policy; RP = Resources Policy Source: GBSP, 2003

3.1.3 Significance Criteria

For the purposes of the EIS, land use and/or coastal zone impacts would be considered significant if the proposed Project:

- Conflicts with existing land uses, local or regional zoning regulations, or land use plan policies.
- Directly conflicts with the Guam CMP policies and objectives.
- Divides a piece of property or an area made up of similar or dependent land uses.
- Conflicts with approved residential or commercial development plans.
- Displaces or cause long-term restriction of access to a business or residence.
- Changes the existing or planned use of a piece of property.
- Disrupts the use of adjacent properties, as defined by plan policies.
- Allows access to previously inaccessible natural or environmentally sensitive areas.

3.1.4 Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no adverse impacts to the existing surrounding land uses. No wharf improvements or land reclamation activities would occur and surrounding land uses would not be disrupted in either the short-term or long-term. This alternative would result in a less than significant impacts on land use and the coastal zone.

Preferred Alternative

Under the Preferred Alternative existing land uses adjacent to the Proposed Project sites might be temporarily disrupted for short periods to accommodate construction activities. For example use of Sea Plane Ramp may be temporarily halted during the construction of the eastern and western dike segments of Reclamation Sites 2 and 3, respectively. Also, dinner cruise operations at Hotel Wharf would need to adjust schedules to plan operations during times when pile driving activities on the western portion of the proposed deep-draft wharf are ongoing. It is the intent of PAG to allow the existing surrounding land uses at the adjacent facilities to continue after completion of the Proposed Project.

The one notable exception would be existing land uses at Outhouse Beach. As discussed above Outhouse Beach is presently utilized for instructional diving purposes by way of a PAG Use Permit. As a result of the Preferred Alternative the Outhouse beach area would be replaced by the proposed deep-draft wharf and the diving activities in this area would no longer be available. Potential impacts to Outhouse Beach and other recreational activities are discussed in Section 3.6.

Based upon the location and nature of the proposed improvements impacts to Guam's coastal zone are anticipated. Coastal zone management issues applicable for consistency review by the GCMP are listed in Table 3-1. The Preferred Alternative may be inconsistent with a number of these policies to varying degrees, and would require further consultation and review of impacts and mitigation measures with the GCMP. In summary, the Preferred Alternative would result in less than significant impacts to land use, and with appropriate mitigation measures (i.e. consultation, and permitting) would result in less than significant impacts to the coastal zone..

Alternative 2

Under this alternative, the potential environmental consequences would be similar to those under the Preferred Alternative, and would result in less than significant impacts to land use, and with appropriate mitigation measures (i.e. consultation, and permitting) would result in less than significant impacts to the coastal zone..

Alternative 3

For the most part, potential environmental consequences under this alternative would be similar to those under the Preferred Alternative and Alternative 2. The notable exceptions to this would be impacts to the Sea Plane Ramp and Golf Pier.

Under this alternative, the Sea Plane Ramp structure and all its associated lane uses would be permanently lost. Although the existing bulk fuel operations at Golf Pier would not need to be relocated the design of the proposed fixed pier structure would need to incorporate substantial infrastructural improvements (bunkering infrastructure, extension of fuel lines, etc.) to accommodate continued bulk fuel operations that presently occur at

the existing Golf Pier. As a result of the permanent loss of the Sea Plane Ramp and all its associated uses, Alternative 3 would result in significant impacts to land use in the project area. Impacts to the coastal zone under this Alternative would be less than significant with the implementation of appropriate mitigation measures (i.e. consultation, and permitting).

3.1.5 Proposed and Potential Mitigation Measures

Mitigation measures are not proposed as no significant adverse environmental impacts on land use are anticipated as a result of the Proposed Project. The Proposed Project is consistent with the light-industrial and maritime-based operations in the Apra Harbor Commercial Port. The nearest residential land use areas are located approximately 2 miles east of the Proposed Project site and would not be adversely impacted by the proposed improvements.

The proposed improvements would not extend (or result in similar future projects extending) beyond the Apra Harbor Commercial Port property, and would not promote long-term land-use incompatibilities. Potential adverse impacts on adjacent surrounding land uses (i.e., Hotel Wharf, Golf Pier, and Wharf F-1) would be short-term, construction-related, and temporary in nature. These minor impacts would only temporarily affect the integrity of land uses of the area.

In accordance with Section 307(c)(3)(A) of the CZMA, consultation with the GCMP will be initiated and a CZM consistency determination will be obtained for the proposed action prior to construction and implementation.

Within the Territory of Guam various Federal agency licenses and permits are subject to certification of consistency with the enforceable policies of the GCMP. Included among these Federal permits are the following permits which are required for the Proposed Project and discussed in further detail in Section 3.11.

- CWA Section 401 Water Quality Certification
- CWA Section 402, NPDES Permit
- Department of the Army Permits (Section 10, Rivers and Harbors Act, and Section 404 of the CWA)

It is therefore anticipated that through compliance with future environmental permitting requirements, implementation of appropriate mitigation measures, and continued consultation with the GCMP regarding potential adverse impacts of the Proposed Project on Guam's coastal zone, potential adverse impacts would be reduced and/or eliminated resulting in a determination of consistency (to the maximum extent practicable) of the Proposed Project with the GCMP objectives and policies.

Mitigation measures to reduce and/or eliminate any potential adverse impacts to the coastal zone will be finalized as part of the continued consultation with the GCMP. The CZMA Federal Consistency review findings will be concluded prior to completion of and incorporated into the Final EIS (see Appendix E).

3.2 SOCIOECONOMIC CONDITIONS AND ENVIRONMENTAL JUSTICE

3.2.1 Introduction

Socioeconomics

This section presents information on existing social and economic conditions on Guam. Topics discussed include economy, population, income, poverty levels, and minority populations. The socioeconomic analysis for this EIS approached Guam as a whole. However, the potential impacts of the Proposed Project in relation to key population and economic sectors with particular attention placed on port-related activities are stressed.

Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898 entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. E.O. 12898 requires federal agencies to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies, and activities on minority and low-income populations. E.O. 12898 addresses persons belonging to any of the following ethnic group as minority populations:

Black - a person having origins in any of the black racial groups of Africa.

Hispanic - a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

Asian - a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent.

American Indian and Alaskan Native - a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.

Pacific Islander or Native Hawaiian - a person having origins in any of the original peoples of Guam, Samoa, Hawaii, or other Pacific Islands

A Presidential memorandum that accompanied E.O. 12898 specified that federal agencies "shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities, when such analysis is required by the National Environmental Policy Act of 1969, 42 U.S.

Code Section 4321 et seq." The memorandum further stated that federal agencies "shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents, and notices."

On April 20, 1997, E.O. 13045 entitled *Protection of Children from Environmental Health Risks and Safety Risks* was issued. E.O. 13045 requires that Federal agencies make it a priority to identify and assess environmental health and safety risks that may disproportionately affect children. It also requires that agencies ensure that their policies, programs, activities, and standards address such risks.

To address these policies, this EIS discusses whether the Proposed Project would result in significant adverse effects that may disproportionately affect minority or low-income populations. The following subsection presents the demographics of Guam, region, and area of potential impact. Minority and low-income populations in the project area and specifically those that could be impacted are identified.

Demographic data from the 2000 United States Census are presented by the island of Guam, District, and Census Designated Place (CDP). A CDP, as defined in the 2000 U.S. Census, comprises a densely settled concentration of population that is not within an incorporated place (city, town, etc.) but is locally identified by a name.

CDP demographic data was important in identifying potential areas of concern with regard to Environmental Justice. CDP data presented poverty levels and ethnic composition for smaller geographic areas helping to identify potential pockets of minority communities may not be apparent when analyzing aggregated data at the district level or for Guam as a whole.

Subsection 3.2.2.2 identifies populations within the project vicinity that may have relatively high representation of minority or low-income status and subsequently concludes whether there is a potential for the Proposed Project to disproportionately adversely affect such populations.

3.2.2 Affected Environment

3.2.2.1 Socioeconomic Conditions

Population and Income

According to the official 2000 census data by the U.S. Bureau of the Census the total population for the island of Guam is 154,805. This figure represents a 16 percent increase over the 1990 total of 133,152, and a 10 percent decline in the population's rate of growth between 1980 and 1990. In 2000, Guam's southern region experienced a 2 percent decline, while the population in the island's northern and central regions increased by 29 and 11 percent, respectively (U.S. Census, 2003).

Table 3-2 below summarizes the overall population of Guam by district and land area.

Table 3-2
Guam: Population by District

District	Total Population	Land Area (in square miles)	Avg. per Square Mile
Agana Heights	3,940	1.03	3,810.5
Agat	5,656	10.50	538.7
Asan	2,090	5.54	377.1
Barrigada	8,652	8.48	1,020.5
Chalan Pago-Ordot	5,923	5.69	1,041.6
Dededo	42,980	30.56	1,406.3
Hagatna	1,100	0.90	1,220.7
Inarajan	3,052	18.85	161.9
Mangilao	13,313	10.21	1,303.6
Merizo	2,163	6.33	341.8
Mong-Mong-Toto-Maite	5,845	1.85	3,163.2
Piti	1,666	7.44	224.1
Santa Rita	7,500	16.17	463.7
Sinajana	2,853	0.85	3,363.3
Talofofo	3,215	17.69	181.8
Tamuning	18,012	5.66	3,183.0
Umatec	887	6.42	138.2
Yigo	19,474	35.41	550.0
Yona	6,484	20.28	319.7
Guam Island	**154,805**	**209.85**	**737.7**

Source: U.S. Census, 2003

The project area is located within the Apra Harbor CDP which is located within the Santa Rita District. The Apra Harbor CDP had a population of 3,347 in 2000, including approximately 900 children, age 18 and under. In the Apra Harbor CDP, there were 751 households, with an average size of 3.14 people per household, including 502 households with children (U.S. Census, 2003).

Between 1990 and 2000 the numbers for the military and their dependents were reduced due to the Base Realignment and Closure (BRAC) Program initiated in 1995. Military related population has dramatically decreased, from 22,178 (active duty personnel and dependents) in 1992, to 11,625 in 2000. Increased migration is expected, especially of Micronesians, primarily due to the Compact of Free Association, which allows these people to travel freely to Guam and to be employed as U.S. citizens. Other natural events affecting the rise and fall of Guam's population over the past

decade include Typhoon Omar in 1992, an 8.2 earthquake in 1993, and Typhoon Paka in 1997 (GovGuam, 2003).

Population demographics for 1990 showed that the median age on Guam was 25.0 years, compared to 32.9 for the U.S. as a whole. Overall, 35 percent of Guam's population was less than 18 years old and four percent was 65 years or older in 1990. The ratio of males in the population was 53.3 percent. By ethnicity, the largest groups were Chamorros with 49,935, followed by 30,043 Filipinos, and 19,160 Caucasians (U.S. Census, 2003).

The island of Guam was ceded to the United States following the Spanish American War of 1898 and has been an unincorporated territory since 1949. The main income sources on Guam include tourism, national defense, and trade and services. Per capita income in Guam was $12,722 in 1999, up from $10,152 in 1991. Of the total 38,769 households on Guam in 1999, thirty-nine percent earned incomes of $50,000 or more. Median household income was $39,317 in 1999, up from $31,118 in 1991. Whereas, the median household income for the Apra Harbor CDP was $37,250 (U.S. Census, 2003). Table 3-3 summarizes household income data for Guam for the year 1999.

Table 3-3
Guam: Household Income (1999)

District	Total House-holds	Median Income (in dollars)	Number of Households (Income in thousands of dollars)				%of House-holds >50K Income
			Less Than 10K	10K to 49.9K	50K to 99.9K	Over 100K	
Agana Heights	1,058	47,396	89	468	343	158	47.4
Agat	1,298	37,389	178	647	369	104	36.4
Asan	552	46,611	76	160	176	95	49.1
Barrigada	2,097	49,974	222	727	687	361	50.0
Chalan Pago-Ordot	1,573	36,506	385	483	433	172	38.5
Dededo	10.016	37,654	1,336	5,025	2,909	746	36.5
Hagatna	268	31,136	51	137	56	24	29.9
Inarajan	644	42,361	94	289	195	68	40.8
Mangilao	3,190	39,754	548	1,373	955	314	39.8
Merizo	471	39,940	63	212	157	39	41.6
Mong-Mong-Toto-Maite	1,633	31,134	380	710	385	158	33.3
Piti	474	54,167	44	175	149	106	53.8
Santa Rita	1,780	41,928	100	966	547	167	40.1
Sinajana	742	48,750	101	279	239	123	48.8
Talofofo	738	47,885	102	278	247	111	48.5
Tamuning	5,953	35,347	1,051	2,842	1,434	626	34.6

District	Total House-holds	Median Income (in dollars)	Number of Households (Income in thousands of dollars)				%of House-holds >50K Income
			Less Than 10K	10K to 49.9K	50K to 99.9K	Over 100K	
Umatec	162	34,286	25	74	41	22	38.9
Yigo	4,634	47,415	554	2,475	1,334	291	34.6
Yona	1,486	52,955	177	522	521	266	53.0
Guam Island	**38.769**	**39,317**	**5,576**	**10,332**	**10,691**	**3,951**	**39.0**

Source: U.S. Census, 2003

According to figures released by the Guam Department of Labor (GDOL), the island's mean household income in 2000 was $45,091, representing a slight increase from $45,045 in 1999, although a decrease from the average household income of $47,374 in 1998. While the average household income decreased in 1999, the average household size increased to an average of 4.16 household members, as compared to an average size of 3.93 in 1998. The number of average earners within the household in 1999 rose slightly to 1.90, as compared with 1.86 average earners from the previous year. Average household income reported in 2000, however remained the same (GovGuam, 2003).

Per Capita Income on Guam was $11,465 in 2000, representing an increase of $640 or 5.9 percent above the Per Capita Income in 1999, which was $10,825, a decrease of $1,203 from the previous year. The Per Capita Income figures encompass the total civilian population, including those without income. The average earners Income in 2000 rose 3.7 percent to $21,756 from $20,976 in 1999, which was a 7.2 percent decline from the previous year's average earners Income of $22,612 (U.S. Census, 2003).

The most important sign of distress in the labor market can be seen in Guam's unemployment rate, which has been gradually rising since the 1990's. Following the island's economic boom of the 1980's, total payroll remained flat or declined slightly from 1992 through 1996. In the same period, the unemployment rate rose from approximately four percent of the labor force (about 1,500 unemployed) to approximately nine percent (more than 4,000 unemployed), indicating that the labor market has not met the expectations of a growing number of new entrants. The unemployment rate has since grown to 13.0 percent according to the Department of Labor's report for March 2001 (9,040 unemployed), and there is little to indicate any significant reduction in this rate for the year 2001. In comparison, the unemployment rate for March 2001 in Hawaii was 4.0 percent, and the U.S. national unemployment rate was 4.6 percent (GovGuam, 2003).

Approximately, 65 percent of Guam's population over the age of 16 is employed. Of that, 61.4 percent is in the civilian labor force and 4.2 percent is in the armed forces. In the Santa Rita District as a whole approximately 72.0 percent of the population over the age of 16 is employed, and in the Apra Harbor CDP, 82.0 percent of the population over

the age of 16 is employed, with 49.5 percent in the armed forces and 32.5 percent in the civilian labor force (U.S. Census, 2003).

GDOL Employment Statistics Report for December 2000 shows total payroll employment at 59,790 persons, a slight decrease of less than one percent from the December 1999 figure of 60,340 persons. Of the 59,790 employed, over two-thirds, or 44,060, are in the private sector, reflecting a four percent increase over the 42,270 from December 1999. The Federal Government employment total during this time period was 3,170, down 30% from 4,530. Government of Guam employees also decreased during this time to a total of 12,560, down 7% from 13,540. These include all the responsibilities of municipal, county and state governments. The federal government employs 7.5 percent of the total work force while the Government of Guam employs 22.4 percent. (Ibid).

Economy

Guam's economic performance is closely tied to overseas markets, especially Japan. Furthermore, Japan has overwhelmingly been the primary source of foreign investment for the island. Thus, any slowdown in the Japanese economy directly impacts the island. Economic recessions in Japan as well as the rest of East Asia act as a restraint on the flow of foreign investment in Guam. It is primarily due to this reason that Guam did not share in the extended economic boom experienced by the U.S. during the 1990s.

Since the early 1990's, the Asian Economic Crises, U.S. military downsizing and expensive natural disasters have adversely affected Guam's economic health. Combined, the declines in visitor industry and military spending and the costs associated with responding to natural calamities have promoted a decline in economic activity and rising unemployment on Guam.

However, today, Guam's economic conditions are slowly improving and the outlook for expansion in the economy, increase in jobs and increase in public revenue is bright, given the initiatives being implemented by the Government of Guam and the private sector. Shipping is the primary means of supplying goods to the Island of Guam and underlies the importance of improving the current infrastructure at the island's only commercial port.

Over the past three decades Guams Gross Island Product (GIP) has increased substantially. In 1998, Guam's estimated GIP was roughly $3.5 billion, as compared to early 1970s, when Guam's GIP was in the neighborhood of $500 million annually. An estimated 40 percent of the current output is generated by the tourism industry and related activities, as compared to the early 1970s when more than half of the island's GIP was attributable to U.S. military activity. The GIP per Capita in 2000 was $22,117.80, rising from the $19,905.57 of the previous year. The 10-year average for the period from 1991 to 2000 is around $20,950, peaking in 1998 at $23,801.72 (GovGuam, 2003)..

In the last 20 years Guam has successfully moved from a military based economy to a diversified commercial economy. While the military and public sector still constitute important components of Guam's economic activity, the private sector has been responsible for virtually all growth since the early 1980's. In 1982, the combined payrolls of the federal and local governments accounted for approximately 50 percent of total employment. By 1996, this payroll had fallen to about 28 percent, with subsequent years continuing to reflect percentages lower than 30 percent.

Today, Guam's tourism industry is the island's single largest economic sector. The tourism industry generates approximately 60% of Guam's annual business revenue, as well as 60% of private sector employment. Asia's business cycle strongly influences Guam's economy with more than 90% of Guam's tourists originating from Asia, and 60% of its trading partners based in the Asia-Pacific rim region.

It should be noted that the federal government still plays a substantial role in the economic affairs of the Island of Guam. Federal government expenditures totaled $840 million in FY 2000. Of this total, $247 million were expended for wages and salaries, $138 million were awarded as grants to the local government, $72 million were in direct payments to individuals, $222 million were for procurement, and $161 million were to pay for other programs. The U.S. Postal Service contributes $6.9 million in wages and salaries to the Guam economy (GovGuam, 2003).

The largest federal expenditure on Guam is for military operations. For FY 2000, the allocation was approximately $431 million, a 42% decrease from 1993's $748 million. Of this amount, $219 million was allocated for wages and salaries, while $211 million was allocated for military construction. Federal income taxes returned a total of $51.2 million to the Government of Guam for FY 2000 (Ibid).

Commercial Fisheries

The National Marine Fisheries Service (NMFS) and the Western Pacific Fishery Management Council (WPFMC) recently completed a draft programmatic EIS titled "Towards an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans". This programmatic EIS contains a wealth of current information on the fisheries in the western pacific region (including Guam) and much of the fisheries information presented in this subsection is drawn from the WPFMC EIS (NMFS, 2005).

The Guam Department of Commerce reported that fleet expenditures in Guam in 1998 were about $68 million, and a 1994 study estimated that the home port and transshipment industry employed about 130 people (Hamnett and Pintz 1996). This industry constitutes an insignificant percentage of the gross island product, which was about $2.99 billion in 1996, and is of minor economic importance in comparison to the tourist or defense industries (Hamnett and Anderson 2000). Nevertheless, home port and transshipment operations make an important contribution to the diversification of

Guam's economy (Hamnett and Pintz 1996). As a result of fluctuations in the tourism industry and cuts in military expenditures in Guam, the importance of economic diversification has increased.

The different types of fisheries that occur the waters off Guam are briefly described below:

- Coral Reef: Guam's coral reef fisheries are culturally and economically important. The gear most often used to harvest coral reef resources include hook and line, cast nets, spears, and surround nets. The most common fish harvested include species of the following: kyphosidae (rudderfish), acanthruidae (surgeonfish), lethrinidae (emperors), scaridae (parrotfish), and labridae (wrasses). Invertebrate harvests include octopus, spiny lobster, trochus shells, conch shells, and reef crabs. Total coral reef fish landings for 2002 and 2003 were estimated at 273,799 lbs and 306,626 lbs, respectively (NMFS, 2005).

- Crustacean: Fishing for crustaceans around Guam occurs in inshore territorial waters, usually in a subsistence or recreational context. In 2004, however, two Crustacean FMP permits were registered to vessels to fish in the EEZ around Guam. The activities of these vessels (if any) including catch levels, composition, or location are unknown at this time. It is estimated that a total of 2,225 lbs of spiny lobsters with a total ex-vessel value of $7,279 were commercially harvested from waters around Guam in 2003 (NOAA 2004).

- Bottomfish: There are two distinct bottomfish fisheries on Guam that can be separated by depth and species composition. The shallow water complex (less than 500 feet) make up a larger portion of the total bottomfish fishery industry and are comprised primarily of reef-dwelling snappers, groupers, and jacks of the genera Lutjanus, Lethrinus, Aprion, Epinephelus, Variola, Cephalopholis and Caranx. The deepwater complex (deeper than 500 feet) consists primarily of groupers and snappers of the genera Pristipomoides, Etelis, Aphareus, Epinephelus, and Cephalopholis.

  Bottomfishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. The majority of the participants in the bottomfish fishery operate vessels less than 25 feet long and primarily target the shallow-water bottomfish complex. The shallow-water component is the larger of the two in terms of participation because of the lower expenditure and relative ease of fishing close to shore. Participants in the shallow-water component seldom sell their catch because they fish mainly for recreational or subsistence purposes (WPRFMC 2003, NMFS, 2005).

  The commercially-oriented highliner vessels tend to be longer than 25 feet, and their effort is usually concentrated on the deep-water bottomfish complex. Most fishermen troll for pelagic fish to supplement their bottomfishing effort and most of those who sell their catch also hold jobs outside the fishery (WPRFMC

2003).

It is estimated that in 2004, 347 domestic vessels landed 109,301 pounds of bottomfish in Guam. Of this, 25,054 lbs were sold for a total ex-vessel value of $73,466 (NMFS, 2005)

- Pelagic Fisheries: Guam's pelagic (or open ocean) fisheries consist of primarily small, recreational, trolling boats that are either towed to boat launch sites or berthed in marinas and fish only within local waters, either within the EEZ around Guam or on some occasions in the adjacent EEZ waters around the Northern Mariana Islands.

  The number of boats involved in Guam's pelagic fishery gradually increased from 193 in 1983 to 469 in 1998. This number decreased until 2001, but then began increasing, and has been increasing since. There were 401 boats active in Guam's domestic pelagic fishery in 2004. A majority of the fishing boats are less than 33 feet in length and are usually owner-operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch at one time or another and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small, but significant, segment of Guam's pelagic fishery is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. These operations were responsible for 22 percent of all domestic pelagic fishing trips from Guam in 2004 (WPRFMC 2005).

  Landings consisted primarily of five major species: mahimahi (Coryphaena hippurus), wahoo (Acanthocybium solandri), bonita or skipjack tuna (Katsuwonus pelamis), yellowfin tuna (Thunnus albacares), and Pacific blue marlin (Makaira mazara). Other minor pelagic species caught include rainbow runner (Elagatis bipinnulatus), great barracuda (Sphyraena barracuda), kawakawa (Euthynnus affinis), dogtooth tuna (Gymnosarda unicolor), double-lined mackerel (Grammatorcynus bilineatus), oilfish (Ruvettus pretiosus), and three less common species of barracuda. Sailfish and sharks were also known to be caught during 2004 but these species were not encountered during offshore creel surveys (NMFS, 2005).

  There are wide year-to-year fluctuations in the estimated landings of the five major species. 2004 mahimahi catch increased more than 134% from 2003, and reached the highest level since 1998. Wahoo catch totals increased 83% from 2003, and were the sixth highest total during the 23 year recording period. Pacific blue marlin landings decreased 28% from 2003, and were 24% below the 23 year average. Supertyphoon Pongsona's direct hit on Guam in December 2002 and subsequent negative impact on fishing during the first quarter of 2003 probably account for the low numbers of mahimahi caught during 2003. Participation and effort generally increased in 2004 with the number of trolling boats up by eight percent (WPRFMC 2005)

Domestic annual pelagic landings in Guam have varied widely, ranging between 322,000 and 937,000 lbs in the 23-year time series. The 2004 total pelagic landings were approximately 691,366 lbs, an increase of 36% compared with 2003. Of this total, it is estimated that 285,545 lbs were sold for a total ex-vessel revenue of $433,911 (Ibid).

3.2.2.2 Environmental Justice

Affected Environment

The majority of Guam's population would be categorized as a minority population, because it is largely comprised of peoples of Pacific Island (namely Chomorro) and Asian ethnicity. Guam's ethnic makeup consists of persons of Chamorro (48.0 percent) and Asian descent (33.0 percent, the majority of which are Filipino), Caucasian (6.8 percent), and Black or African American (3.3 percent) populations. By contrast, the ethnic makeup of the Apra Harbor CDP is primarily Caucasian (43.7 percent), Asian (17.0 percent), and Black or African American (9.4 percent), with Chamorro comprising only 12.4 percent (U.S. Census 2003).

Table 3-4 summarizes the breakdown of Guam's population by ethnic origin and race during the year 1999.

Table 3-4
Guam Population by Ethnic Origin and Race (2000)

District	Total Population	Ethnic Origin and Race					
		Pacific Islander	Asian	White	African-Amer.	Other Ethnicity	2 or More Ethnic.
Agana Heights	3,940	2,762	506	237	24	35	376
Agat	5,656	3,537	1,370	171	10	32	536
Asan	2,090	1,464	218	181	5	35	187
Barrigada	8,652	5,200	2,297	398	21	85	651
Chalan Pago-Ordot	5,923	3,902	832	295	14	31	849
Dededo	42,980	16,520	21,053	1,378	255	260	3,514
Hagatna	1,100	688	276	43	5	6	82
Inarajan	3,052	2,718	93	53	1	8	179
Mangilao	13,313	7,489	4,037	532	48	116	1,091
Merizo	2,163	1,888	49	72	2	9	143
Mong-Mong-Toto-Maite	5,845	3,705	1,342	217	25	59	497
Piti	1,666	931	209	273	12	21	220

District	Total Population	Ethnic Origin and Race					
		Pacific Islander	Asian	White	African-Amer.	Other Ethnicity	2 or More Ethnic.
Santa Rita	7,500	2,651	100,619	1,805	364	254	807
Sinajana	2,853	2,102	326	113	9	45	258
Talofofo	3,215	2,646	143	225	7	38	156
Tamuning	18,012	5,153	9,593	1,424	119	349	1,374
Umatec	887	817	11	10	2	4	43
Yigo	19,474	6,873	6,657	2,856	637	456	1,995
Yona	6,484	4,805	475	383	25	67	729
Guam Island	**154,805**	**75,851**	**51,106**	**10,666**	**1,585**	**1,910**	**13,687**

Source: U.S. Census, 2003

In 2000, approximately 34,792 residents or 23 percent of Guam's total population were at or below poverty level. This represents a total of 6,466 (or 20 percent) of Guam's families which live at or below the poverty level. (U.S. Census, 2003).

Table 3-5 summarizes the percentage of Guam's population living under the federal poverty level during the year 1999.

Table 3-5
Guam: Poverty Status (1999)

District	Total Population	Income Below Poverty Level			
		Individuals		Families	
		Number	Percent	Number	Percent
Agana Heights	3,940	599	15.5	113	13.2
Agat	5,656	1,400	24.9	254	22.7
Asan	2,090	423	20.3	79	17.0
Barrigada	8,652	1,525	17.8	260	14.3
Chalan Pago-Ordot	5,923	1,644	27.9	320	25.6
Dededo	42,980	9,745	22.8	1,802	20.3
Hagatna	1,100	294	33.3	44	23.9
Inarajan	3,052	715	23.5	134	22.8
Mangilao	13,313	3,301	26.3	637	24.0
Merizo	2,163	477	22.2	90	21.6
Mong-Mong-Toto-Maite	5,845	1,915	32.9	357	28.6
Piti	1,666	265	16.0	48	13.1
Santa Rita	7,500	618	9.5	124	8.0
Sinajana	2,853	620	21.9	116	19.0

District	Total Population	Income Below Poverty Level			
		Individuals		Familes	
		Number	Percent	Number	Percent
Talofofo	3,215	790	24.7	144	22.1
Tamuning	18,012	4,666	26.0	872	21.6
Umatec	887	280	31.8	49	32.7
Yigo	19,474	4,092	21.6	762	18.1
Yona	6,484	1,423	22.0	261	19.7
Guam Island	**154,805**	**34,792**	**23.0**	**6,466**	**20.0**

Source: U.S. Census, 2003

As shown in the table above, almost one quarter of Guam's families and approximately one fifth of all Guam's residents live in poverty. By contrast, poverty levels within the Santa Rita District and the Apra harbor CDP are much lower. Approximately, 9.5 percent of all residents 8.0 percent of of all families in the Santa Rita district live at or below the poverty level. Within the Apra Harbor CDP percentages are even lower with only 4.5 percent of its residents and 4.2 percent of its families within living at or below the poverty level. The Apra Harbor CDP has the second lowest poverty level on Guam with only the Finegayan Station CDP, within the Dededo District, being lower with 4.0 percent of its population at or below the poverty level (U.S. Census, 2003).

In order to ensure the protection of populations with differential patterns of subsistence consumption of fish and wildlife, E.O. 12898 requires that Federal agencies, "whenever practicable and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence".

Fishing on Guam continues to be important in terms of contributing to the subsistence needs of the Chamorro people. As discussed in the previous subsection the waters and facilities (i.e., Seaplane Ramp) within the project area are utilized by local fishermen some of whom likely fish for subsistence purposes.

Surveys of fishery participants on Guam have found that participants in small-scale offshore fisheries live throughout the island of Guam and are not concentrated in specific locales. Surveys have found that these individuals reside throughout the island. With the small size of Guam, the dispersal of fishery participants and extensive community networks for sharing locally caught fish, it is likely that the social benefits of fishing are widely shared by most of the island's long-term residents (WPRFMC 2003).

3.2.3 Significance Criteria

Socioeconomic impacts would be considered significant if a project:

- Induces substantial growth or concentration of population.

- Induces a substantial increase in short- or long-term demand for housing in excess of existing and projected capacities.
- Causes a permanent population increase of three percent or more in a district affected by the project.
- Causes the vacancy rate of temporary housing to fall to less than 5 percent.

Commercial fisheries impacts would be considered significant if a Project:

- Creates long-term (more than one year) exclusion of fishing areas that historically have been important to the commercial and recreational fishing industries.
- Depletes fisheries resources.
- Causes a loss of protected marine biological resources as a result of lost fishing equipment.
- Creates long-term economic losses to the local commercial and recreational fishing industries as a result of project construction or operation.

An environmental justice impact would be considered significant if Project construction or operation results in:

- A disproportionately adverse impact for a population that is more than 50 percent minority or has a minority population that is meaningfully greater than the minority population in the general population or other appropriate unit of geographic analysis
- A disproportionately adverse impact for a low-income population (as defined by poverty thresholds from the Bureau of the Census).

3.2.4 Environmental Consequences

3.2.4.1 Socioeconomic Conditions

Under the No Action Alternative deep-draft wharf and land reclamation improvements to the existing commercial port facilities would not occur. Therefore, socioeconomic conditions would not be impacted as a result of project-related construction or operations.

Under the remaining reasonable alternatives potential impacts to socioeconomic conditions would in large part be similar regardless of project location and/or design. Therefore, analysis of potential impacts to socioeconomic conditions were not differentiated by alternative but rather addressed collectively for the proposed improvements.

The economic importance of harbor development and improvement is best illustrated when looking at potential adverse impacts associated with imposing restraints upon such activities. Because it is an island, the economic viability and growth potential of Guam is closely tied to its essential port facilities and overall commercial harbor infrastructure. Therefore, from an economic standpoint, not implementing harbor development and improvement projects would, in the long-term, result in adverse impacts to the island of Guam. The Proposed Project would provide essential port infrastructure which would allow Guam to continue its economic growth.

The purpose of the Proposed Project is to expand and improve existing commercial port facilities to meet anticipated the future demands of commercial maritime operations within Apra Harbor. In meeting this need, the Proposed Project would result in both short-term and long-term beneficial impacts to the socio-economic environment of Guam.

In the short-term socio-economic impacts would be generated during the project construction phase including jobs, local purchases of goods and services, and procurement expenditures associated with supplying and maintaining the new facility. The largest direct expenditures, estimated to be $67 million over the 18 to 24-month construction period, would come from locally procured supplies, equipment, materials, and services.

Money in the form of construction payroll would enter the regional economy by increasing the disposable incomes of workers, households, and businesses directly or indirectly affected by the Proposed Project. Additional jobs would also be created as a result of construction-related expenditures and payrolls filtering through the economy.

Construction of the Proposed Project would therefore have a beneficial impact on the socio-economic environment by generating new direct construction-related jobs which would also stimulate a corresponding decrease in unemployment rates over the short-term.

In the long term, expanded harbor operations would stimulate direct maritime expenditures, develop new businesses, and create port-related jobs to operate the new facilities, which in turn would stimulate a corresponding decrease in unemployment rates over the long-term. Implementation of the Proposed Projects and resultant harbor expansion would stimulate harbor related business enterprises (i.e. shipping, cargo handling, and other services) and increase local employment.

The combined increased business activities in the commercial shipping industry would result in increased tax revenues, in the form of excise, individual, and corporate taxes. In the long-term, the tourism industry should also experience potential beneficial economic impacts as a result of the Proposed Projects as a result of the new and expanded facilities. Turning away of larger deep-draft cruise ships because of inadequate berthing facilities would be avoided by the availability of a deep-draft wharf infrastructure.

Upon completion of the project, congestion at the Port would be alleviated, room for additional economic activity could be created, thereby generating additional revenue. In addition, the multi-use design of the proposed deep-draft wharf would provide the U.S. Navy with the opportunity to utilize wharf facilities that can accommodate larger military vessels such as aircraft carriers that are unable to enter Inner Apra Harbor due to their size. The ability of the proposed wharf to accommodate large deep-draft military vessels on a contingency basis would result in beneficial economic impact to the U.S. Navy. Contingency use of the proposed wharf by the U.S. Navy would result in a substantial cost savings by eliminating the need to construct of a new military wharf, that could potentially remain underutilized much of the time, due to infrequent air craft carrier visits to the island.

Adverse impacts to socioeconomic conditions would occur. However, these impacts would, for the most part, be negligible, short-term, and temporary. Potential adverse impacts to socioeconomic conditions are listed below.

Temporary Disruption of Onshore Commercial Businesses and Tourist Activities

Onshore construction activities could temporarily disrupt access to small commercial and tourist establishments and events in the Hotel Wharf and/or Family Beach areas and could deter attendance.

Tourist operations that could be affected by Proposed Project construction include the small scale snorkeling, diving, and jet skiing operations at Family Beach, and the commercial dinner cruises operations. Potential adverse impacts on tourism would be limited primarily to temporary impacts due traffic congestion and to stoppages from lane closures during construction. Traffic impacts are discussed in further detail in Section 3.4

Temporary Disruption of Off-Shore Commercial Businesses and Tourist Activities

The temporary disruption of commercial fishers from fishing grounds within the project area during construction could decrease catch revenues for commercial fisheries. However, these impacts would be short-term and localized. Once construction is completed commercial fishing vessels would again have access to these waters within Outer Apra Harbor. A beneficial impact of the proposed deep-draft wharf facility on the commercial fishing industry would be the increase in berthing space for cargo vessels. Construction of the new deep-draft wharf would make additional berthing area available to fishing vessels at the existing wharf facilities.

It should also be noted that construction of the deep-draft wharf would result in the elimination of coral reef upon which the fishing industry is dependent for both fish nurseries, and/or forage fish habitat, Loss of coral reef would result in potential adverse impacts. However, it should be noted that although the submerged pier pilings could never replace a full functioning reef ecosystem, the pilings would over time begin to

function as a replacement fish nursery and/or fish foraging area. Therefore, the Proposed Project would likely result in a less than significant but potential adverse impact on the fishing industry.

In the short-term, excursion vessel operations at the Hotel Wharf may also be disrupted during the deep-draft wharf facility construction activities. However, these impacts would also temporary and localized. Disruptions to excursion vessel operations would mainly be limited to periods of in-water construction (i.e. pile driving operations) occurring on the western end of the deep-draft wharf structure.

Public Services

Impacts on public services such as police, education, fire, medical services would be minor. In addition, the government would receive new tax revenues that can be used to meet any minimal public service demands tied to the Proposed Project.

The small projected incremental demands during both the construction and operational phases would not be sufficient to induce a substantial increase in the short- or long-term demand for these public services, in excess of existing and projected capacities. Consequently, public agency expenditures requirements would not be significantly impacted.

Overall, the Preferred Alternative, Alternative 2, and Alternative 3 would all result in both beneficial economic impacts as well as less than significant but potentially adverse impacts on the fishing industry.

3.2.4.2 Environmental Justice

Under the No Action Alternative deep-draft wharf and land reclamation improvements to the existing commercial port facilities would not occur. Therefore, Environmental Justice impacts would not occur as a result of project-related construction or operations.

Similar to socioeconomics, potential impacts to Environmental Justice would be similar regardless of project location and/or design. Therefore, potential impacts to Environmental Justice conditions were also not differentiated by alternative but rather addressed collectively for the proposed improvements in general.

The most recent demographic data show that the communities within the Santa Rita and Piti Districts, nearest to the project site, do not have a disproportionately high percentage of either minority or low income populations. Conversely, as noted in the previous section, within the Apra Harbor CDP (in the Santa Rita District) only 4.5 percent of residents and 4.2 percent of families live at or below the poverty level. Similarly, the main ethinc group within the Apra Harbor CDP is Caucasian which comprises 43.7 percent of the population. By contrast, residents of Chamorro ethnicity comprise only 12.4 percent of the Apra Harbor CDP population.

Based upon these demographic data, and the fact that the Proposed Project would take place within a non-residential, highly industrialized commercial port setting, it is more than likely that the Proposed Project would have little or no Environmental Justice related impacts.

The Proposed Project's overall impacts were reviewed to identify the appropriate level of data analysis to determine potential Environmental Justice impacts. Most of the potential onshore impacts that could affect minority or low income communities disproportionately are related to less than significant temporary construction impacts. The main adverse impacts associated with construction that would occur near the project site would be the temporary noise, dust, and traffic congestion, none of which are considered significant adverse impacts after mitigation.

In addition to the construction-related impacts above an adverse impact that could not be fully mitigated would be the offshore visual and recreational impacts from the presence of the deep-draft wharf and backland facilities (see Section 3.6 "Aesthetic and Recreational Resources"). Since the new port facilities would be visible primarily to recreational ocean goers with a variety of ethnic and socioeconomic backgrounds, it is not expected to disproportionately adversely affect minority or low-income communities onshore.

As discussed in the previous section, the loss of coral reef would result in the loss of fish nursery and/or fish forage habitat. Which in turn would result in adverse impacts to commercial and subsistence fishing activities in the area.

There are no data on the ethnicities of individuals who fish in the waters proposed for the Deep-Draft Wharf, nor are there any data distinguishing between recreational and subsistence fishermen utilizing these waters. As a result, it is unclear as to what degree minority or low-income users would be affected by the loss of coral reef in the Proposed Project area. However, since subsistence fishing plays such a prominent role in the lives of the Chomorro people it can be assumed that the Proposed Project area is utilized by subsistence fishermen. It should also be noted that the pilings would over time begin to function as a replacement fish nursery and/or fish foraging area. Therefore, the permanent loss of coral reef in the Proposed Project area would result in a less than significant adverse impact to this minority segment of the population.

The only significant adverse impact that cannot be mitigated, and could potentially affect minority and/or low income populations, would be the permanent loss of the Sea Plane Ramp under Alternative 3. Under Alternative 3 the Sea Plane Ramp would be permanently lost as it would be replaced by a contiguous fixed pier structure. The loss of Sea Plane Ramp would adversely impact recreational and subsistence fishermen who utilize the ramp.

There are no data on the ethnicities of individuals who use the Sea Plane Ramp for launching of boats. Nor are there any data distinguishing between recreational and subsistence fishermen utilizing the Sea Plane Ramp. As a result, it is unclear as to

what degree minority or low-income users would be affected by the loss of Sea Plane Ramp. However, since subsistence fishing plays such a prominent role in the lives of the Chomorro people it can be assumed that the Sea Plane Ramp is utilized by subsistence fishermen. Therefore, the permanent loss of the Sea Plane Ramp under Alternative 3 would constitute a significant impact to this minority segment of the population.

In summary, the No Action Alternative, Preferred Alternative, and Alternative 2 would result in less than significant impacts on Environmental Justice. The notable exception would be Alternative 3 which would likely result in significant impacts due to the loss of the Sea Plane Ramp for use by subsistence fisherman.

3.2.5 Proposed and Potential Mitigation Measures

The following measures could be employed by PAG to mitigate potential adverse socioeconomic impacts resulting from construction and or operation of the Proposed Project.

PAG would take the necessary measures (including development of a traffic management plan if required) to insure that vehicular access to Hotel Wharf and Family Beach be maintained at all times (to the extent possible) both during construction and operation of the deep-draft wharf facility. Traffic impact mitigation measures are discussed in greater detail in Section 3.4.

Furthermore, to mitigate the temporary disruption of both onshore and offshore commercial businesses and tourist activities PAG would schedule any construction activities requiring either road closure or in-water restrictions around peak tour operations, to the extent possible. When possible PAG would provide commercial businesses with advance notice of any construction activities that would temporarily restrict their operations. In this manner, activities and schedules could be adjusted accordingly.

In the short-term, disruption of fishing activities would be temporary and localized, and are not anticipated to result in any significant decreases in catch revenues of commercial fisheries. Mitigation of potential adverse impacts to commercial and subsistence fisheries would be achieved mainly through the implementation of required mitigation to avoid, minimize and mitigate impacts to coral reefs through the Magnuson Stevens Act EFH consultation, FWCA 2(b) process, and Section 404(b)(1) of the Clean Water Act.

However, in the event that there is a complaint by a fisher related to impacts from the project, a mutually agreed upon settlement could be reached between PAG and the subject party. If a settlement cannot be reached through voluntary negotiation and terms that are acceptable to both parties, dispute resolution could then be conducted by a mutually agreed-upon arbitrator.

Project construction and/or operational activities would not impede access to or restrict any onshore or offshore commercial businesses. With implementation of the described mitigation measures, the impact to businesses in the immediate vicinity of the Proposed Project would be less than significant.

3.3 INFRASTRUCTURE AND UTILITIES

3.3.1 Introduction

Water and Sewer

Water and sewer services in Guam are provided by the Guam Waterworks Authority's (GWA). The GWA's primary task is to produce, treat, transmit and distribute water on Guam and to collect, treat and dispose of wastewater. The GWA provides water service to approximately 36,800 customers and sewer service to approximately 21,000. Water revenues for FY 1999 were $23.4 million (GovGuam, 2003).

Prior to 1996 GWA operated as a line department of the Executive Branch called the Public Utilities Agency of Guam (PUAG). In that year PUAG was abolished and GWA was created as an autonomous agency. The GWA is presently contending with a number of problems that contribute to infrastructural system failures. These problems include under capitalization for necessary infrastructure projects, limited manpower development, excessive loss of water due to leak from an antiquated Navy water system, continued reliance on the purchase of water from military and private sources, and operating with a chronic deficit. The accelerated growth associated with Guam's tourist industry and rapid modernization are two other factors that have attributed to the island's system failures.

In March of 2001 Executive Order No. 2001-13 was issued by Governor Gutierrez, "Relative to Declaring a Continuing State of Emergency Relative to the Guam Water and Waste Water Systems." The Executive Order further states, "A continuing state of emergency exists in the dilapidated state of our water and wastewater systems, which are suffering from age and earthquake damage as well as failure of materials, inability to locate underground pipes and other failures..."

To date, GWA estimates $40 million in costs to bring the island's sewage treatment plants in compliance with Notice Of Violations and administrative orders issued to the authority by GEPA. GWA currently owes the USEPA $45 million in penalties (GovGuam, 2003).

As a result of P.L. 24-37 which allows the agency to seek partnership with private firms, GWA has entered into private partnerships. to build wells, operate and maintain them, and turn them over to the government of Guam at the expiration of the contract period. GWA is currently in the process of seeking financing for the design, construction, operation and maintenance of water and waste water infrastructure projects, and seeking partners to take over waste water treatment plants, meter management, and private sewer line connections.

Power

Power on Guam is supplied by the Guam Power Authority (GPA). Over the past three decades, the GPA has changed significantly in response to the development of the tourism industry, the implementation of a Customer Service Agreement with the Navy, and the growth of its residential and commercial customer base. In 1990, 701.6 million kilowatt hours of electricity were consumed by 32,353 users. By 1998, the island's power consumption more than doubled, with a total of 1,601.6 million kilowatt hours consumed by 44,269 users (GovGuam, 2003).

During FYs 1998 and 1999, GPA completed several capital improvement projects focusing on improving system reliability and service. Transmission capabilities were increased with the installation of new transmission lines for Piti-

Harmon, Cabras-Piti, San Vitores-Tamuning, and Agat-Umatac. In addition, new substations were built in Umatac and San Vitores. And finally, transmission and distribution line extensions were completed to serve anticipated home construction projects in Iha, Matagua, Pigua and on Chamorro Land Trust property.

GPA is planning to install a fuel-switching device that would automate the fuel switching from high-sulfur oil to low-sulfur fuel oil, at an estimated cost of $2.9 million. This project is a result of a consent decree in a civil action filed in October 1996, by the Environmental Protection Agency against GPA for operating its Cabras-Piti generating facilities in violation of the Clean Air Act. The consent decree was signed by USEPA and GEPA on February 24, 1999 (Ibid).

All electrical power on Guam is pooled from the generators at Piti, Cabras, and Tanguisson. In October 1972, the Navy and the GPA agreed to a pooling agreement which provides for the joint use of power generation, transmission, and distribution facilities. The agreement calls for the GPA and the Navy to share equitably in the responsibilities and costs of operating the island-wide power system.

Telecommunications

Guam possesses the most advanced telecommunications infrastructure and systems in the Western Pacific Region. The island of Guam is situated at the nexus of the Pacific's underwater fiber optics cabling network, with more terminating cable connections than anywhere else in the world, making Guam a telecommunications hub for numerous international providers.

Telecommunications services on Guam are provided by the Guam Telephone Authority (GTA). The GTA was created as an autonomous agency of the Government of Guam twenty-seven years ago. With island wide fiber-optic trunking, GTA is currently the only local telephone service provider. GTA's system is designed to be redundant to provide alternate routing should damage occur to any part of its

fiber-optic loop. Efforts are presently underway to privatize GTA as a means of spurring Guam's full integration into the global telecommunications system.

As a result of the Telecommunications Act of 1996, Guam was included in the U.S. Domestic Rate Structure. Due to increasing competition and the entrance of pre-paid calling cards, international rates are also less expensive. Currently there are 7 companies that offer long distance service on Guam and 2 main carriers of cellular service. Some companies, which provide consolidated services for land lines, mobile and Internet services offer incentive plans. Currently, half a dozen companies offer Internet access to local residents.

3.3.2 Affected Environment

Cabras Island, including the Commercial Port, is serviced by the GWA as well as the U.S. Navy. The GWA service line is supplied by the Asan springs, and has a capacity of 250 gallons per minute (approximately 350,000 gallons per day).

The Port of Guam is currently served by a 50,000 gallon per day package sewage treatment plant located near the main entrance to the port area. The GWA has completed the design of a new pump station adjacent to the existing sewage treatment plant. When completed, the sewage will be collected at the pump station, pumped along the pipe paralleling Route 11, to an existing gravity sewer system along Marine Drive.

The proposed deep-draft wharf site is comprised of undeveloped backland and a rocky shoreline area. The shorelines bordering propose Reclamation Sites 1, 2, and 3 are comprised mostly of narrow undeveloped sandy and/or rocky shoreline areas. There are no existing utilities at any of the Proposed Project sites.

North of the proposed deep-draft wharf site an existing 12-inch diameter water main runs along Route 11 and provides potable water to developed areas along the Glass Breakwater. The 12-inch main continues eastward where it connects to a 14-inch diameter main adjacent to the PAG offices and continues until if connects to 16-inch water main at Marine Drive.

There is an existing power system along Route 11 in the form of an overhead 13.8 KV distribution line which provides power to existing facilities located on the breakwater. The large SPPC and Mobile tank farm located to the east of Reclamation Site 3 is equipped with basic utilities including electrical, water, and sanitary sewer systems. In addition each company has fire protection via seawater intake pipes.

3.3.3 Significance Criteria

Impacts to infrastructure and utilities would be considered significant if they induce a substantial increase in short- or long-term demand for public utilities in excess of existing and projected capacities

3.3.4 Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no adverse impacts to existing infrastructure and utilities in the project area. No wharf improvements or land reclamation activities would occur and existing utilities and infrastructure would not be disrupted in either the short-term or long-term. This alternative would result in a less than significant impact.

Preferred Alternative

Potable water service would be provided to the proposed deep-draft wharf via a connection to the existing 12" diameter pipe adjacent to the site along Route 11. It is anticipated that potable water requirements for vessels berthed at the deep-draft wharf facility are estimated to be between approximately 1,000 gallons per minute (gpm) and 95,000 gallons per day (gpd) average demand with a Post-Panamax cargo vessel at berth, and 1,000 gpm and 185,000 gpd peak demand with a Nimitz Class Aircraft carrier at berth (TG Engineers, 2005)

Existing system capabilities and agreements for water supply between the US Navy and the Government of Guam appear to indicate a peak flow rate below the 1,000 gpm vessel requirement is the maximum flow available. The average and peak daily demands are within the system capacity and could be supplied assuming normal consumption of other Cabras Island tenants (Ibid).

Sanitary sewer service would be provided to the deep-draft wharf with a gravity system from dockside service connections to a new central lift station. Sewage would be pumped from the lift station to the existing Guam Waterworks Authority (GWA) lift station adjacent to the PAG Office Building on Cabras Island. The GWA lift station would pump sewage to the gravity line in Marine Drive and the sewage would flow to the Hagatna Treatment Plant.

It is anticipated that vessel sanitary sewer discharge flow requirements would be approximately 400 gpm and 190,000 gpd average demand with a Post-Panamax cargo vessel at berth, and the daily flow requirement would increase to 310,000 gpd peak demand with an aircraft carrier at berth. These flow requirements would exceed the existing GWA lift station system capacity of 150 gpm. Therefore, an upgrade to the existing GWA lift station would be necessary for it to accommodate the 400 gpm flow rate.

The existing overhead 13.8KV power distribution line along Route 11 does not appear to have sufficient capacity to provide the proposed shore power requirements for a Nimitz Class Air Craft Carrier. To address this issue, the proposed deep-draft wharf facility would be equipped with two power systems.

The first system would be a standard utility service from the existing 13.8KV line to a 13.8 KV to 120/208V/3ph/4w step down transformer. This system would provide power

to area lighting and any other 120 volt auxiliary needs. The second system would be a 4000 amp, 480V, three phase system which would go through a utility service transformer and would extend out to the property line for connection to a future utility power source. This service would be dedicated to a 4000 amp distribution panel that would feed two 2000 amp ship to shore power mounds each containing five 400 amp, 480 volt plugs. The power mounds would be located as appropriate for the ship configurations. Each plug would be provided with safety interlocks to shunt trip its feeder breaker in the event the terminals are left exposed. The proposed power distribution equipment would be housed in a dedicated, fenced enclosure. A proposed utilities plan for the Preferred Alternative is shown in Figure 3-2.

At the present time utility improvements for Land Reclamation Sites 1, 2, and 3 have not been specified. These areas would also eventually require utility systems such as electrical, water supply, and wastewater systems. However, these areas would serve mainly as open space cargo container storage areas and utility usage is anticipated to be minimal.

Reclamation Site 3 is directly adjacent to the SPPC and Mobil tank farms. Both SPPC and Mobil have fire protection seawater intake pipes that extend into the proposed Reclamation Site 3 area. The seawater intake pipes would be extended across the fill area in order to continue to provide water for fire protection purposes.

Presently, Mobil and SPPC are experiencing recurring problems with their seawater intakes being covered with sand and debris during typhoon events. The extension of the intake pipes across the Reclamation Site 3 fill lands would provide beneficial impacts as the pipe extensions would take the intakes into deeper water and raise them above the sea bottom further out in the harbor.

In summary, the Preferred Alternative would result in less than significant impacts to utilities and infrastructure resources.

Alternative 2

The proposed utility improvements and potential impacts under this alternative would be similar if not identical to those identified under the Preferred Alternative.

Alternative 3

Under this alternative specific improvements to utilities have not been developed. However, general improvements to water, wastewater, and energy utilities in the project area would be similar to those proposed for alternatives 1 and 2. The SPPC and Mobil fire protection seawater intake pipes would require additional extensions of approximately 300 feet as the backland area under this alternative would be considerably larger than that proposed under alternatives 1 and 2. Similarly, extension of the intake pipes would provide beneficial impacts as the pipe extensions would take the intakes into deeper water and raise them above the sea bottom further out in the

harbor, reducing the incidence of in take blockage during typhoon events. In addition, the existing fuel line infrastructure at Golf Pier would need to be extended approximately 200 feet seaward to connect to the proposed deep draft wharf face south of the Glass Breakwater. Alternative 3 would result in less than significant impacts to utilities and infrastructure resources.

3.3.4 Proposed and Potential Mitigation Measures

The Proposed Project improvements would increase the demand for utilities such as power and water as well as increase wastewater volumes. However, through the implementation of the proposed system upgrades discussed in the previous sections, these increased volumes are not anticipated to result in significant adverse impacts by overburdening the Commercial Port's existing utility system capabilities. In addition to the proposed system upgrades conservation measures could be implemented during the design phase of the proposed improvements to further mitigate potential adverse impacts.

To ensure water conservation, proposed structures and landscapes at the project sites would be designed with water saving considerations in mind. Water conservation methods which could be considered during the project design phase may include but not be limited to:

- Installation of water efficient fixtures.
- Low-volume flush toilets and urinals.
- Automatic Faucets for sinks and lavatories.
- Appropriate landscape plant selection to limit water uptake.
- Irrigation with non-potable or reclaimed water.

Energy conservation methods which could be considered during the design phase of the improvement projects may include, but not be limited to:

- Maximum cooling load through the use of site shading, orientation, and use of naturally ventilated areas.
- Use of high efficiency indoor and outdoor lamps and lighting.
- Maximum integration of day lighting in shed design.
- Design of mechanical systems to comply with energy conserving requirements.

3.4 TRAFFIC AND CIRCULATION

3.4.1 Introduction

A *Traffic Impact Analysis Report* (TIAR) was prepared in support of this EIS and is attached as Appendix B. The purpose of the TIAR was to identify and assess future impacts of the Proposed Project on local and regional roadway systems and to identify roadway improvements that may be necessary to provide adequate access Apra Harbor

after the proposed improvements have been implemented. Information in this section is based largely on the findings of the TIAR.

Traffic related impacts of a Proposed Project generally involve the determination of project-generated traffic during the A.M. and P.M. weekday commuter peak periods and the determination of the "Level of Service" (LOS) at affected roadway intersections subsequent to implementation of the project.

LOS is a qualitative measure derived from the *Highway Capacity Manual* used to describe the flow or operational characteristics of traffic as perceived by the level of congestion or delays experienced by motorists. There are six grades of LOS measured from "A" to "F". In general, LOS A is considered best, representing free-flow conditions with no congestion. LOS F is considered worst, representing severe congestion with stop-and-go conditions.

LOS at unsignalized intersections are based on delays caused by stop controls or the need to yield to conflicting traffic. At signalized intersections, levels of service are also based on delays where all movements incur delays and averages for each approach and the entire intersection can be calculated. For both types of intersections, LOS C is considered acceptable for rural conditions and LOS D is considered acceptable for urban conditions. Table 3-6 summarizes LOS criteria for both unsignalized and signalized intersections.

Table 3-6
Levels-of Service Descriptions and Time Delays

LOS	Description	Average Delay Per Vehicle (in seconds)	
		Unsignalized	Signalized
A	Little or no delay	< 10.0	< 10.0
B	Short traffic delays	10.1 to 15.0	< 10.0
C	Average traffic delays	15.1 to 25.0	10.1 to 20.0
D	Long traffic delays	25.1 to 35.0	20.1 to 35.0
E	Very long traffic delays	35.1 to 50.0	35.1 to 80.0
F	Extreme traffic delays(1)	> 50.1	> 80

Source: Rowell, 2006; Highway Capacity Manual, 2000
(1) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. LOS F conditions usually warrant improvement of the intersection.

Regional impacts were assessed by calculating volume to capacity ratios of the regional roadway network in the Agat, Piti, and Santa Rita areas based upon comparison of daily highway segment volumes and estimated capacities contained in the *Guam 2020 Highway Master Plan Report Progress Edition* Levels of service were correlated with these ratios, as based on the guidelines above (Duenas & Assoc., 2004).

The design, or horizon, year of a project is the future year for which background traffic conditions are estimated. In order to remain consistent with the timeframes presented in the *Port Authority of Guam Master Plan*, and the *Guam 2020 Highway Master Plan Report Progress Edition* it the year 2025 was used as the traffic forecast design year.

3.4.2 Affected Environment

Guam's road network is just under 1,000 miles long. Of this total, 420 miles of roadway are classified as non-public. Of the 550 miles of public roads, approximately 144 miles comprise the primary and some secondary roads. There are about 222 miles of streets and 123 miles of local or collector roads on Guam. The primary road network is paved. In the case of streets and local roads, 80 percent are paved Guam has a total of 35 bridges, the majority of which are located in central and southern Guam. Most of Guam's bridges are in fair condition, but several are in varying states of disrepair and are in need of renovation. (GovGuam, 2003).

Within the immediate vicinity of the Apra Commercial Harbor, Route 11 is the main roadway that provides access to project area and the Commercial Port as a whole. Route 11 branches off of Route 1 (Marine Drive) which is the main north-south arterial roadway on the west side of Guam. Route 1 is a four-lane highway with a separate northbound to eastbound left turn lane. Southbound deceleration and acceleration lanes are also provided. The posted speed limit along Route 1 is 35 miles per hour. All traffic to and from the project will use the intersection of Route 1 at Route 11. This intersection is signalized with separate left turn phasing.

Route 11 is a two-lane, two-way roadway with a posted speed limit of 15 miles per hour. The roadway borders the Proposed Project site on the north side and provides access to Hotel Wharf and to the Family Beach and Dogleg Reef areas. In 1990, Route 11 was realigned to provide 12-foot travel lanes with 10-foot wide shoulders along the 100-foot wide right-of-way corridor, and turning pockets at the entrance to the Administration building parking lot and to the Container Yard sentry station. Based upon the most recent traffic planning data for Guam, Route 11 is not subject to become congested in the foreseeable future. Accordingly, no short-term or long-term highway improvements have been, nor are presently recommended to this roadway (Duenas & Assoc., 2004).

Route 11 is presently situated at approximately five feet below the proposed grade of the proposed deep draft wharf deck. Therefore Route 11 would be raised along the wharf backland area with manageable slopes of approximately 5 to 6% gradients.

The proposed deep-draft wharf deck would be fenced for security and access would be provided via two sliding gates located near each end of the wharf deck. Each sliding gate will provide a 40-foot opening to allow trucks turning into or exiting the site to keep within traffic lanes and avoid wide turning movements and possible traffic conflicts.

Existing traffic volume along Route 11 in the areas adjacent to the proposed deep-draft wharf is very low as the site is beyond the existing Port Authority Commercial Port and other major Cabras Island Tenants. Existing traffic conditions within the Proposed Project vicinity in terms of LOS are summarized in Table 3-7 below.

Table 3-7
Existing Levels-Of-Service Conditions - Project Vicinity

Roadway	Approach and Movement	A.M. Peak Hour		P.M. Peak Hour	
		Delay in seconds	LOS	Delay in seconds	LOS
Route 11	Eastbound Left	41.2	D	33.2	C
	Eastbound Right	39.5	D	31.4	C
Route 1	Northbound Left	38.4	D	28.2	C
	Northbound Thru	3.3	A	6.8	A
	Southbound Thru	14.0	B	20.1	C
	Southbound Right	9.7	A	14.9	B
Overall Intersection		12.2	B	13.7	B

Source: Rowell, 2006

The data summarized in Table 3-7 above illustrates that all controlled traffic movements currently operate at a Level-of-Service D or better, which is considered an acceptable level-of-service for peak hour conditions.

3.4.3 Significance Criteria

For the purposes of the EIS, traffic impacts would be considered significant if a Project:

- Uses an access road that is already at or exceeds LOS Class E, or brings a roadway up to LOS Class E
- Creates substantial safety hazards to motorists, bicyclists, pedestrians, or rail operations
- Prevents movement of emergency vehicles
- Restricts one or more lanes of a primary or secondary arterial during peak-hour traffic, thereby reducing its capacity and creating congestion, or causes the closure of an arterial or collector roadway for more than 48 consecutive hours
- Disrupts access to or from adjacent land uses for more than 14 days
- Reduces the supply of available parking
- Noticeably deteriorates roadway surfaces due to restoration of road surface inconsistent with local requirements
- Conflicts with planned transportation projects or adopted public transportation policies

3.4.4 Environmental Consequences

Future traffic volumes generated by the project were estimated in terms of trip generation rates. Trip generation rates are used to estimate the number of trips that a Proposed Project would generate during the A.M. and P.M. weekday commuter peak period. Traffic related impacts of a Proposed Project generally involve the determination of project-generated traffic during the A.M. and P.M. weekday commuter peak period and the determination of the LOS at affected roadway intersections subsequent to implementation of the project.

The Proposed Project improvements do not have established trip generation rates or equations in the standard references. Therefore, the methodology used in conducting the Proposed Project's trip generation analysis was based on the estimated number of revenue tons of cargo passing through Apra Harbor. The methodology and calculations for these analyses are presented in detail in Appendix B.

Future traffic conditions were assessed in terms of 2025 Background Traffic Projections and 2025 Background Plus Project Traffic Projections. The former are the projected future traffic conditions without implementation of the Proposed Project improvements, and the latter are projected future traffic conditions with the implementation of the Proposed Project improvements.

The *Guam 2020 Highway Master Plan Report Progress Edition* provided data indicating that traffic volumes in the Agat, Piti and Santa Rita areas are anticipated to increase 36.3% between 2003 and 2020. This equates to an average annual increase of 1.846% per year. This growth rate was used to determine the background growth between the years 2005 and 2025 which resulted on a growth factor of 1.44. The growth factor was then applied to the north-south traffic movements along Route 1. It was not applied to turning movements at the intersection of Route 1 and Route 11 as any increases in traffic along Route 11 would be the result of the Proposed Project improvements and therefore are included in the Background Plus trip generation analysis.

As mentioned above, the Proposed Project improvements do not have established trip generation rates or equations in the standard references. Therefore, the methodology used in conducting the Proposed Project's trip generation analysis was based on the estimated number of revenue tons of cargo passing through Apra Harbor. Existing and estimated future revenue tons of shipping for Apra Harbor was based on shipping estimates in the *Port Authority of Guam Master Plan*. For 2005, the estimated revenue tons was 2,714,000. The estimate for 2025 is 3,461,000. Therefore, in the year 2025, it is projected that Apra Harbor will handle an additional 747,000 revenue tons of cargo annually.

No Action Alternative

Under the no action alternative the proposed deep-draft wharf project and land reclamation would not occur. Therefore, traffic projections under this alternative would

be equivalent to the 2025 Background Traffic Projections as described above. Traffic conditions under this alternative take into consideration Guam's projected future traffic growth based on volumes and estimated capacities contained in the *Guam 2020 Highway Master Plan.*

2025 Background Traffic Projections were calculated by expanding existing traffic volumes by the appropriate growth rates. However, projected traffic growth, volume, trip generation, and LOS analysis, under this alternative are not presented in this subsection. Rather, they are presented under the Preferred Alternative subsection below, as they provide a more useful comparative baseline against which the Preferred Alternative can be measured. In summary, the No Action Alternative would result in less than significant impacts to traffic and circulation.

Preferred Alternative

Under the preferred alternative, future traffic conditions were assessed in terms of trips generated, LOS, and comparative traffic volume changes.

Existing and future volumes of cargo passing through Apra Harbor were used to estimate inbound and outbound vehicle trips at Apra Harbor. Based upon the estimated growth in annual revenue tons, the preferred alternative would generate an additional 90 trips during the A.M. peak hour and 75 additional trips during the P.M. peak hour.

In addition to vehicular traffic generated by the growth in annual revenue tons of commerce, the commercial port would likely handle additional cargo transfers between vessels. This transferred cargo is not included in the estimated of revenue tons cited above. Furthermore, additional employees would likely be required to handle this increase in transfer cargo.

As there are no available estimates for the number of additional employees such operations would require, it was estimated that the number of peak hour trips generated by the additional annual revenue tons would be increased by 50% (as a worst case scenario) to account for the additional employment required to handle the additional transfer cargo.

Taking into consideration future cargo volumes and additional employees required for operations, the preferred alternative would generate 140 additional trips during the A.M. peak hour, 115 of which would be inbound and 25 outbound. During the P.M. peak hour 35 inbound trips and 85 outbound trips would be generated for a total of 140 trips (Rowell, 2006).

Trip generation analysis under this alternative is summarized in Table 3-8 below.

Table 3-8
Trip Generation Analysis (Preferred Alternative)

Peak Period	Direction	Existing Trip rates			Year 2025 Estimated Trip Rates			
		Counted Trips	Revenue Tons	Trips per Million Tons	New Revenue Tons	New Trips	Factor for New Employees	Total New Trips
A.M.	Inbound	275	2.714	101.33	0.747	75	1.5	115
A.M.	Outbound	54		19.90		15		25
A.M.	Total	329		121.22		90		140
P.M.	Inbound	69		25.42		20		35
P.M.	Outbound	199		73.32		55		85
P.M.	Total	268		98.75		75		120

Source: Rowell, 2006

Based on existing turning movement volumes during A.M. and P.M. peak hours, traffic generated by the preferred alternative was assigned distribution patterns at the intersection of Route 1 at Route 11. Once trip distribution and assignments were established an intersection LOS analysis could be performed.

The LOS analysis was performed for 2025 conditions with traffic generated by the preferred alternative using the following assumptions:

- The intersection configuration of Route 1 at Route 11 is the same as existing.
- The traffic signal phasing is the same as existing. The timing is optimized for 2025 traffic conditions.
- Level-of-Service D is the minimum level-of-service acceptable.

The results of the LOS analysis for the signalized intersection at Routes 1 and 11 during A.M. and P.M peak hours is shown in Tables 3-9 and 3-10, respectively.

Table 3-9
Future Conditions A.M. Peak Hour
Level-of-Service Analysis (Preferred Alternative)

Roadway	Approach and Movement	Year 2025 Without Project		Year 2025 With Project	
		Delay in seconds	LOS	Delay in seconds	LOS
Route 11	Eastbound Left	41.2	D	41.7	D
	Eastbound Right	39.5	D	40.1	D
Route 1	Northbound Left	38.4	D	45.3	D
	Northbound Thru	4.3	A	4.3	A
	Southbound Left	22.8	C	22.8	C
	Southbound Thru	9.7	A	10.3	B

Overall Intersection	16.1	B	16.9	B

Source: Rowell, 2006

Table 3-10
Future Conditions P.M. Peak Hour
Level-of-Service Analysis (Preferred Alternative)

Roadway	Approach and Movement	Year 2025 Without Project		Year 2025 With Project	
		Delay in seconds	LOS	Delay in seconds	LOS
Route 11	Eastbound Left	33.2	C	34.6	C
	Eastbound Right	31.4	C	32.2	C
Route 1	Northbound Left	28.2	C	29.2	C
	Northbound Thru	13.9	B	13.9	B
	Southbound Left	27.6	C	27.6	C
	Southbound Thru	14.9	B	15.1	B
Overall Intersection		19.7	B	20.1	C

Source: Rowell, 2006

As shown in the above tables all traffic movements would operate at Level-of-Service D or better during both A.M. and P.M. peak periods for 2025 future conditions both without and with the preferred alternative. The conclusion is that all the traffic movements would operate at an acceptable level-of-service after the implementation of the preferred alternative. It should also be noted that there are no changes in the level-of-service of any lane group as a result of project-generated traffic except for the southbound through movement. For this movement, level-of-service changed from Level-of-Service A to Level-of-Service B, which is considered a very good level-of-service.

In addition to the level-of-service analysis, change in traffic volumes along the adjacent roadway segments and the percentage of traffic growth between 2005 and 2025 as a result of the preferred alternative were analyzed to further assess potential impacts of project-generated traffic. Changes in total approach and departure traffic volumes at the intersection of Route 1 at Route 11 were analyzed and are presented in Table 11.

Table 3-11
Traffic Volume Changes Along Study Streets
(Preferred Alternative)

			A.M. Peak Hour				P.M. Peak Hour			
Street	Location	Direction	Without Project	With project	Change	Percent Change	Without Project	With project	Change	% Change
Route 1	North of Route	North-bound	1520	1530	10	0.7%	2245	2290	45	2.0%

	11	South-bound	1995	2055	60	3.0%	1415	1425	10	0.7%
	South of Route 11	North-bound	1645	1700	55	3.3%	2405	2430	25	1.0%
		South-bound	1845	1860	15	0.8%	1330	1370	40	3.0%
Route 11	West of Route 1	East-bound	145	170	25	17.2%	120	205	85	70.8%
		West-bound	420	535	115	27.4%	365	400	35	9.6%
	At Harbor Gate	East-bound	55	80	25	45.5%	200	285	85	42.5%
		West-bound	275	390	115	41.8%	70	105	35	50.0%

Source: Rowell, 2006

As shown in the table above, increases in traffic volume along Route 1 is 3% or less. Traffic volume increases along Route 11 are more substantial with anticipated increases up to 70.8% during the afternoon peak hour along Route 11 in the eastbound direction. However, in the context of overall traffic volumes the total number is vehicles during these times, and at these locations, is relatively minimal that high levels-of-service are expected.

The preferred alternative's pro rata share of traffic growth between the years 2005 and 2025 was also assessed. The peak hourly projections for existing conditions, 2025 conditions without, and 2025 conditions with the Proposed Project were compared, in terms of percentage of traffic growth. The Preferred Alternative's pro rata share of traffic growth between the years 2005 and 2025 is estimated to be 12.4% during the A.M. peak hour and 10.2% during the P.M. peak hour traffic.

The overall pro rata share of traffic growth in the project area over the next 20 years is summarized in Table 3-12 below.

Table 3-12
Pro Rata Share of Traffic Growth – 2005 through 2025 (1)
(Preferred Alternative)

					Future Change (without Project)(2)		Future Change (with Project)(3)	
Intersection	Peak Period	Existing (2005)	2025 without Project	2025 with Project	Volume	Percent Increase	Volume(4)	Percent Increase
Route 1 at Route 11	A.M.	2800	3785	3925	985	87.6%	140	12.4%
	P.M.	2885	3940	4060	1056	89.8%	120	10.2%

Source: Rowell, 2006

Notes:
(1) Volumes shown are total intersection approach volumes
(2) Compared to existing (2005) conditions
(3) Compared to Future Change without Proposed Project
(4) Project generated traffic

Regional Traffic Impacts

As the residents of the project may be employed over a large area of Guam, it is reasonable to assume that project generated traffic will have an impact beyond the immediate vicinity of the project. However, the further away one is from the project, the less the impact since traffic will dissipate over distance. Since the impact in the immediate vicinity of the project is insignificant, it is also reasonable to assume that the traffic impacts of the project will also be insignificant at locations more distant from the project. In summary, the Preferred Alternative would result in less than significant impacts to traffic and circulation.

Alternative 2

Under this alternative potential impacts related to traffic and circulation would be the same as the Preferred Alternative resulting in less than significant impacts to traffic and circulation.

Alternative 3

Under this conceptual alternative internal traffic and circulation details for the proposed pier facilities have not been developed. However, traffic-related impacts at the project site and the surrounding roadway network would be the similar to those presented under the Preferred Alternative and Alternative 2 resulting in less than significant impacts to traffic and circulation.

3.4.5 Proposed and Potential Mitigation Measures

The results of the LOS analysis of future conditions with and without the Proposed Project indicate that there would be only negligible short-term impacts on traffic and circulation during the weekday A.M. and P.M. commuter peak periods. In summary, traffic generated by the Proposed Project would be localized and would not contribute significantly to regional traffic nor would they result in significant long-term cumulative impacts on the environment.

Mitigation measures such as roadway improvements and/or additional traffic signals would not be required as all intersections and controlled lane groups would operate at Level-of-Service D, or better, with project generated traffic. Although they are not necessary, the following measures could be employed to further minimize the negligible traffic impacts which may occur as a result of the Proposed Projects.

- Limiting the operation of construction vehicles to off peak hours would reduce traffic congestion in the adjacent street network

- During the construction phase of the Proposed Projects, potential site tenants and users will be consulted to determine specific off-street parking and loading area requirements.

US Navy aircraft carriers occasionally visit Guam and anchor at Apra Harbor. However, such visits are limited and occur only two or three times a year. The frequency of Nimitz Class aircraft carriers berthing at the proposed deep-draft wharf is undetermined at this time. However, the proposed wharf would accommodate these aircraft carriers on a contingency basis only. Accordingly, U.S. Navy use of the wharf facility would be considered a special event. As this is a special event and the number of persons to be transported to and from Apra Harbor would vary widely based on the size of the aircraft carrier, the development of a special Traffic Management Plan is recommended as a mitigation measure.

3.5 HISTORIC AND CULTURAL RESOURCES

3.5.1 Introduction

Historic and archaeological resources, including historic properties which are listed (or are eligible for listing) in the National Register of Historic Places (NRHP), and which may be affected by an undertaking by a Federal agency, are protected by Federal law. Primarily, this is under the National Historic Preservation Act of 1966 (NHPA), as amended, and the implementing regulations, 36 CFR 800. The issuance of a federal grant by EDA for this activity is considered a "federal undertaking". Thereby, review of potential impacts to historic properties and consultation with the Guam Historic Resources Division (GHRD) must be conducted in accordance with Section 106 of the NHPA..

In addition to the NHPA, cultural resources for NEPA analyses may take into consideration authorities including, but not limited to cultural items as defined in the Native American Graves Protection and Repatriation Act (NAGPRA), archaeological resources as defined in the Archaeological Resources Protection Act, and scientifically significant sites as defined by the Archaeological and Historic Data Preservation Act (AHPA).

Under the NHPA Historic and cultural sites are considered "historic properties" and protected if they satisfy each of two categories comprising the National Register criteria for evaluation (36 CFR Part 60.4): (1) they must possess integrity of location, design, setting, materials, workmanship, feeling, and association; and (2) they must be characterized by at least one of the following attributes or criteria:

(a) associated with events that have made a significant contribution to the broad patterns of our history; or

(b) associated with the lives of persons significant in our past; or

(c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) have yielded, or may be likely to yield, information important in prehistory or history.

In compliance with Section 106 of the NHPA, consultation with the Guam Historic Resources Division (GHRD) was initiated to determine potential impacts on historic properties as a result of the Proposed Project.

An archaeological investigation was conducted in support of this EIS to locate and assess the historical significance of any cultural resources present within the project area, and to assess potential adverse effects by the Proposed Project improvements. The archaeological investigation is attached herein as Appendix C. The remainder of this section provides a brief historical background of land use within the Apra Harbor area, and draws in large part on the findings of the archaeological survey to assess potential impacts to historical and cultural resources if present.

Historical Land Use

Historical evidence suggests that in general traditional Chamorro settlements on Cabras Island and within the Apra Harbor area was not extensive. A possible reason could be that Cabras Island's small size and lack of freshwater may have deterred habitation and agriculture in prehistoric times. Prehistoric use of this side of the harbor was probably limited to fishermen and foragers who frequented the narrow shorelines of Cabras Island and fished the western shallows of Luminao Reef and Calalan Bank (Pacific Legacy, 2005).

Early Spanish and missionary accounts indicate that in the last half of the 1600s, some of the Chamorro people were residing in villages located along the northern shoreline of Orote Peninsula on the south side of Apra Harbor and on the high ground inland of the harbor. Perhaps the largest of these settlements was fishing community of Sumay situated on the shore of Orote Peninsula, located south and across the harbor from Cabras Island and the project area.

After peace had been achieved between the Spanish and Chamorros, the Spanish began to build military fortifications in Apra Harbor between the early 18th and 19th centuries. Apra Harbor eventually became the favored anchoring spot on Guam during the Spanish Period. The Manila Galleons, as well as the vessels of the visiting explorers and whalers sailed into Apra Harbor. The whalers brought cash to the islanders in exchange for local goods and services (Hunter-Anderson and Moore, 2002).

Descriptions of Cabras Island in the late 1800s indicate that it was then a low, rugged mass of limestone, edged by narrow strands of sandy beach that was often frequented by local fisherman. At that time, the island was covered by low, dense vegetation, and was separated from Guam's shoreline by about 100 feet of shallow reef flat. Two rocky shoals, Luminao Reef and Calalan Bank, extended in a westerly direction from the western end of Cabras Island.

The Americans sailed into Apra Harbor and took over Guam in 1898. Because Guam was remote and was to be used as a coaling station, President McKinley decided that the Department of the Navy would be responsible for administrating the island. Due to the shallow waters that were located between the ships at anchor in Apra Harbor and the shorelines, the naval administrators quickly found that transporting cargo from their ships was extremely difficult. Consequently, improvements to the Piti landing and the small boat channels (Piti and Sumay) were among the first public works projects carried out by the U.S. Navy.

By 1914 a wharf, a coal storage facility and a quarantine station had been built on Cabras Island. The wharf was located along the Cabras Island shoreline just east of the present oil dock, the coal shed was located just inland of the wharf, and the quarantine station was located at the east end of the island. Due to the subsequent construction activities, including the industrial park and commercial port, only the ruins of the quarantine station remain on Cabras Island

After WWII the U.S. military began a series of infrastructural improvements within Apra Harbor, and by 1950 major projects had been completed including the Glass Breakwater, the Piti Channel, four fuel storage tanks, the existing Oil Dock (Wharf F-1) and fuel lines at Southwest Point, three boat quays (located along the southern shores of the breakwater between Hotel Wharf and Seaplane ramp), and a rock quarry on Cabras Island. The Glass Breakwater which was completed in 1947 and acquired its name in honor of Captain Henry Glass who seized Guam for the United States nearly a half-century earlier. The harbor was dredged and portions of the former reef flats were filled to build the breakwater and to create land for military facilities such as those at Polaris Point.

In 1966, the Government of Guam re-acquired Cabras Island from the federal government and a ground-breaking ceremony was held for the construction of the new commercial port. Facilities at the new port included new wharves with dredged approaches. Construction was completed in 1969. It is not clear when Golf Pier and H (Hotel) Wharf were built, but Hotel Wharf appears on a 1955 map of Apra Harbor which suggests that the Navy continued to improve the facilities along the Glass Breakwater after 1947. Other facilities that appear on the 1955 map include the oil dock, the three docks built prior to 1947, Hotel Wharf and Dog Leg Pier. It is likely that Golf Pier was renovated in 1960 when it began to be used to store bulk cement (Pacific Legacy, 2005).

During the Vietnam War the U.S. Navy utilized Hotel Wharf as their ammunition wharf and this wharf may have been renovated during this time period. Subsequently, the Navy's ammunition wharf was moved from Hotel Wharf to Orote Peninsula, across the harbor from Hotel Wharf, and additional lands on Cabras were then turned over to GovGuam to build the Industrial Park which was dedicated in 1971. By 1970 the Marianas Yacht Club operated a small anchorage in the area between the Sea Plane Ramp and the fuel storage tank farm. In the 1990s the Mariana's Yacht Club facility moved to their present location in the inner harbor.

3.5.2 Affected Environment

Historic Resources

The Proposed Project area extends along the shoreline from Southwest point westward to Hotel Wharf. Due to the presence of man-made lands in the vicinity of the project area along the breakwater shoreline, prehistoric sites are not known and are highly unlikely to exist. Historic sites located within or immediately adjacent to the Proposed Project area limited and include the Glass Breakwater, the Oil Dock, Hotel Wharf built in the 1950s, and Golf Pier built about 1960. In addition to these existing sites the remains of the three boat quays (A, B, and C) built between the years 1944-47 are also located within the project area. The three quays were constructed next to each other and were located in the area between Seaplane Ramp and Hotel Wharf. Historic maps label the three quays as Quays A, B, and C, with A in the west (at the existing Hotel Wharf) and C in the East (at the existing Golf Pier). Summary descriptions of these existing and remnant historic structures are discussed in further detail below.

Oil Dock (Wharf F-1)

Oil Dock, also called Gorco Pier, located on Southwest Point is actually located outside (but directly adjacent to) the proposed Reclamation Site 3 project area. The Oil Dock was initially built during the 1941 construction that marked the first attempt to build a breakwater along Luminao Reef. Since then the pier has been upgraded and is in use presently. Although the original structure would have been old enough to be eligible for nomination to the National Register of Historic Places, it has been rebuilt and repaired over the years and is currently in use. It is likely that none of the original construction is visible, but this could not be confirmed, as the pier is a secured area.

The shoreline fronting the present tank farm north of the Oil Dock is formed of coral boulders placed there to make hard land and protect the shoreline. This zone contains no significant cultural resources. This area was formerly used as a Landing Ship Tank (LST) landing, and is today part of the Mobile/SPPC fuel tank facility. Ruins of the former Marianas Yacht Club facility, are located in the northern shores of the proposed Reclamation Site 3. However, these ruins date to about 1970 and are too recent to be considered historically significant. In addition, they are in poor condition and have lost their structural integrity as they are now part of the fuel tank facility. In summary the

shoreline fronting the proposed Reclamation Site 3 contains no significant cultural resources.

The existing facilities and any remnant historical structures at the Oil Dock would not be impacted by proposed improvements under the Preferred Alternative.

Seaplane Ramp

Today, Seaplane Ramp is still used to launch small watercraft, but its exact year of construction is not known. It was either built in 1944-45, immediately after the U.S. retaking of Guam, or during the 1945-47 construction of the Glass Breakwater. It is the only relatively intact feature of the three original boat quays (A-C) built on the south side of the breakwater during the 1940s. Seaplane Ramp is located in the area formerly occupied by boat "C" quay.

The backfilled area making up the Sea Plan Ramp is quite large, and in addition to the ramp and seawall, other structures in the area include a steel bollard, the ruins of a concrete foundation, and a small concrete slab. The backfilled area measures approximately 360 feet along the shoreline of the breakwater and extends into the harbor for a maximum distance of about 400 ft from the road along the south side of the breakwater.

The concrete ramp is located approximately 170 feet west of the east side of the filled area, and is about 29 feet wide by 40 feet in length (above the water). The ramp extends below the water line for an unknown distance. Above the water line the surface of the ramp is in good condition. Below the water line, the surface has eroded exposing the rebar used to strengthen the concrete

Each side of the ramp is edged with a concrete and metal wall that continues below the water line. Near the point where the ramp meets the water, the sidewall is 1 ft high. These ramp-edge-walls are built of alternating blocks of concrete and rock-filled open rectangles of metal pilings, with a solid concrete facing along the ramp measuring approximately about 1 x 6 feet in size.

The seawalls on either side of the ramp are made of concrete and interlocking metal pilings that face the backfilled area, which forms the level parking area around the ramp. Portions of the ramp and seawalls and/or corrosion as a result of their age, but overall they appear to be in fairly good condition. The concrete foundation on the east side of the Sea Plane Ramp area measures approximately 21 feet x 14 feet in size. At regular intervals along the tops of the foundation walls, rusty metal bolts are visible. These would have served to secure a metal super-structure to the foundation.

Golf Pier

Golf Pier is the wharf immediately west of the Sea Plane Ramp. It is presently used as a docking facility with fuel lines running the length of its pier. The pier is in good condition and it was likely built or re-built in the 1960s when it began to be used for cement storage. Golf Pier appears to have incorporated the "B" quay (one of the three quays built along the breakwater in the 1940s). Although it has been modified with concrete buttresses, a new pier, and a circular concrete pad with a diameter of 121 feet, remnants of the concrete-filled metal box construction technique used during WWII, remain at the wharf's edge. Two bollards remain in place along the shoreline, one at the southeast corner and another at the southwest corner. The distance between the two old bollards is approximately 300 ft. The bollards are located approximately 300 feet south of Route 11 (the south side of the breakwater).

Outhouse Beach

The area now known as Outhouse Beach is so named due to the presence of an outhouse at this location. It is likely that the Outhouse Beach area marks the remains of "A" quay (the remaining quay of the three constructed at the end of WWII (1944-45) or during the 1945-47 construction of the Glass Breakwater). Outhouse Beach is presently an undeveloped area, where much of the shoreline has eroded. Two bollards stand at the eastern end of this area and one remains on a block in the water at the western end. The distance between these two bollards in the water is approximately 344 ft. The bollards are located approximately 85 feet south of Route 11 (the south side of the breakwater).

At the east end, the cylindrical bollard on the concrete-covered block in the water is approximately 3 feet in height with a top diameter of 14 inches. A date of 9/29/2000, written in the concrete surface of this block, suggests that concrete was poured on the block in recent years, perhaps in an effort to repair it for use as a stable fishing spot. The second eastern bollard, located toward the breakwater from the first, sits on a concrete slab approximately 10 square feet square in size. The concrete slab is situated on made land and it is likely that this bollard and its concrete base were constructed after "A" quay was first built. The height of the southwestern bollard is approximately 3 feet and it has a diameter of 13 inches. It is mounted on a slightly tilted concrete block that measuring about 35 square feet in size.

Visible in the water between the two bollards is a row of corroded metal remnants. These metal remnants are possibly all that remains of the boxes that once formed the waterfront edge of "A" quay. If the two old bollards and the alignment of metal remnants at Outhouse Beach mark the harbor edge of the former "A" quay built in the 1940s, the feature is in poor condition and has lost much of its historical integrity.

H (Hotel) Wharf

Hotel Wharf appears to be in fairly good condition; on its eastern side there is an abandoned concrete sentry post which is in poor condition. In addition, there are abandoned metal buildings, abandoned boats and equipment occur on its breakwater

side where some large nets used by commercial fishing boats are currently stored. The harbor side of the wharf is being used as a docking facility; the concrete wall along the wharf's edge is approximately 400 feet in length. Metal cleats occur at intervals along the harbor edge of the wharf. Also at intervals along the edge of the wharf are concrete utility boxes that once had water lines and spigots to supply fresh water to the ships docked there.

Three paired sets of bollards occur near the center of the inland length of Hotel Wharf, other sets of bollards and cleats occur along the wharf's harbor edge, and two sets of bollards occur along its east side.

There are no known significant cultural resources along the shorelines fronting proposed Reclamation Sites 1, 2, and 3.

Submerged Historic Resources

More than 60 shipwrecks have been documented in and around Guam. These shipwrecks span a period more than four centuries. The earliest of which is the manila galleon San Pablo which sunk at anchor when a typhoon struck in 1568. Ships representing every period in Guam's history including, the Spanish colonial period, whaling, American colonialism, World Wars I and II, and up to the modern era have been wrecked in the waters off Guam (Carrell, 1991).

Underwater cultural resources have been identified within Apra Harbor. Some of these sites have been documented and others remain undocumented. The documented historical wrecks in Apra Harbor include the remains of four ships: the Cormoran, Tokai Maru, Kitsugawa Maru, and Nichiyu Maru and one Japanese airplane named the Val. In addition to the documented sunken vessels there are several undocumented sunken vessels in the harbor. The undocumented vessels include a Japanese salvage tugboat, an American tanker, the Scotia (a cable ship), four yachts and a fishing boat.

Table 3-13 summarizes the submerged historic vessels within Apra Harbor, providing the age, historic register status, historic site number designation, and documentation status. A brief description of the historic sunken vessels is provided below and their locations within Apra Harbor are shown in Figure 3-3.

- The Tokai Maru – This vessel was a Japanese passenger-cargo ship that was initially damaged in 1943 by torpedoes from the U.S. submarine Flying Fish. Later on in 1943 the U.S. submarine Snapper fired torpedoes and sunk the ship in 120 feet of water next to the SMS Cormoran (discussed below). The Tokai Maru has been documented, drawn and photographed.

- The SMS Cormoran – Was a German ship whose captain scuttled it in 1917 rather than surrender it to the Americans during World War I. The vessel lies on its starboard side in 120 feet of water with its bow facing approximately northeast. Its keel is almost touching that of the Tokai Maru with the latter on its port side bow facing almost due north. There has been no major damage to the

ship's hull as a result of the sinking, and the vessel has a general intact appearance with the exception of sea growth and corrosion (Carrel, 1991). The Cormoran has been documented, drawn and photographed.

- The Nichiyu Maru – This vessel was a Japanese freighter built in 1938. it was damaged by a torpedo from the U.S. submarine Permit in 1943 and sunk by shelling from the U.S. destroyer Caperton, on June 25, 1944. The freighter, currently lies below the existing Oil Dock (Wharf F-1) in 100 feet of water. The Nichiyu Maru has been documented, drawn and photographed.

- The Kitsugawa Maru – This vessel, also a Japanese freighter was towed to Apra Harbor after being damaged on Guam's east coast in April 1944. The freighter was sunk in June 1944. It lies in 144 ft of water. The Kitsugawa Maru has been documented, drawn and photographed.

- The Val – This is a Japanese Navy dive bomber that was shot down in 1944. It lies in 80 feet of water. The plane was buried nose first into the bottom with its tail and fixed landing gear pointing into the air. A good portion of the tail section is missing. An unsuccessful attempt to raise the plane many years ago resulted in separating the wing and flipping the Val upside down. The Val has been documented but not drawn or photographed.

- Japanese Tugboat - This vessel that was used to place torpedo nets across the harbor, and provide tug and salvage services during the Japanese occupation of Guam. The tugboat was first hit by U.S. aircraft strafing and was later sunk by a torpedo. The tugboat has not been documented, drawn or photographed.

- The Scotia – This vessel was a cable ship that sank in 1904 after striking rocks while entering Apra Harbor. The vessel is actually located outside of the harbor to the west of Spanish Rocks. The Scotia has not been documented, drawn or photographed.

- American Tanker – Not much is known about the history of this World War II era barge. It sits upright atop a small reef in approximately 40 to 120 feet of water. The barge has not been documented, drawn or photographed.

- Yachts and Fishing Boat – Four small private yachts and one fishing vessel were wrecked in the waters between Southwest Point and Sea Plane Ramp. The yachts sunk during the time that the Marianas Yacht Club was located in this area. These five vessels have not been documented, drawn or photographed. However, they are recent wrecks having sunk between the years 1970 to crica. 1990.

Table 3-13
Submerged Historic Resources in Apra Harbor

Site Name	Age/Era	Historic Site Number	Guam Register	National Register	Documentation, Drawings
Scotia	1904	None			No
Cormoran	1917	66-03-1037	July, 1974	April, 1975	Yes
Tokai Maru	WWII	66-03-1089	July, 1988	July, 1988	Yes
Nichiyu Maru	WWII	66-03-1155	No	No	Yes
Kitsugawa Maru	WWII	66-03-1154	No	No	Yes
Val *(dive bomber)*	WWII	None	No	No	Documentation Only
Japanese Tugboat	WWII	None	No	No	No
4 yachts and 1 fishing boat	1970-1990?	None	No	No	No
American Tanker	?	None	No	No	No

In summary, of the documented sunken vessels in Apra Harbor, the Cormoran dates to WWI and the other four wrecks date to WWII. Two of these shipwrecks, the SMS Cormoran (HRD Site 66-03-1037), and the Tokai Maru (HRD Site 66-03-1089), are on the Guam and the National Registers of Historic Places. Although the Kitsugawa (HRD Site 66-03-1154) and Nichiyu Maru (HRD Site 66-03-1155), have been assigned historic site numbers and mapped, to date they have not been placed on either register. The Val bomber has not been mapped, but it has been documented.

Cultural Resources

Fishing in Guam continues to be important not only in terms of contributing to the subsistence needs of the Chamorro people but also in terms of preserving their history and identity. Fishing assists in perpetuating traditional knowledge of marine resources and maritime heritage of the Chamorro culture. A strongly enduring cultural dimension related to offshore fishing is the high value placed on sharing of the catch, and the importance of gifts of fish to relatives and friends.

Over the centuries of acculturation beginning with the Spanish conquest in the late 17th century, many elements of traditional Chamorro culture in Guam were lost. But certain traditional values, attitudes and customs were retained to become a part of contemporary life. The common practice of sharing one's fish catch with relatives and friends during Christian holidays is rooted in traditional Chamorro culture (Amesbury

and Hunter-Anderson 1989).

Based on creel surveys of fishermen, only about one-quarter to one-third of the inshore catch is sold. The remainder enters non-commercial channels. Reef and bottomfish continue to be important for social obligations, such as fiestas and food exchange with friends and families. One study found a preference for inshore fish species in non-commercial exchanges of food (NMFS, 2005).

The social obligation to share one's fish catch extends to part-time and full-time commercial fishermen. Such gifts are often reef fish or shallow-water bottomfish (Amesbury and Hunter-Anderson 1989). Even when fish are purchased informally by friends, neighbors or relatives of the fishermen, the very personal marketing tends to restrain the price asked. Domestic fishing on Guam supplements family subsistence, which is gained by a combination of small scale gardening, ranching and wage work (Amesbury and Hunter-Anderson 1989). The availability of economic activities such as part-time fishing is among the major reasons that Guam has not experienced more social problems during times of economic hardship and increasing unemployment. The subsistence component of the local economy has gained significance in recent years with the downturn in Guam's major industries and increasing unemployment (WPRFMC 2003).

Local fisherman access the ocean waters at various launch sites throughout Guam. The Agana Boat Basin is centrally located on the western leeward coast and serves as the island's primary launch site for boats fishing areas off the central and northern leeward coasts and the northern banks. At Ylig Bay, a paved parking area and maintenance of the brush along the highway has helped increased the number of boats accessing the east side of the island.

Within the project area the Seaplane Ramp provides access to Apra Harbor, Cocos Lagoon, and the southern banks. However, other boat launch areas including Agat Marina, Merizo boat ramp, and Umatac boat ramp, are more frequently used by fishermen to access Guam's southern waters. The Agat Marina in particular, located between the Agana Boat Basin and the Merizo boat ramp, provides trailered boats from the northern and central areas of the island a closer and more convenient launch site to the southern fishing grounds.

3.5.3 Significance Criteria

For the purposes of the EIS, historic and/or cultural resource impacts would be considered significant if the project:

- Violates Federal, State, or Territorial agency cultural resource standards or objectives

- Causes a substantial adverse change in the significance of an archaeological resource, such demolition or material alteration of the resource itself or its immediate surroundings
- Causes a substantial adverse change in the significance of a historical resource as defined on the Federal level by its eligibility for listing on the NRHP
- Directly or indirectly destroys a unique historical resource or site
- Results in the elimination or substantial reduction of a traditional cultural resource area or practice
- Disturbs any human remains, including those interred outside of formal cemeteries.

3.5.4 Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no adverse impacts to existing historical or cultural resources in the project area. No wharf improvements or land reclamation activities would occur and existing potential historic and/or cultural resources would not be disrupted in either the short-term or long-term. This alternative would result in a less than significant impact to historic and cultural resources.

Preferred Alternative

For the most part the existing and remnant historical structures at Hotel Wharf, Seaplane Ramp, and Golf Pier would not be adversely impacted as the area would not be altered as a result of the proposed improvements. However, the possibility of adverse impacts to some areas of the existing and remnant historical structures at these facilities could occur as a result of the construction of abutting portions of proposed wharf and dike structures.

In contrast, the entire Outhouse Beach area including the remnant historical structures associated with the former "A' quay would be eliminated by the proposed deep-draft wharf facility.

Other than Golf Pier, all of the structures discussed in Section 3.5.2 appear to be 50 years old, or older, which is old enough to consider them eligible for nomination to the National Register of Historic Places based upon the criterion set forth in Section 3.5.1. With the exception of Golf Pier, the wharves could be considered significant under Criterion (a), which states that they must be associated with events that have made a significant contribution to the broad patterns of our history. In the application of Criterion (a), the Sea Plane Ramp (remnant "C" quay), the early portion of Golf Pier (remnant "B" quay), and Outhouse Beach (remnant "A" quay) may qualify because of their possible association with WWII. Hotel Wharf may qualify because of its association with the Vietnam Conflict.

The former "A", "B", and "C" quays could also be considered significant under Criterion (c) which states that the properties must embody the distinctive characteristics of a method of construction. The WWII "Magic Box" construction technique that apparently was used to build portions of these three features may be considered a unique characteristic. However, considering their present condition and their history of remodeling and modifications, they may not be significant under National Register Criteria.

Alternatively, the quays could be considered as features of the Glass Breakwater and, as such, they could be included along with the breakwater in a nomination to the National Register. It has been suggested that the Glass Breakwater could be eligible for listing on the National Register, but to date, the nomination forms have yet to be completed. If the three quays are nominated along with the breakwater, additional archival research may locate photographs, engineer's drawings, and more detailed descriptions of quay construction.

Hotel Wharf is in better condition than the three older "A", "B", and "C" quays, but there is little on its surface to remind us of its role in the transportation of ammunition from military ships at anchor in the harbor to the appropriate magazines on Guam's military bases during the Vietnam Conflict. As an additional mitigation measure, the roles the former quays and Hotel Wharf played in supporting U.S. participation in WWII and subsequent military activities within the Asian region could be described in one or more plaque(s) placed in either the new deep-draft wharf area, or in the vicinity of the Sea Plane Ramp and/or Hotel Wharf.

Proposed dredging under the Preferred Alternative could impact some of the underwater cultural resources, including the known significant wrecks discussed in Section 3.5.2 and other possible yet-to-be-identified remains. The wrecks in the former Marianas Yacht Club area are not old enough to be eligible for listing on the National Register. Additionally, there is the possibility that dredging activities expose cultural material from Guam's entire historic past.

The five submerged vessels between the Sea Plane Ramp and Southwest Point were registered with the Marianas Yacht Club. These vessels are less than 50 years old, and therefore are not old enough to be listed on the NRHP. Therefore, the vessels potentially within the project area that may be impacted by construction activities are not considered significant cultural resources. Based upon their locations and implementation of water quality mitigation measures (see Section 3.11.5), It is expected that the five underwater historical vessels located outside the immediate project area, including the Nichiyu Maru (Guam Site 3-1155), would also not be impacted by project construction and/or operational activities.

The preferred alternative could provide a potential beneficial indirect impact to off-site historic resources on Guam. The Guam Preservation Trust (GPT) has expressed interest in accepting any dead coral that may be generated as a result of the Proposed

Project. The GPT would stockpile the coral material for later use in their Mamposteria Restoration Program.

The GPT's Mamposteria Restoration Program focuses on the restoration of historic structures from Guam's Spanish period that were constructed using the "mamposteria methods" which utilized local materials including coral. Therefore, use of project-generated dead coral would result in beneficial impacts to GPT's efforts in undertaking new mamposteria restoration projects or in GPT's maintenance of completed mamposteria structures and bridges. In summary, the Preferred Alternative with appropriate mitigation measures would result in less than significant impacts to historic and cultural resources.

Alternative 2

Potential impacts under Alternative 2 would be similar to those described for the preferred alternative resulting in less than significant impacts with appropriate mitigation measures.

Alternative 3

Under this alternative the existing facilities and historical remnants at Sea Plane Ramp would be permanently lost. The seaplane ramp area would be backfilled and become part of the operational backland area and therefore it would not be possible to preserve any of the ramp and seawall structures. However, the Sea Plane Ramp and the filled area exhibit structural integrity and are in fair condition, and it should be noted that unless these eroded areas are repaired, they will continue to deteriorate during the storms that frequently hit Apra Harbor, and the ramp and seawall structures will eventually be destroyed. Therefore, the Alternative 3 with appropriate mitigation measures would result in less than significant impacts to historic and cultural resources.

3.5.5 Proposed and Potential Mitigation Measures

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended. The USACE initiated consultation with the GHRD and other interested parties to ensure the protection of any potentially significant historic resources that could potentially be impacted by the Proposed Project. The Section 106 consultation process was initiated on March 9, 2005 and is presently ongoing. Additionally, in early 2002, PAG initiated an early consultation with the GHRD regarding their proposed deep-draft wharf improvements. Copies of PAG's early consultation and the ongoing Section 106 correspondences are attached herein as Appendix D.

Quays A, B, and C, would be permanently lost during construction under the Preferred Alternative and Alternative 2. However as previously noted, these three original docking features built on the Glass Breakwater during the 1940's (quays A-C), are deteriorated and in poor condition, they have endured remodeling and modification, and have lost much of their integrity. As such, through consultation, Quays A, B, and C have been determined ineligible for listing on the NRHP.. As a mitigation measure the

documentation included in the Archaeological Investigation Report (attached as Appendix C) would be adequate to mitigate the loss of the quays from the archaeological record.

Under Alternative 3 the existing Golf Pier and Sea Plane Ramp structures would be permanently lost. Golf Pier built in the 1960's, is not eligible for listing on the NRHP. However, the Sea Plane Ramp may be eligible for listing on the NRHP for their possible association with WWII. Although Alternative 3 is the least preferred alternative and will likely not be implemented, as a mitigation measure the documentation included in the Archaeological Investigation Report would be adequate to mitigate the loss of the Sea Plane Ramp from the archaeological record. As an additional mitigation measure a plaque of other type of signage could be erected at the site to mark the Sea Plane Ramp's place in Guam's history.

In-water construction activities are not anticipated to adversely impact submerged cultural resources in the project vicinity. However, an additional concern for submerged resources is the possibility of exposing yet unidentified cultural resources (e.g., Spanish Period canons, canon balls, and other items and equipment) during dredging activities.

Due to the nature of the activity, the feasibility of archaeological monitoring of dredged material as a mitigation measure would be contingent upon the development of an examination technique able to overcome the tendency for submerged items to be covered with dredge material that would make them difficult to recognize and identify. Therefore, archaeological monitoring during construction/dredging activities is not recommended.

As a mitigation measure, dredging contractors would be made aware of the locations, and instructed to avoid areas with known submerged cultural resources. Furthermore, dredging contractors would be advised of the potential for their work to expose significant cultural resources spanning many centuries. Contractors would also be directed to contact the Guam (State) Historic Preservation Officer in the event anything of cultural interest is discovered.

In summary, mitigation measures to reduce and/or eliminate any potential adverse impacts on archaeological and historic resources are presently being finalized as part of the ongoing Section 106 consultation between the USACE and the GHRD. Consultation with GHRD regarding acceptable mitigation measures for the cultural resources of concern is ongoing and will be concluded prior to completion of the Final EIS.

It is anticipated that through the implementation of appropriate mitigation measures and continued consultation with GHRD regarding cultural resource management related to the Proposed Project, adverse impacts to archaeological resources would be reduced and/or eliminated resulting in a determination of "no adverse effect to historic properties".

3.6 AESTHETIC AND RECREATIONAL RESOURCES

3.6.1 Introduction

There are no commonly used regulatory standards for quantifying potential environmental impacts from visual aesthetics or increased ambient light levels in the communities adjacent to a container and cruise terminal complex. General guidance on these topics is found in Executive Order 11514 (Protection and Enhancement of Environmental Quality) and 40 CFR 1500-1508 (NEPA guidance).

The visual quality of the landscape contributes to a community's sense of uniqueness, and views may add to the quality of life and to property values. In many cases, the landscape and its visual characteristics set it apart from other locations.

Visual aesthetics is often analyzed in terms of "viewsheds," which is the entire area an individual can see from a given point. The aesthetics assessment includes identifying viewsheds based on sensitive receptors, which include those persons living or traveling nearby or engaging in recreational activities in the immediate vicinity. In the context of developing large infrastructure facilities, the subject of aesthetics is generally one involving personal and subjective evaluations of the acceptability of visual scenes. The public commonly describes such scenes in qualitative terms, such as "beautiful," "ugly," "pastoral," and "striking," and such terms do not lend themselves to quantitative evaluation. Public perception of visual aesthetic quality will vary from one individual to another. Visual aesthetic quality may vary based upon a combination of factors, including the number of viewers, the duration and purpose of the view, the distance between viewers, and the various points of interest within the viewshed.

This section presents a brief discussion of the existing characteristics of the viewsheds within the Proposed Project area. The analysis does not attempt to make value judgments regarding aesthetic qualities. In addition, this section addresses potential impacts to existing recreational facilities and activities that occur within the project site and immediate surrounding vicinity.

3.6.2 Affected Environment

Aesthetic Resources

The visual character and view sheds within Apra Harbor is typical of most commercial industrial port settings with shed-like structures, expansive parking, loading and storage areas, service/utility facilities, and minimal trees and other landscaping. The proposed improvements and their associated operations would be consistent with the existing maritime industrial setting of the harbor areas.

Due to varying hours of operation at the commercial port, wharves and storage areas are well illuminated to allow for harbor operations to be performed under safe and

secure light conditions. In addition, lower intensity lighting is used for security/safety purposes and for navigational aids.

In the immediate vicinity of the Proposed Project area ambient lighting levels are much lower than lighting at the existing commercial port facilities. Lighting sources in the immediate project vicinity are limited to lighting sources at the existing Hotel Wharf and Golf Pier facilities as well as lighting sources from the adjacent SPPC and Mobil tank farm located to the west of the project site.

Recreational Resources

With its large protected water area, Apra Harbor has become the venue for a variety of water-oriented recreational activities. These activities include both commercial and privately-owned boats and other mechanized water crafts The commercial activities include tourist jet skiing, SCUBA diving, and banana-boating as well as day and evening dinner cruises.

There are several recreational areas within and in the immediate vicinity of the project site. Recreational sites in the project area include, Family Beach, Outhouse Beach, and the Sea Plane Ramp. In addition, the Marianas Yacht Club is located approximately 0.75 miles southeast of the project site along the south shore of Dry Dock Island. The Aqua World and Harbor of Refuge Marinas are located approximately 1 mile east of the project site in the inner Cabras Island area. The Aqua World and Harbor of Refuge marinas are adjacent to one another and house residential, recreational, and commercial vessels. Both marinas are managed by private companies under a management agreement with PAG.

The inner harbor portion of the Glass Breakwater just west of Dog Leg Pier is known as Family Beach. Family Beach is an open, sandy beach primarily used by local residents for picnics, jet skiing, and swimming. Access to the beach is via the unpaved coral road which extends westward along the Glass Breakwater from Route 11. There are no paved parking lots in the Family Beach recreation area. There are several ocean recreation businesses operating at Family Beach including jet ski and SCUBA diving operators.

In an effort to assure the safe use of the waters, the Department of Parks and Recreation prepared a Recreational Water Use Master Plan (RWUMP). The purpose of the RWUMP is to reduce conflicts among water users in recreational water use areas, especially within those areas of high activity, and to insure the safety and rights of the general public. The RWUMP designates the Apra Harbor area as Recreational Area 10 and allows jet ski operations along designated locations in the inner waters of the Glass Breakwater in the Family Beach and Dog Leg Pier areas to the west of the Proposed Project site.

Seaplane Ramp is a small landing located to the east of Golf Pier. As previously noted, PAG occasionally provides open space leases at Seaplane Ramp to accommodate

users for various miscellaneous purposes. However, there are no open space leases at the present time. The Seaplane Ramp is utilized by the general public for the purposes of launching recreational watercraft (mainly smaller fishing vessels).

Outhouse Beach is located immediately to the east of Hotel Wharf is known as Outhouse Beach. As previously mentioned, Outhouse Beach is so named due to the presence of an outhouse at this location. The area is presently an undeveloped, and much of the shoreline has eroded comprising a rocky shoreline. Recreational SCUBA diving activities occur in this area by way of a PAG Use Permit which allows SCUBA diver activities in this area for educational purposes only.

In addition to instructional SCUBA diving activities that occur at Outhouse Beach Outer Apra Harbor in general contains many underwater sites that are often frequented by recreational SCUBA divers.

As previously discussed in section 3.5.2 and shown in Figure 3-3 there are numerous sunken vessels in Apra Harbor frequented by recreational SCUBA divers. In addition, to these submerged cultural resources Apra Harbor also contains a number of coral reefs that are popular SCUBA diving sites. Popular dive reefs within Outer Apra Harbor are shown in Figure 3-4. The dive reef nearest to the project site is the Western Shoals Reef which is located approximately 0.75 miles directly to the south of the proposed deer-draft wharf facility. Other dive reefs within Apra Harbor are located between 1 and 1.5 miles from the project site and include Elephant Ear Point, Finger, Sponge, Gab-Gab, Hidden, Hourglass, and Shell reefs.

3.6.3 Significance Criteria

For the purposes of this EIS, aesthetic/visual impacts would be considered significant if a project would:

- Substantially degrade the character of the area, degrade an existing viewshed or scenic vista, or alter the character of the viewshed by the introduction of anomalous structures or elements
- Substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway
- Creates a new source of substantial light or glare, which would adversely affect nighttime views from shoreline areas and adjacent water areas

Impacts to recreational resources would be considered significant if the project construction or operations:

- Conflict with existing or future area wide or local recreational policies or plans
- Create incompatible adjacent land uses
- Permanently alter or eliminate a recreational resource

- Substantially reduce the quality of the recreational experience (e.g., routine operations degrade the character of a recreational area)

3.6.4 Environmental Consequences

No Action Alternative

Under the No Action alternative aesthetic and recreational resources within Apra Harbor would not be affected. The visual character, existing view sheds, and light emissions in the project vicinity would remain unchanged. Recreational uses of the Family Beach, Sea Plane Ramp, and Outhouse Beach areas would also remain unaffected. This alternative would result in a less than significant impact to aesthetic or recreational resources.

It should be noted, that there is a potential for recreational activities to become restricted and/or prohibited within the Apra Harbor area as a result of possible future federal national security measures/regulations promulgated through the Department of Homeland Security. It is not possible to predict what types of new commercial harbor-related security threats might arise in the future.

However, should federal regulations restricting entry into presently accessible land-side and/or in-water harbor areas ever be promulgated as part of the nation-wide approach to cope with the evolving terrorist threats, recreational activities in Apra Harbor could be adversely impacted. As such, the effect such security measures might have on recreational activities is not known. Ultimately, any impacts on such recreational activities resulting from such measures would need to be addressed in terms of the public's understanding of today's extraordinary circumstances with regard to national security.

Preferred Alternative

Potential impacts on the visual character of the project area and vicinity would mainly be associated with short-term construction-related activities. Existing unimproved areas (e.g., proposed reclamation sites and the outhouse beach area) would be replaced by modern, port facilities. However, long-term impacts on visual resources are not anticipated to occur since the Proposed Projects and their associated operations would be consistent with the overall existing maritime industrial setting in the harbor area.

Proposed improvements would require lighting for security and safety purposes. The lighting would be provided by overhead lights, either on buildings or "pole" mounted. As a result, the new lighting would increase the amount of light emissions in the project area. However, impacts from light emissions are not anticipated to be significant as the nearest residential area of Piti is located approximately 2.5 miles to the east of the project site. Additionally, the project area already receives ambient light from the adjacent Hotel Wharf, Golf Pier, and SPPC facilities. Furthermore, the surrounding

harbor area is heavily industrialized comprised mainly of commercial port and military installation facilities both of which emit relatively high level of ambient light.

Although light emission impacts are not anticipated to result in adverse impacts, to further minimize the impacts, certain measures would be undertaken to limit any spillover effect from the new lighting. For example, new lighting would be properly - shielded and directed to prevent intrusion into areas outside the harbors to the extent feasible and reasonable. In addition, new lighting would be in compliance with applicable lighting codes and standards.

Construction activities would involve the presence of equipment and workers along roadways that may temporarily interfere with some coastal views from roadways. However, this would be a relatively minor short-term disruption which inevitably occur as part of any major construction project. The proposed improvements would not alter or damage any important scenic coastal landforms or other visual resources in the surrounding area since work would be limited within the existing harbor.

In the long-term, an adverse impact that could not be fully mitigated would be the offshore visual impacts resulting from the presence of the completed deep-draft wharf and backland facilities. However, these visual impacts would be visible primarily to off-shore vessels and in-water ocean recreational users. Furthermore, once constructed the proposed improvements would not alter or damage any important scenic coastal landforms or other visual resources in the surrounding area, and they would be visually consistent with the surrounding maritime and industrial character of the commercial port. Therefore, the Proposed Project is expected to have less than significant impacts on aesthetic resources or scenic views.

Recreational access and activities at the Sea Plane Ramp and Family Beach would not be affected by the proposed improvements. Family Beach is located to the west of the Proposed Project site and water recreation activities are not anticipated to be affected as a result of either construction or operational activities. Sea Plane Ramp would be situated between proposed Reclamation Sites 1 and 2. Operations at reclamation sites 1 and 2 would not preclude use of Sea Plane Ramp by the general public. However, because Reclamation Sites 1 and 2 would function as operational backland access to Sea Plane Ramp would likely require coordination with PAG container cargo schedules.

Recreational SCUBA diving activities in the nearshore waters at Outhouse Beach would be permanently lost under the Preferred Alternative. The foot print of the proposed deep-draft wharf facility would occupy the entire area from the eastern side of Outhouse beach to the eastern side of Hotel Wharf. As a result, this stretch of rocky shoreline would no longer be available for instructional SCUBA diving activities.

Recreational SCUBA diving activities at sunken vessel and reef sites in Outer Apra Harbor would not be adversely impacted by the proposed improvements. The improvements would not impact diving at these submerged resources as they are situated at considerable distances from the deep-draft wharf berthing area. There are

no regulations governing recreational SCUBA diving activities within the harbor area. However, it is common practice that recreational SCUBA divers do not encroach within the main commercial shipping lanes during container vessel activity for both safety and security reasons.

As a result of the permanent loss of Outhouse Beach and SCUBA diving areas fronting the beach, the Preferred Alternative would result in significant impacts to these recreational resources.

Alternative 2

Potential impacts under Alternative 2 would be similar to those described for the preferred alternative. Impacts on the visual character of the project area and vicinity would mainly be short-term resulting from construction-related activities. Existing unimproved areas (e.g., proposed reclamation sites and the outhouse beach area) would be replaced by modern, port facilities. However, long-term impacts on visual resources are not anticipated to occur since the Proposed Projects and their associated operations would be consistent with the overall existing maritime industrial setting in the harbor area. Adverse impacts from light emissions are also not anticipated to be significant under this alternative due to the distance of the nearest residential areas and the existing industrial/commercial land uses in the immediate project vicinity.

Recreational access and activities at the Sea Plane Ramp and Family Beach would not be affected under this alternative. Recreational SCUBA diving activities at sunken vessel and reef sites in Outer Apra Harbor would not be adversely impacted by the proposed improvements. The improvements would not impact diving at these submerged resources as they are situated at considerable distances from the deep-draft wharf berthing area. However, recreational/instructional SCUBA diving activities at Outhouse Beach would also be lost under alternative 2. The proposed deep-draft wharf facility would occupy the entire area from the eastern side of Outhouse beach to the eastern side of Hotel Wharf. As a result, this stretch of rocky shoreline would no longer be available for instructional SCUBA diving activities.

Similar to the preferred Alternative, Alternative 2 would have less than significant impacts on aesthetic resources and/or scenic views, but would result in significant impacts to recreational resources due to the permanent loss of Outhouse Beach.

Alternative 3

Potential impacts to visual resources and from light emissions would be similar to those discussed under the Preferred Alternative and Alternative 2. Impacts on the visual character of the project area and vicinity would mainly be short-term resulting from construction-related activities. Existing unimproved areas (e.g., proposed reclamation sites and the outhouse beach area) would be replaced by modern, port facilities. However, long-term impacts on visual resources are not anticipated to occur since the Proposed Projects and their associated operations would be consistent with the overall

existing maritime and industrial setting in the harbor area. Adverse impacts from light emissions are also not anticipated to be significant under this alternative due to the distance of the nearest residential areas and the existing industrial/commercial land uses in the immediate project vicinity.

Under alternative 3 recreational activities at Family Beach would not be affected due to its removed location from the project site. The conceptual design of Alternative 3 leaves the western half of Outhouse Beach and the adjacent rocky shoreline that extends up to Hotel Wharf intact. Therefore, instructional SCUBA diving activities could continue in this area and would not be affected under Alternative 3. As a result of the large contiguous operational backland area proposed under this alternative access to and recreational use of the Seaplane Ramp would be permanently lost.

Similar to the preferred Alternative, Alternative 3 would have less than significant impacts on aesthetic resources and/or scenic views, but would result in significant impacts to recreational resources due to the permanent loss of the Sea Plane Ramp.

3.6.4 Proposed and Potential Mitigation Measures

Impacts on visual resources by the Proposed Project are anticipated to be less than significant. The Proposed Projects and their associated operations would be consistent with the existing maritime industrial setting in the harbor area and no mitigation is required.

The waters directly off Outhouse Beach are utilized primarily by SCUBA divers for recreational and instructional purposes. The waters off of Outhouse Beach are desirable for instruction and novice SCUBA divers because of its gently sloping bottom and it's relatively calm protected waters. The permanent loss of this SCUBA diving area would be considered a significant adverse impact.

As a mitigation measure, prior to the start of construction activities PAG would notify recreational users and the general public about the loss of Outhouse Beach as a result of the Proposed Project. PAG would then initiate a working dialog with SCUBA organizations such as the Micronesian Dive Association, private SCUBA commercial operators, and the general public (recreational users) to identify a substitute location suitable for conducting similar SCUBA diving activities.

Since every potential dive location has its own unique features it would be impossible to find a substitute dive site that would replicate all of the features found at Outhouse Beach. However, by working with the existing associations, businesses, and recreational users knowledgeable about the area, criteria could be established that would help PAG identify potential substitute locations that best meet the user's needs.

There are many areas along the westerns shores of Guam which could serve as potential substitute dive locations. For example, one of the best areas on Guam for the beginning scuba diver is Tumon Bay. SCUBA diving in the Tumon Bay area is known

for its calm waters created by the large coral reef that protects the bay. In addition, there are already many SCUBA diving shops located in the Tumon Bay area which could provide instruction and/or rent equipment to beginning SCUBA divers.

3.7 PUBLIC HEALTH AND SAFETY

3.7.1 Introduction

This section provides a general discussion of public health and safety concerns in the vicinity of the project areas. Public health and safety concerns within the project area are related to natural hazards, unexploded ordnance and explosive material hazards, hazardous material management and transportation, and homeland security.

3.7.2 Affected Environment

3.7.2.1 Unexploded Ordnance (UXO)

During World War II, the Island of Guam was an active battlefield. As a result, unexploded ordnance (UXO) is periodically discovered throughout the island. Discovered items include unexploded shells, grenades and mortars, some of which are of Japanese origin such as mortars and fuses found in May 1998 near Tenjo Vista, east of Polaris Point. Battlefield munitions may also exist on submerged lands that occur off many of the beaches used during the amphibious landings. In this document, the term "unexploded ordnance" is used to address both military munitions and battlefield UXO.

As a result of Guam's wartime and military history the potential for UXO occurrence always exists. However, as previously noted in Section 3.5.1, during the Vietnam War Hotel Wharf was utilized by the U.S. Navy as an ammunition wharf. Use of Hotel Wharf as an ammunition wharf presents an increased potential for UXO presence in the vicinity. There are no verified accounts of UXO in the waters off Hotel Wharf. However, unconfirmed reports of submerged UXO in the Hotel Wharf vicinity have been reported by recreational divers.

3.7.2.2 Explosive Safety Quantity Distance

To safeguard against development in dangerous areas, hazard zones have been established by the Department of Defense for various quantities and types of stored explosives. This zone is designated as the Explosive Safety Quantity Distance (ESQD).

The distance of the zone is relative to the quantity and type of ammunition stored at the specific location and radiates from the origin of the ammunition. Generally, the following guidelines should be followed within the ESQD arc:

- Inhabited buildings are not allowed.

- Other structures with the potential of collapsing onto people or otherwise endangering human life are not allowed. The blast itself do not generally pose a threat to human life but damage to proximate structures do.
- At the outer 40 percent of the ESQD arc, recreational facilities (except structures such as grandstands) are allowed.
- Ships are not allowed to moor within the ESQD arc.
- Wharves are generally not allowed since their purpose is to moor ships.

Since Apra Harbor is shared by both the PAG and the U.S. Navy, there is the potential of Navy explosive activities affecting civilian activities within the Apra Harbor area. The existing ESQD arcs within the Apra Harbor area are shown in Figure 3-5.

The only ESQD encumbrance that affects any PAG property is the Ammunition Anchorage ESQD arc of 6,398 feet located in the open waters of the Outer Harbor area (Label G in Figure 3-5). This encumbrance affects most of Glass Breakwater, including Hotel Wharf, Dog Leg Pier, Family Beach, and surrounding areas. The subject ammunition anchorage ESQD origin is a mooring for a navy ship that is storing ammunition.

The next closest ESQD arc is the Kilo Ammunition Wharf ESQD arc (Label F in Figure 3-5) of 7,210 feet (emanating from Orote Point) affecting the western-most end of Glass Breakwater as well as the mouth of Apra Harbor. No existing Commercial Port lands within this ESQD arc.

3.7.2.3 Natural Disasters

At 13°30' north latitude and 145°20' east longitude and 550 square kilometers in area, Guam is the southernmost and largest island in the Marianas chain, a north/south-trending archipelago in the tropical western Pacific Ocean. Guam's climate is maritime tropical and experiences droughts and typhoons in addition to a seasonal rainfall pattern in which the majority of precipitation falls during the northern hemisphere summer months. Average annual rainfall is close to 2500 mm although it is highly variable, and storms can result in markedly higher yearly precipitation totals just as El Nino-influenced droughts can result in markedly lower annual totals. Northeasterly trade winds prevail during the northern hemisphere winter months, reversing or ceasing during the summer (Lander 1994).

Guam is affected by one or more typhoons almost every year. However, they often do not pass directly over the island. Guam is subject to strong winds associated with tropical storms and typhoons, and these high winds can be very localized. Due to its proximity to typhoon breeding grounds, Guam is threatened year-round with the passage of developing tropical storms and typhoons. Typhoons are defined as storms

with sustained wind speeds equal to or greater than 65 knots, while tropical storms are defined as having sustained wind speeds between 34 and 64 knots.

Based on information from the US Fleet Weather Central, Guam (now the Joint Typhoon Warning Center), at least 19 typhoons typically occur annually across the western North Pacific and South China Sea. Several of these storms threaten the Mariana Islands each year. Recent typhoons, Typhoon Russ in 1990, Typhoon Yuri in 1991, Omar in 1992, Typhoon Paka in 1997, and Pongsana in 2002 approached within 30 miles of Guam and affected Guam severely. Supertyphoon Paka, which struck the island in December 1997, sustained maximum wind speeds in excess of 175 mph. These data indicate a high likelihood of a typhoon threatening Guam on an annual basis (Sea Engineering, 2005).

Since 1945, the island has been affected by 160 tropical cyclones of at least tropical storm intensity (34-60 knots sustained wind speed). Of the 160 tropical storms, 68 were classified as typhoons (sustained wind speed of 64 knots or higher). Supertyphoon Paka, which struck the island in December 1997, with maximum wind speeds in excess of 175 mph (GovGuam, 2003).

Tropical cyclones generally move from east to west and pass north or south of Guam. However, the tracks often curve so that the typhoon can move south to north and even double back in a retrograde manner and move from west to east. Nine storms between 1946 and 2002 virtually passed over the island. Typhoon Pamela in 1976, with sustained winds of 120 knots, stalled off the west coast of Guam for several days, resulting in extensive damage to coastal facilities, including Glass Breakwater. Typhoon Paka in 1997, passed directly over the north end of the island, generating waves that damaged Guam's shoreline, including various sites in Apra Harbor. Meteorological data show that the highest percentage of tropical storms and typhoons approach Guam from the northeast and that the east coast of the island is at most risk from typhoon onslaught (Sea Engineering, 2005).

Since Apra Harbor is located on the west coast of Guam, it is relatively more sheltered from the worst typhoon wind and wave conditions. However, damaging waves from the northwest and north can occur from typhoons passing north of the harbor, such was the case with typhoons Paka, Pamela, and Pongsana.

In addition to typhoons, earthquakes and tsunami are two related natural disaster phenomena which also affect Guam. The Marianas Trench, which lies just off Guam, is located within a seismically active zone, making Guam subject to periodic earthquakes. The earthquake that occurred in August 1993 was severe, measuring 8.2 on the Richter scale. As previously mentioned in Section 3.1.2, Wharf F-5 was severely damaged during the 1993 earthquake, and as a result it is currently unable to support vessel operations.

Tsunamis occur as a series of waves that strike a coastline, and the waves decrease in height over time. Tsunamis can cause serious damage to coastal areas. The degree of

tsunami damage is dependent upon several factors including an area's topography, wave origin, and wave intensity.

Tsunamis are sea waves generated by rapid displacement of a large volume of sea water, resulting from submarine vertical faulting or warping of the sea floor, from large-scale submarine slides, or from volcanic eruptions in or near ocean basins. In the open ocean, these waves have a very long period and wavelength; i.e., the waves are spaced far apart and travel at speeds up to hundreds of miles per hour.

As a tsunami approaches the shoreline, the speed of the wave decreases and the wave height increases, resulting in potentially destructive effects. Historical records indicate that the severity of tsunami-generated damage varies greatly depending on factors such as coastal topography, the existence of offshore islands, and the direction of the incoming waves.

As is the case for most coasts of the Pacific Ocean, the potential exists for a future major tsunami in the project area. Locally generated tsunamis could result from significant displacement of submarine faults or from submarine slides. Tsunamis can cause serious damage to coastal areas. The degree of tsunami damage is dependent upon several factors including an area's topography, wave origin, and wave intensity.

3.7.2.4 Homeland Security

Container and cruise ship terminal security has received increased interest since the events of September 11, 2001. This topic addresses the new programs being developed to reduce the risk of terrorism in regard to port, container, and cruise operations. Container security has two aspects - domestic and international. The lead agency for international security is the World Customs Organization (WCO). The U.S. Customs Services (USCS) and US Coast Guard (USCG) are the lead agencies for domestic efforts. In addition, on November 25, 2002, President Bush signed the "Homeland Security Act of 2002" into law. The Act restructures and strengthens the Executive Branch of the Federal government to better meet the threat to our homeland posed by terrorism. In establishing a new Department of Homeland Security, the Act for the first time creates a Federal department whose primary mission would be to help prevent, protect against, and respond to acts of terrorism on U.S. soil.

United States Coast Guard

The USCG homeland security role includes:

- Protect ports, the flow of commerce, and the marine transportation system from terrorism.
- Maintain maritime border security against illegal drugs, illegal aliens, firearms, and weapons of mass destruction.

- Ensure that we can rapidly deploy and resupply our military assets, both by keeping Coast Guard units at a high state of readiness, and by keeping marine transportation open for the transit assets and personnel from other branches of the armed forces.
- Protect against illegal fishing and indiscriminate destruction of living marine resources, prevention and response to oil and hazardous material spills--both accidental and intentional.
- Coordinate efforts and intelligence with federal, state, and local agencies.

U.S. military operations associated with homeland defense and civil support to federal, state and local agencies in the United States, and includes the increased security measures taken after the September 11 terrorist attacks. The operation involves joint agency coordination and cooperation to ensure our nation and borders are protected from future attacks. An increased presence will prevent and deter those who would cause harm to innocent Americans.

As of March 1, 2003, the USCG became a component of the Department of Homeland Security. As a result the Secretary of Department of Homeland Security assumed all duties once bestowed on the Secretary of Transportation with respect to security measures at U.S. commercial ports.

In addition to the above described homeland security roles, the USGC is also responsible in assisting with the removal of grounded vessels in manner that minimizes potential impacts from oil spill or physical damage to the marine environment.

World Customs Organization

Internationally, The WCO is taking the lead on ensuring security with containers entering the U.S. WCO has organized a task force of USCG staff, intergovernmental organizations, trade associations, and owner/operators of maritime transport systems to assist with protecting international goods and services from terrorism while also facilitating legitimate trade. The WCO is assembling guidelines requiring owners/operators of terminals to verify manifests, examine containers for physical integrity, and erect restricted areas to secure cargo prior to loading.

U.S. Customs Service

The international effort of the USCS has been the Container Security Initiative (CSI) program. The CSI program screens containers before they reach the U.S: `The CSI has the following four core elements: 1) establishing security criteria to identify high-risk containers; 2) pre-screening those containers identified as high-risk; 3) using technology to quickly pre-screen high-risk containers; and 4) developing and using smart and secure containers. To date, ports in Canada, Asia, and Europe have agreed to participate with the U.S. in the CSI program.

3.7.2.5 Hazardous Material Management and Transport

The U.S. Department of Transportation (USDOT), the USCG, and the USEPA regulate the transport of hazardous materials in vessels in 49 Code of Federal Regulations (CFR) 100-185, Transport of Hazardous Materials. The U.S. DOT provides regulations for the transport of hazardous materials in 49 CFR 170-179. The Superfund Amendments and Reauthorization Act (SARA) Title III regulates spill response.

Under the auspices of the USEPA, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) regulates the handling of hazardous waste. If a spill of hazardous material were to occur, the cleanup of the spill would be regulated by the Resource Conservation and Recovery Act of 1976 (RCRA).

Local Regulations

The Emergency Planning and Community Right-to-Know Act of 1986 was included as Title III of the SARA. The Act authorized a nationwide program of emergency planning as a protection against accidents involving extremely hazardous materials. The Act also required a comprehensive body of information about hazardous materials to be submitted to various State and local groups. The four major issues addressed in the Emergency Planning and Community Right-to-Know Act deal with:

- Emergency planning and release notification (sections 301 - 304).
- Community right-to-know reporting on chemicals (sections 311 - 312).
- Emissions inventory (section 313).
- Miscellaneous provisions (including trade secrets in section 322).

The legislation built on USEPA's Chemical Emergency Preparedness Program (CEPP) which required each State to establish a state emergency response commission or SERC. The SERC was required to form Local Emergency Planning Committees (LEPCs) to operate at the community level.

Under SARA Title III, the local committees are required to develop contingency plans for responding to releases of extremely hazardous substances. On Guam, the SERC is chaired by Civil Defense, which ensures coordination between the two entities. Because of the availability of equipment, training, and manpower, the Guam Fire Department is the "First Responder" in the event of a release of hazardous materials. Federal HazMat Response Teams and local commercial resources are usually mobilized on an "as needed" basis.

3.7.3 Significance Criteria

Any impact on public safety from the deep-draft wharf and harbor operations both offshore or onshore would be considered significant and require additional mitigation if the Proposed Project construction or operation resulted in the following adverse effects:

- Loss of life or serious injury to people other than those involved with the construction and/or operation of the Proposed Project
- An act of terrorism
- Long-term damage to the environment

3.7.4 Environmental Consequences

Under the No Action alternative resources relating to public health and safety within Apra Harbor would remain unaffected in the short-term. However, over the long-term increasing traffic at the existing commercial port facilities would result in adverse impacts by contributing to increased vessel congestion and create an environment where the risk of vessel collisions and groundings may increase. Vessel collisions or groundings within the Apra Commercial Harbor may result in an increased potential for adverse impacts to safe commercial and military port operations as well as pose an increased threat to the general public. In addition, increased potential for vessel collisions or groundings could result in the release of petroleum products or other hazardous materials into the harbor, resulting in a contamination threat and potential adverse impacts to public health and safety.

Under the remaining reasonable alternatives potential impacts related to public safety and health would in large part be similar regardless of project location and/or design. Therefore, analysis of potential impacts to public safety and health conditions were not differentiated by alternative but rather addressed collectively for the proposed improvements.

Any of the alternatives considered could be adversely impacted by natural disasters including earthquakes, tsunami, or typhoons.

An increase in cargo shipments and harbor traffic could lead to the increased potential for vessel groundings and/or spills in Apra Harbor. Guam has experienced a number of spills, mainly in or near Apra Harbor. Most of the spills are minor operational spills (normally less than 50 gallons) during vessel bunkering or cargo transfers from tankers, or from oil installations ashore. Larger reported incidents have involved pipeline ruptures, groundings and sinkings, the largest comprising several thousand gallons of heavy fuel oil. However, the majority of spills have been carried out of Apra Harbor and have resulted in little shoreline impact (ITOPF, 2000).

An increase in cargo shipments could also lead to the increased potential for truck transport of hazardous materials. This in turn may lead to an incremental increase in

truck accidents. However, the Proposed Project-related roadway improvements in the immediate project vicinity, and future roadways improvements to Guam's inland roadways, in conjunction with the latest safety controls and the existing safety standards for trucks transporting hazardous materials, would make the roadways safer. These controls and standards would minimize the safety impact of any additional truck transport of hazardous materials.

Although there are no verified accounts of UXO in the waters off of the project site. Unconfirmed reports by recreational divers, Guam's wartime and military history, and the use of Hotel Wharf as a munitions wharf during the Vietnam War provide the for UXO occurrence within the project area. Consequently, the potential for UXO related impacts also exists.

Proposed backland facility locations under each of the three alternatives are located outside of any U.S. Navy ESQD arcs. However, the proposed deep-draft wharf facilities under all three alternatives are located either wholly or partially within the Navy's Ammunition Anchorage ESQD. Consequently, the potential for ESQD related impacts exist.

The proposed harbor improvements would not increase the risk of a terrorist threat on a national level but could present an incremental increase in the risk at a local or community level. A successful terrorist attack under any of the alternatives could potentially impact the same general population in the surrounding communities of the Piti and Santa Rita Districts

A terrorist could use the proposed facilities to import conventional weapons or weapons of mass destruction. These weapons could be detonated at the proposed deep-draft wharf or backland facilities, or the weapons could be shipped to another location where detonation would affect more people or other strategic targets. In addition, the cruise ships could be terrorist targets. Risks of container terminal and passenger ships are not new and already exist at various locations within the Apra Commercial Port. All of the containers destined for Guam would still come through the Apra Commercial Port regardless of whether or not the proposed improvements were implemented.

In summary, all of the considered alternatives, with appropriate mitigation measures, would result in less than significant impacts to public health and safety.

3.7.5 Proposed and Potential Mitigation Measures

With regard to natural disasters in general, the government of Guam's most effective form of disaster mitigation has been the adoption and policing of a building code that mandates that all structural designs minimize the destructive effects of both types of natural disasters. The building code is far stricter than most, if not all, U.S. cities. An emergency response plan is annually updated by the Guam Office of Civil Defense to best utilize the Government's limited resources in mitigating, preparing for, responding to, and recovering from the various emergencies and disasters affecting the island and

its residents. While the adoption of a stringent building code has reduced the loss of life and property from natural disasters, the code has also significantly increased construction costs.

Of the three major natural disasters that could potentially impact the Proposed Project site, typhoons are the most frequent. In addition, relative to other types of natural disasters typhoons and are the only ones that can be sufficiently prepared prior to the event occurrence. When a typhoon is first categorized and warning notices are issued, companies shipping containers to the Apra Commercial Port would begin to slow their shipments so the container vessels are not in the hurricane path. The trucking lines, which are directed by the shipping companies, would also decrease the movement of trucks. The PAG would remain open to receive trucks in transit to help minimize the trucks on the roadways. Vessels would stay at sea or unload if at a port and subsequently return to sea. The PAG would secure all empty containers and follow protocols under applicable existing typhoon evacuation plans.

Hazardous material impacts related to management and/or transport would be mitigated through existing applicable PAG emergency plans and the Hazardous Materials Emergency Operations Plan (HMEOP). The latter being part of the island-wide Guam Emergency Plan which covers other potential calamities. The HMEOP addresses protocol and procedures pertaining to hazardous material-related emergency response operations. At the present time the Guam Environmental Protection Agency is in the process of updating the HMEOP.

To mitigate potential UXO related impacts, the construction contractor will address possible UXO occurrence in their construction management plan. In the unlikely event that UXO is encountered during construction activities the appropriate authorities would be notified and the UXO would be transported from the site and destroyed following established protocols.

As previously discussed the deep-draft wharf facility would be located within the U.S. Navy's Ammunition Anchorage ESQD arc. However, it is PAG's understanding that ESQD requirements apply only when there is a ship at the mooring. Therefore, activities at the deep-draft wharf facilities would only be permitted within the arc when the area is vacant of explosive storing vessels. All wharf operations would cease while explosive storing vessels are moored.

As such, potential ESQD related impacts could be mitigated through the development of an operations schedule/plan in conjunction with the U.S. Navy. Operations at the deep-draft wharf facility would need to be carefully coordinated with the U.S. Navy in order to prevent any potential ESQD arc violations.

All alternatives, including the No Action Alternative, represent an incremental increase in the risk of a terrorist event. Additional wharfs or container yards provide the opportunity for additional containers to transport conventional weapons or weapons of mass destruction. Additional cruise ships increase the number of potential terrorist

targets. If a nuclear or other conventional or weapons of mass destruction were used, the results would be catastrophic under any of the alternatives.

The risks of a terrorism event focused on container terminals, cruise ships, and chemical/petroleum facilities already exist within Apra Harbor. In the case of a port security incident, existing emergency management plans would be implemented and support would be provided by appropriate Federal and Territorial agencies.

Homeland security-related issues will continue to be primarily monitored and addressed through Department of Homeland Security and Department of Defense administrative protocols. These Federal agencies are taking the lead on reducing the risk of a terrorist attack on ports and passenger vessels. PAG will continue to implement existing port security programs as well as actively participate in developing new programs for upgrading port security in conjunction with Federal, and Territorial agencies and officials.

In Summary, the construction and operation of the proposed harbor improvements are not anticipated to significantly adversely affect, or be affected by, various elements of public safety on Guam. It is anticipated that residential, commercial, and industrial growth would continue into the future consistent with current growth projections. This would result in a commensurate growth in public safety services on the island. This situation is expected to be adequate to serve the new wharf and backland facilities. Furthermore, construction or operation of the facilities would not affect natural disater evacuation plans.

3.8 AIR QUALITY

3.8.1 Introduction

Ambient air pollution concentrations are regulated by both the US and Guam Environmental Protection Agencies. The USEPA, under the Clean Air Act (CAA) of 1970, developed concentration-based standards called Ambient Air Quality Standards (AAQS) for all pollutants that are harmful to public health and the environment. The USEPA has established both primary and secondary National AAQS (NAAQS) under the CAA.

Primary standards define levels of air quality that are necessary to protect public health with an adequate margin of safety. Secondary standards are established levels to protect public welfare from any known adverse impacts, through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values. The primary and secondary standards for principal automotive pollutants, such as nitrogen dioxide (NO_2), and ozone (O_3), are identical. There are no secondary standards for carbon monoxide (CO).

Guam standards are identical to the NAAQS for Particulate $Matter_{10}$ $(PM)_{10}$. Sulfur

dioxide, nitrogen dioxide, carbon monoxide, and lead. Guam has the same primary standards for ozone for the one (1) hour averaging period, but has no standard for the eight (8) hour period. Guam does not have any standards for $PM_{2.5}$.

The current applicable air quality standards for Guam can be found in the Guam Air Pollution Control Standards and Regulations. A summary of the NAAQS and Guam Ambient Air Quality Standards (GAAQS) are summarized in Table 3-14. Each regulated air pollutant has the potential to adversely impact human health or to produce environmental degradation when present in sufficiently high concentrations for prolonged periods of time.

Table 3-14
Summary of National and Guam
Ambient Air Quality Standards[1]

Pollutant	Averaging Period	NAAQS Primary	NAAQS Secondary	Guam Primary	Guam Secondary
Particulate Matter (PM_{10})[2]	Annual Arithmetic Mean[4]	50	50	50	50
	24 hours[5]	150	150	150	150
Particulate Matter ($PM_{2.5}$)[3]	Annual Arithmetic Mean[6]	15	15	--	--
	24 hours[7]	65	65	--	--
Sulfur Dioxide	Annual Arithmetic Mean	80	--	80	--
	24 hours[5]	365	--	365	--
	3 hours[5]	--	1,300	--	1,300
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	100
Carbon Monoxide	8 hour[5]	10	--	10	--
	1 hour[5]	40	--	40	--
Ozone	1 hour	235	235	235	235
	8 Hour[8]	156	156	--	--
Lead	Quarterly Average	1.5	1.5	1.5	1.5

1) All standards represent the maximum allowable concentrations and are expressed in micrograms per cubic meter ($\mu g/m^3$) except CO in milligrams per cubic meter (mg/m^3)
2) Particles are less than or equal to 10 microns aerodynamic diameter.
3) Particles are less than or equal to 2.5 microns aerodynamic diameter.
4) To attain this standard, the 3 year average of the weighted annual mean PM10 concentration at each monitor within an area must not exceed 50 µg/m3.
5) Not to be exceeded more than once per year
6) To attain this standards, the 3 year average of the weighted annual mean PM2.5 concentration at each monitor within an area must not exceed 15 µg/m3.
7) To attain this standards, the 3 year average of the 98th percentile of 24-hour concentrations at each population oriented monitor within an area must not exceed 65 µg/m3.
8) To attain this standards, the 3 year average of the fourth-highest daily maximum 8 hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08ppm

An air quality impact assessment was conducted in support of this EIS to assess potential impacts of the proposed harbor improvements on the air quality in the project area. The air quality impacts assessment is attached as Appendix F, and information presented in this section is based largely on this assessment.

3.8.2 Affected Environment

Since 1978, the United States EPA has designated the entire island of Guam as non-attainment for the primary sulfur dioxide (SO_2) NAAQS due, in part, to the air quality violations at Piti and Tanguisson Power Plant. In 1982, USEPA redesignated the non-attainment area to only include two (2) small circular areas with a radius of 3.5 kilometers around Piti Power Plant and Tanguisson Power Plant. The Proposed Project site is included in the non-attainment area around the Piti Power Plant.

The project site is located on the end of a peninsula (Cabras Island) in the westernmost part of Guam The climatic conditions in this coastal area is marked by prevailing tradewinds from a northeasterly direction the majority of the year. Tradewind-driven circulation result in relatively good air quality at the project site and the immediate environs.

The nearest residential receptors to the site are 2 miles away (Piti Village to the northeast and Naval Station to the south). The distance from potential receptors and the prevailing wind that carries potential pollution out over the Philippine Sea is a main reason that eight (8) of Guam's ten (10) power plants were located on Cabras Island (approximately 1 mile to the northeast of the project site).

There is little ambient air quality data available for Apra Harbor, however, limited existing data was made available by the Guam Power Authority (GPA). The GPA implemented air quality monitoring program in the non-attainment areas and data has been collected for the contaminants PM_{10} and Sulfur Dioxide (SO_2). There are currently no ambient air quality data available for Apra Harbor for the other criteria pollutants, which include nitrogen dioxide, carbon monoxide, ozone, and $PM_{2.5}$.

Tables 3-15 and 3-16 presnt air quality data for PM_{10} and SO_2, respectively, at the Apra Heights Substation between October 1999 and September 2000.

Table 3-15
Apra Heights Substation, PM_{10} Data
(October 1999 – September 2000)

Sample Date	Highest 24-hr Average	Quarterly Average
October – December 1999	23.9	13.8

Sample Date	Highest 24-hr Average	Quarterly Average
January – March	19.2	13.7
April – June	20.9	13.1
July – September	15.5	9.7
Annual Arithmetic Mean	23.9[1]	12.6

1) 99th Percentile 24-hour

Source: GPA, 2000

Table 3-16
Apra Heights Substation, SO_2 Data[1]
(October 1999 – September 2000)

Month	Highest 3-hr Average	Highest 24-hr Average	Monthly Average
October 1999	4.3	0.40	0.395
November 1999	0.3	0.00	0.000
December 1999	0.0	0.00	0.000
January 2000	4.7	0.61	0.027
February 2000	79.2	10.17	0.329
March 2000	129.4	18.27	0.459
April 2000	0.8	0.13	0.00
May 2000	4.6	0.40	0.00
June 2000	0.0	0.00	0.00
July 2000	3.2	0.31	0.00
August 2000	10.5	2.48	0.00
September 2000	4.6	0.88	0.00
		Annual Average	**0.118**

1) All Measurements in parts per billion (ppb)

Source: GPA, 2000

3.8.3 Significance Criteria

Impacts on air quality are considered significant if any of the following apply:

- Conflicts with or obstructs implementation of any applicable Federal, State, or local air quality plan.

- Violates any air quality standard or exceeds de minimis levels to an existing or projected air quality violation, including normal operational and accidental releases.

- Results in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable Federal or Territorial ambient air quality standard (including releasing emissions that exceed quantitative thresholds for Oprecursors).

- Exposes the public (especially schools, day care centers, hospitals, retirement homes, convalescence facilities, and residences) to substantial pollutant concentrations that are above acceptable health effects levels.

- Produces ammonia levels above odor threshold levels and that create objectionable odors affecting a substantial number of people.

3.8.4 Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no adverse impacts to existing air quality in the project area. No wharf improvements or land reclamation activities would occur and air quality would not be affected in either the short-term or long-term. This alternative would result in a less than significant impacts to air quality resources.

Preferred Alternative

The principal source of short-term air quality impacts would be associated with the construction activities for the project. It is anticipated that there would be negligible direct, localized air quality impacts as a result of construction activities. In the short-term, construction activities would impact air quality by generating fugitive dust as well as gaseous and particulate emissions from various fossil fuel-fired equipment, such as dredges, trucks, loaders, pavers, etc.

Building and road construction are examples of construction activities with high emissions potential. Emissions during the construction of a building or road can be associated with land clearing, drilling and blasting, ground excavation, cut and fill operations (i.e., earth moving), and construction of a facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions results from equipment traffic over temporary roads at the construction site.

Based on EPA field measurements of total suspended particulate (TSP) concentrations

surrounding apartment and shopping center construction projects, the approximate emission factors for construction activity operations are 1.2 tons/acre/month of activity. The value is most applicable to construction operations with: (1) medium activity level, (2) moderate silt contents, and (3) semiarid climate.

It should be noted that because the above emission factor is referenced to TSP, use of this factor to estimate particulate matter (PM) no greater than 10 µm in aerodynamic diameter (PM_{10}) emissions would result in conservatively high estimates. Also, because derivation of the factor assumes that construction activity occurs 30 days per month, the above estimate is somewhat conservatively high for TSP as well (PCR, 2006).

Vehicles hauling construction materials and debris can also at times increase automotive pollutant concentrations along adjoining existing streets as well as on the project site itself. The additional construction vehicle traffic may also cause temporary reduction in average travel speeds, due to congestion on feeder roads, which results in an increase in vehicle emissions.

In the long-term, increased traffic volumes in the vicinity of the project areas would contribute minimally to ambient carbon monoxide concentration levels. Mobile emissions analysis indicate the overall change in carbon monoxide levels at the project sites are expected to be insignificant mainly due to 1) the relatively small increase in projected traffic, 2) attrition over time of older higher polluting vehicles, and 3) federal emission control programs mandating lower emissions from newer vehicles (PCR, 2006).

Mobile source air quality modeling has historically focused on estimating concentrations of nonreactive pollutants, primarily carbon monoxide (CO). This has been the case because CO is relatively stable in the atmosphere, having a half-life in the order of approximately one month, and it comprises the largest fraction of automotive emissions.

Since air quality impact is typically greatest in the vicinity of intersections, and since the closest residential receptors to an increase of air pollution are also located near an intersection, modeling was performed at the the intersection of Route 1 (Marine Corps Drive) and Route 11 (Cabras Highway) for the years 2005 and 2025.

Based upon the predicted project-generated traffic increases as discussed in Section 3.4 mobile source emissions modeling predicts that composite CO concentrations would decrease from current (2005) levelks of 11.218 grams/mile to 4.379 grams/mile in the year 2025, or an approximately 60% decrease per vehicle mile driven. This decrease is largely attributable to the federal motor vehicle emissions control program, which offsets increasing traffic volumes by requiring more stringent emissions standards for new vehicles. Over time, older, higher emitting vehicles are eventually replaced by newer, lower emissiion vehicles. This results in a net decrease in total emissions despite an overall increase in traffic volume (PCR, 2006).

In addition to the onsite impacts attributable to construction activity, there will also be

offsite impacts due to the operation of concrete and asphalt batching plants needed for the construction of new piers, buildings, sidewalks and roadways. Such plants routinely emit particulate matter and other gaseous pollutants. The batch plants that would be producing this concrete and asphalt are all permitted by the GEPA, in accordance with the Guam Air Pollution Control Standards and Regulations. In order to obtain their operating permits, plants must demonstrate their ability to comply with emission and ambient air quality standards. Under the federal EPA's Title V Operating Permit requirements, which are incorporated in GEPA 's rules, air pollution sources must regularly attest to their compliance with all applicable requirements. Typical concrete and asphalt batch plants on Guam are outfitted with "baghouses" to filter for particulate matter. These controls have a normal efficiency of 95 – 99%.

In summary, the Preferred Alternative with appropriate mitigation measures would result in less than significant impacts to air quality resources.

Alternative 2

The proposed utility improvements and potential impacts under this alternative would be the same as those identified under the Preferred Alternative, and through the implementation of appropriate mitigation measures would result in less than significant impacts to air quality resources.

Alternative 3

The proposed utility improvements and potential impacts under this alternative would be the same as those identified under the Preferred Alternative and Alternative 2, and through the implementation of appropriate mitigation measures would result in less than significant impacts to air quality resources.

3.8.5 Proposed and Potential Mitigation Measures

During the construction period, fugitive dust control measures should be implemented to reduce the amount of particulate matter emissions. On-site dust control can be accomplished through erecting dust screens around the construction site and frequent watering of unpaved roadways and areas of exposed soil. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50% (U.S. EPA, 2004). To further minimize fugitive dust emissions, the paving and/or landscaping of bare earth areas should be implemented as soon as practicable. Dust screens would also reduce impacts on adjacent buildings and other areas of human activity in the immediate project environs.

Due to the relatively short-term nature of construction activities, some control measures are more cost effective than others. Wet suppression and wind speed reduction are two common methods used to control open dust sources at construction sites, because a source of water and material for wind barriers tend to be readily available on a

construction site. However, several other forms of dust control are available. Table 3-17 summarizes potential control measures, by fugitive dust source.

Table 3-17
Potential Mitigation Measures for Air Quaility Impacts from General Construction Open Sources[1]

Emission Source	Potential Mitigation Measure(s)
Debris Handling	Wind speed reduction Wet suppression[2]
Truck Transport[3]	Wet suppression Paving Chemical stabilization[4]
Bulldozers	Wet suppression[5]
Pan Scrapers	Wet suppression of travel routes
Cut/fill Material Handling	Wind speed reduction Wet suppression
Cut/fill Haulage	Wet suppression Paving Chemical stabilization
General Construction Activities	Wind speed reduction Wet suppression Early paving of permanent roads

1) Open sources of particulate matter no greater than 10 µm in aerodynamic diameter (PM_{10})
2) Dust control plans should contain precautions against watering programs that confound trackout problems.
3) Loads could be covered to avoid loss of material in transport, especially if material is transported offsite.
4) Chemical stabilization is usually cost-effective for relatively long-term or semi-permanent unpaved roads.
5) Excavated materials may already be moist and not require additional wetting. Furthermore, most soils are associated with an "optimum moisture" for compaction.

Additional mitigation measures could include:

- Minimizing the amount of dust-generating materials and activities, centralizing material transfer points and on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact.
- Limiting the area that might be disturbed at any given time.
- Road cleaning and/or tire washing as practical.

Mobile vehicular CO emissions require no special mitigation measures as emission levels associated with the Proposed Project would be negligible and well in compliance with both federal and state air quality standards. Though not necessary, a mitigation measure to reduce short-term vehicular CO emissions could be implemented by limiting construction vehicle activity to off-peak hours. This restriction would lower traffic congestion, which in turn, would reduce vehicle emissions and CO concentration levels.

3.9 HYDROLOGY AND DRAINAGE

3.9.1 Introduction

Regulatory Framework

Construction of the proposed facilities would have to comply with relevant Federal, state, and local regulations pertaining to drainage, flooding, and potential impacts on the hydrologic environment. Local regulations may be more stringent than Federal regulations.

Pertinent Federal regulations are associated with the National Flood Insurance Program. They affect construction-related activities that take place in areas designated as floodplains by Federal Emergency Management Agency (FEMA) and as defined by a Flood Insurance Rate Map (FIRM). In addition, construction activities in or on navigable waterways are regulated by the USACE.

Executive Order 11988 provides floodplain management direction to Federal Agencies for avoiding to the extent possible long-term and short-term adverse impacts of altering and occupying floodplain areas, and for avoiding direct and indirect support of floodplain development wherever practical. The E.O. requires that actions taken reduce the risk of flood loss, minimize the impacts of floods on human safety, health, and welfare, and to preserve and restore the natural and beneficial functions served by floodplains. Federal agencies are required to evaluate the potential effects of their actions which may occur in a floodplain to ensure that planning and budget considerations take into account flood hazards and floodplain management, and to prescribe procedures to implement polices and requirements of this E.O.

3.9.2 Affected Environment

3.9.2.1 Hydrology

Guam is comprised of two sub-equal-sized hydrogeologic provinces. In the southern half of the island, fresh groundwater occurs in volcanic rock of low permeability, unconsolidated sediments within river drainages and, along the eastern coast, fringing limestone outcrops. The water table in the southern province reaches elevations of hundreds of feet above sea level in the volcanic rock and unconsolidated sediments. Other than a few springs, groundwater production in southern Guam is restricted to the narrow fringing limestone along the eastern coast, where the water table rarely reaches elevations greater than a few feet above sea level. Brackish to saline groundwater occurs along the southern and western coasts of the southern province within fractured limestone, artificial fill, and unconsolidated marine and estuarine sediments.

In northern Guam, groundwater is contained within the aquifer termed the "Northern Guam Lens" (NGL). This aquifer has been designated a "principle source aquifer" in 1978 by the U.S. Environmental Protection Agency, and is essentially The principal

source of drinking water for the civilian population of Guam. The aquifer is contained within a fractured carbonate complex ranging in age from the Tertiary to the Pleistocene. The carbonate rock sequence has been significantly altered by tectonic and geochemical processes which has resulted in the formation of multiple stages of porosity development. The resulting aquifer is therefore comprised of primary porosity and dissolution features of varying scale, both of which have been modified and/or enhanced by fracturing. This aquifer is recharged from rainfall that percolates through surface soils to the underlying cavernous limestone (USDA, 1988).

The geology in the northern half of the island is composed mainly of uplifted limestone with a few volcanic "inliers" that protrude above the undulating karstic northern plateau and are associated with freshwater outlets. The limestone plateau rising up to 850 feet above sea level. Soils on the plateau vary in depth, very deep soils occurring in sinks and crevices and shallower soils on elevated and flatter areas.

The southern half of the island is mountainous with elevations of 700 to 1,300 feet. The southern half is composed of volcanic rocks and includes a north-south trending mountain range along the west coast. Capping some of the mountains are remnant limestone patches, from prior to the island's uplift. Streams are short and steep on the west side of the range and long and gradual on the east side of the range. Soils in the south are volcanically derived, and over geological time, erosion has filled valleys and coastlines with alluvium and colluvium. On some of the higher hills and mesitas, remnant limestone caps (old reef formed prior to uplift of the island) are still in place or have been partially dissolved and eroded downward (Williams, 2000).

3.9.2.2 Drainage

According to the Flood Insurance Rate Map prepared by the Federal Emergency Management Agency (FEMA), lands within the project area are designated as being within Flood Zones A and C. Flood Zone A is defined by FEMA as an area which is inundated by 100-year flooding, and for which no base flood elevations have been established. Flood Zone C is defined as an area which is outside of both the 100-year and 500-year floodplains (FEMA, 1985).

Under the Preferred Alternative and Alternative 2 approximately 10% and 90% of the wharf area would be situated within Flood Zone A and Flood Zone C, respectively. Under these two alternatives the proposed backland facilities would be entirely located within Flood Zone C. Figure 3-6 shows the flood zone designations within the project area and surrounding vicinity.

3.9.3 Significance Criteria

For the purposes of the EIS impacts to hydrology or drainage would be considered significant if the Proposed Project resulted in:

- Placement of permanent structures within a 100-year floodplain that would impede or redirect flood flows
- Altered the existing drainage pattern of the site in a manner that would result in:
  - An increase in short- or long-term erosion or siltation on- or off-site;
  - An increase in the rate or amount of surface runoff that would exceed the capacity of existing or planned stormwater drainage systems;
  - Flooding on- or off-site

3.9.4 Environmental Consequences

Environmental consequences related to hydrology, drainage, and flooding include alterations in land use, drainage patterns, volumes and rates of runoff entering nearby surface water bodies, areal extent of floodplains or inundated areas, and hydraulic conveyance of waterways in the site vicinity.

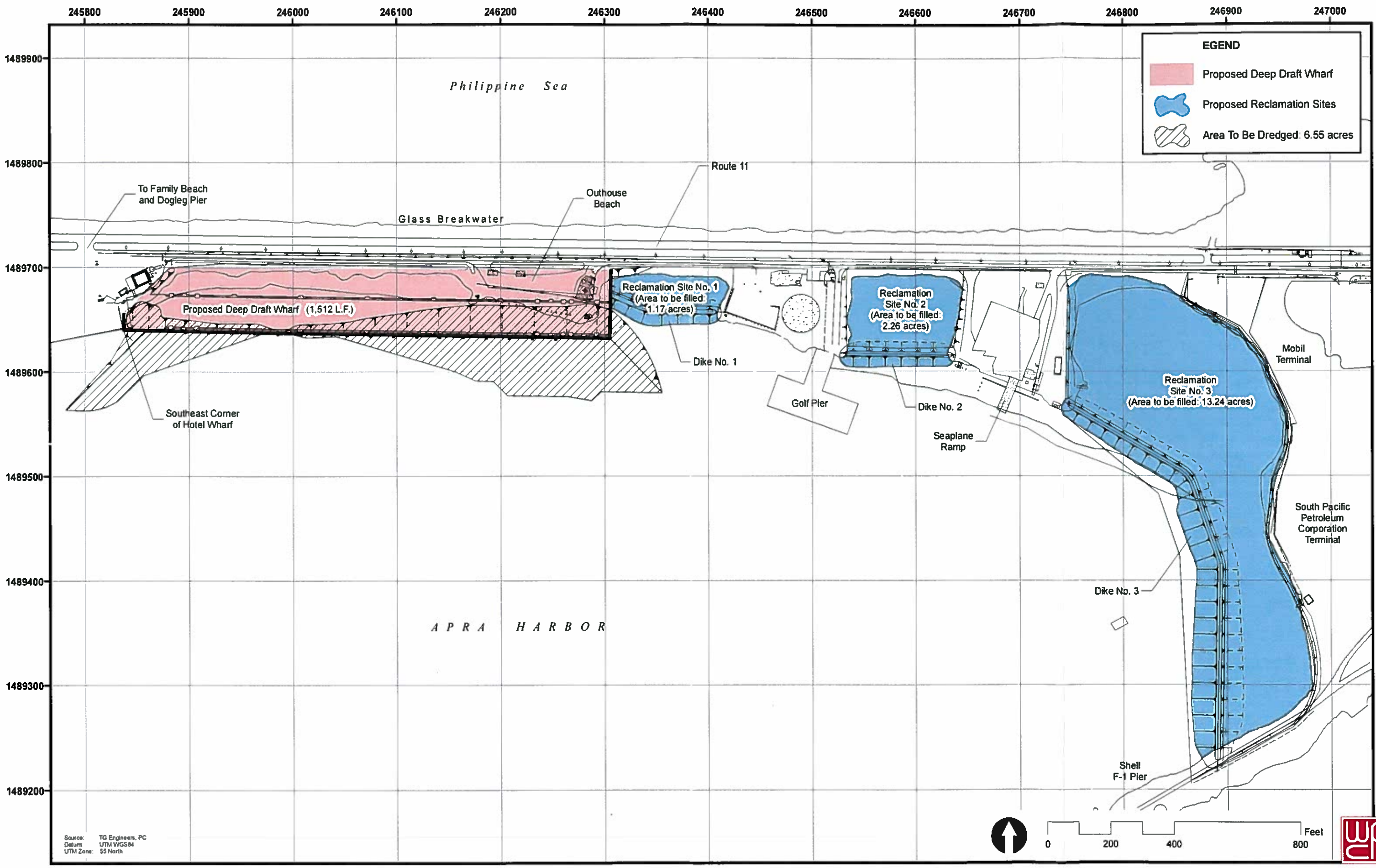
Under the No Action alternative construction of deep-draft wharf and backland facilities would not occur. Therefore, existing runoff, drainage, and flooding patterns at the project site would remain the same and not be affected.

Under the Preferred Alternative and Alternative 2 stormwater runoff from approximately 7.5 acres from the deep-draft wharf facility and 16.67 acres from the backland facilities would be discharged into the Outer Apra Harbor. Under Alternative 3 stormwater from approximately 40 total acres from the fixed pier and contiguous backland facilities would be discharged into the Outer Apra Harbor. The overland flow pattern of surface runoff would change to point-source discharges through man-made outfalls. Final drainage design plans have not been completed, but preliminary drainage plan for proposed improvements under the Preferred Alternative are shown in Figure 3-7.

The Preferred Alternative and Alternative 2 would for the most part affect areas of land designated as "Outside the 500-Year Floodplain," (Flood Zone C) and to a lesser degree lands designated as "Special Flood Hazard Areas" (Flood Zone A). Alternative 3 would affect areas of lands designated as being "Outside the 500-Year Floodplain".

Under Alternatives 1 and 2, flooding along the northern portions of the proposed deep-draft wharf during a 100-year storm event would primarily occur as a result of storm surge wave action. Approximately 0.75 acres of the 7.5 acres deep-draft wharf facility would encroach onto Flood Zone A. The FIRM map does not specify the 100-year flood elevations in Zone A floodplains. However, the estimated 100-year elevations in Zones AE are 12 feet above the National Geodetic Vertical Datum (NGVD) (FEMA, 1985).

Proposed improvements under any of the alternatives that fall within areas outside the 500-year floodplain would not impact floodplains at of near the project site. Under any of the considered alternatives (with the exception of the No Action Alternative) with appropriate mitigation measures would result in less than significant impacts to site hydrology and drainage.



DACA83-00-D-0012, Task Order 0067

PREFERRED ALTERNATIVE - OVERALL SITE PLAN

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 2-3

Apra Harbor, Piti, Guam

245808 245908 246008 246108 246208 246308

1489821

1489721

1489621

1489521

Philippine Sea

Raised AC Paved Road
(Route 11)
Two 12' Lanes with 2' Shoulders

Glass Breakwater

To Family Beach
and Dogleg Pier

Sheet Pile Bulkhead

Outhouse Beach

Hotel
Wharf

1
2.5

2
2.5

3
2.5

Face of Deep
Draft Wharf

Crane Rail Girders

Salvage
Exist RSP
(Typ)

Gulf Pier Mooring
To Be Relocated

Mooring Bollards (Typ)

Universal Fender
System (Typ)

AC Pavement
Deck

Concrete Deck

APRA HARBOR

Source: TG Engineers PC, October 2005
Datum: UTM WGS84
UTM Zone: 55 North

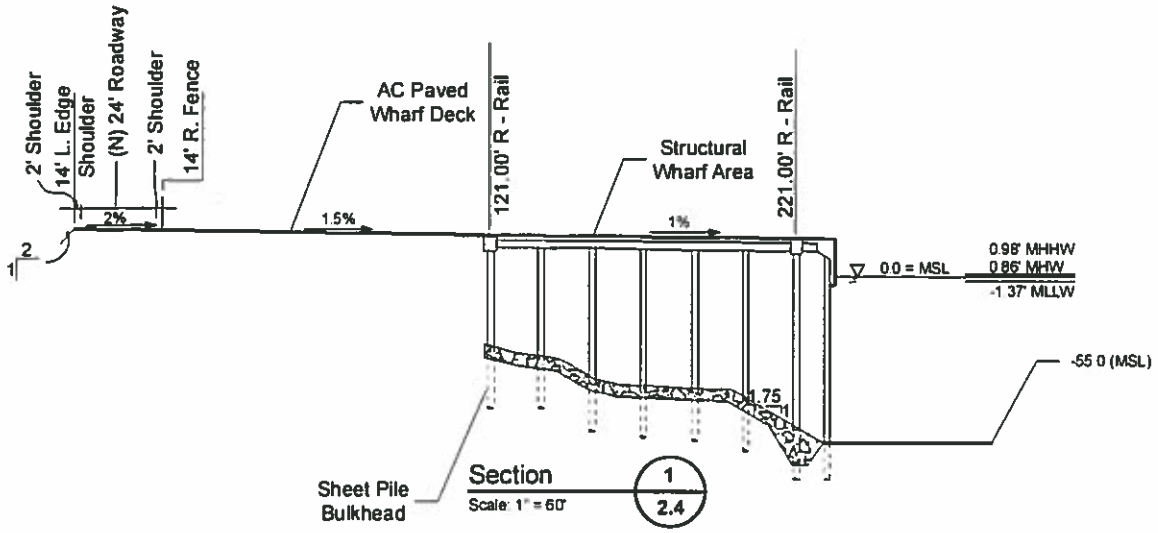
0 100 200 Feet 400

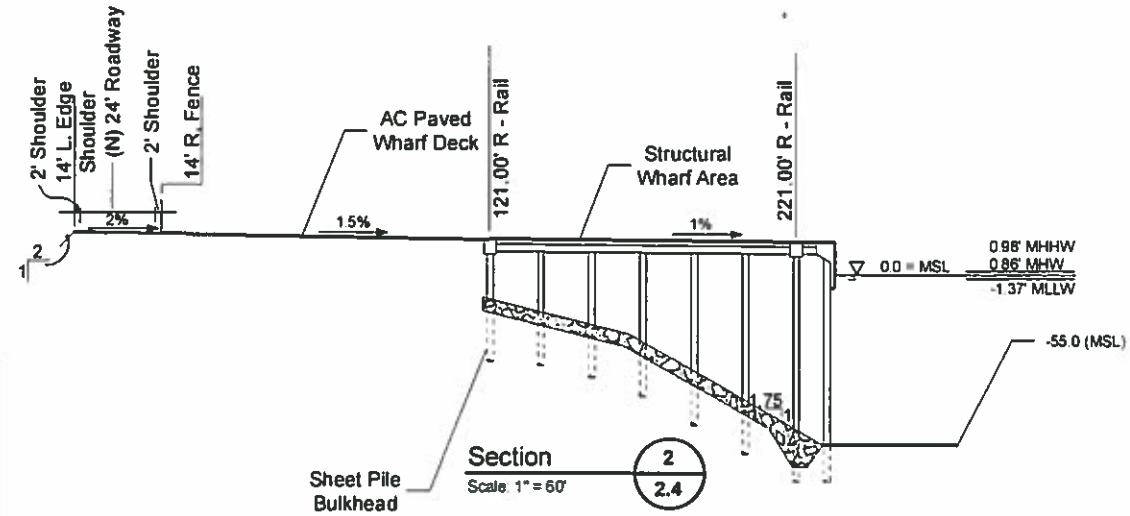
PREFERRED ALTERNATIVE - WHARF GEOMETRY PLAN

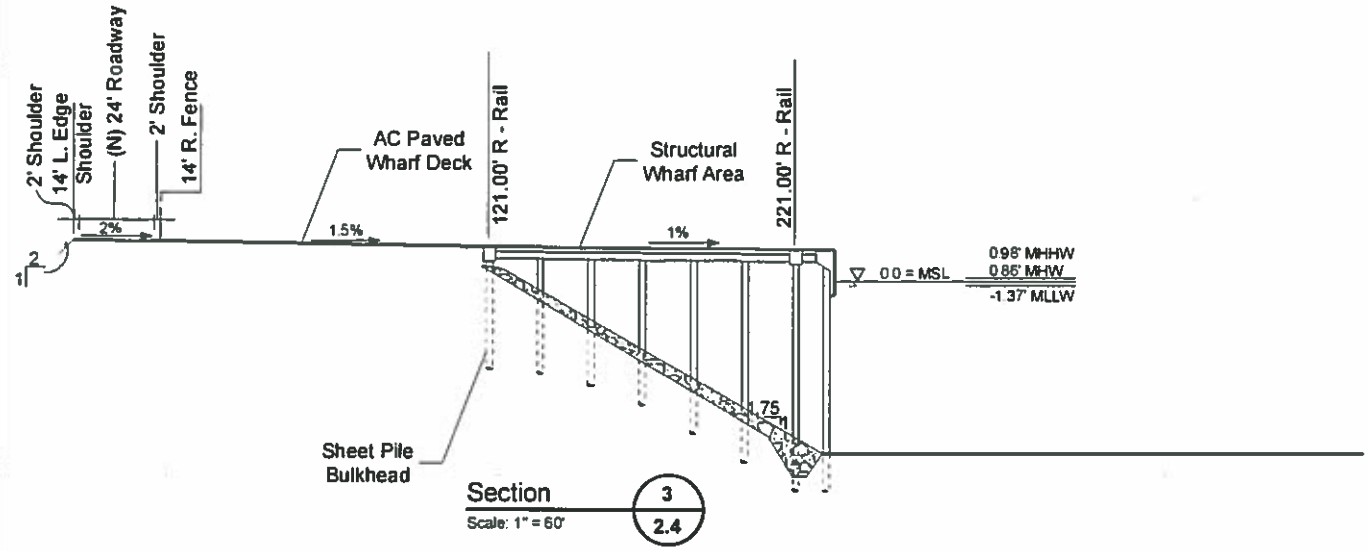
Deep Draft Wharf Improvements and Fill Environmental Impact Statement

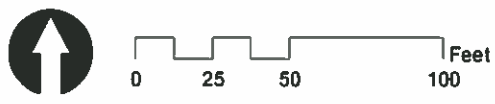
FIGURE 2-4

Apra Harbor, Piti, Guam









Source: TG Engineers PC, October 2005

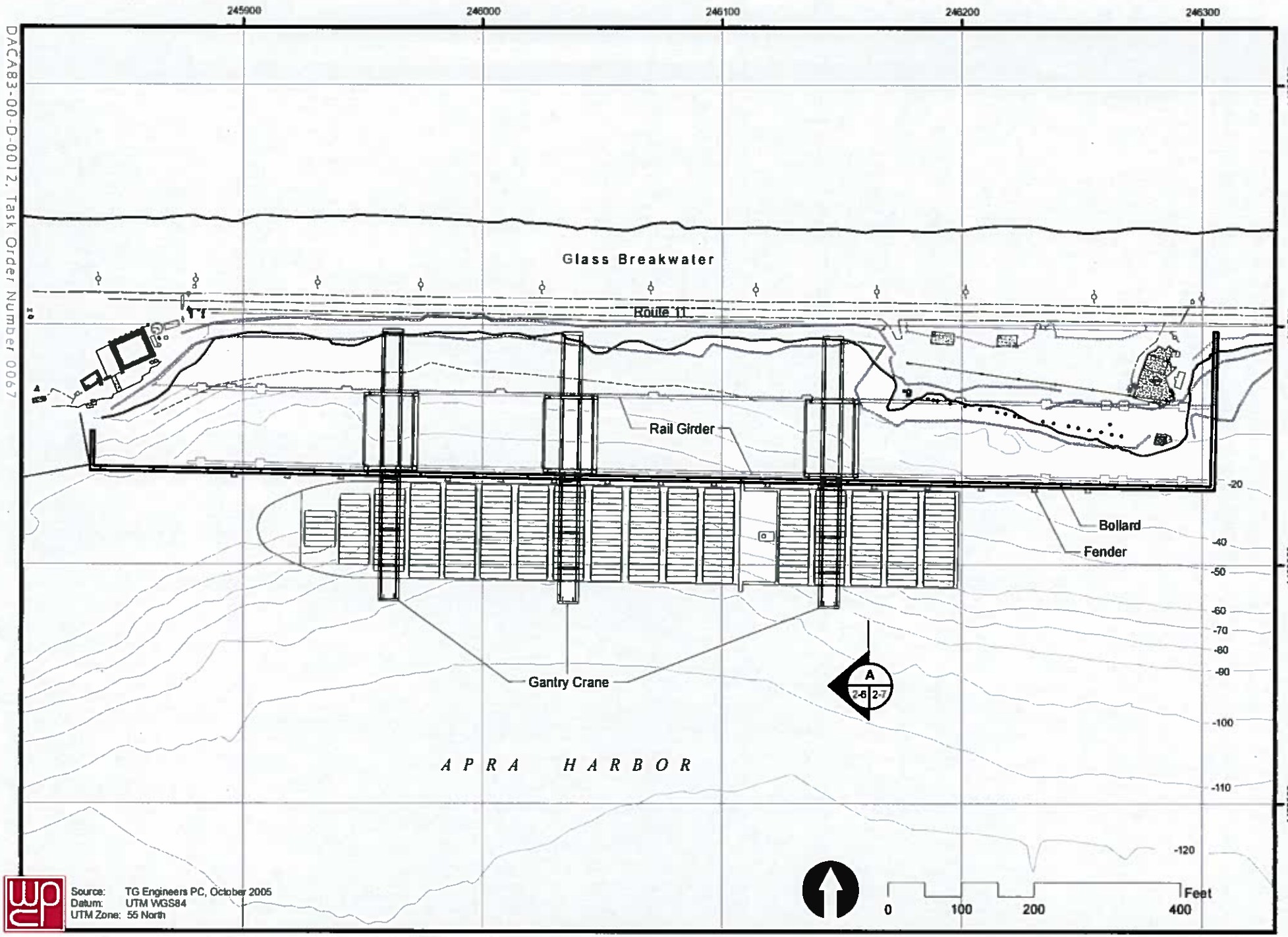
PREFERRED ALTERNATIVE - WHARF SECTIONS

FIGURE 2-5

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067



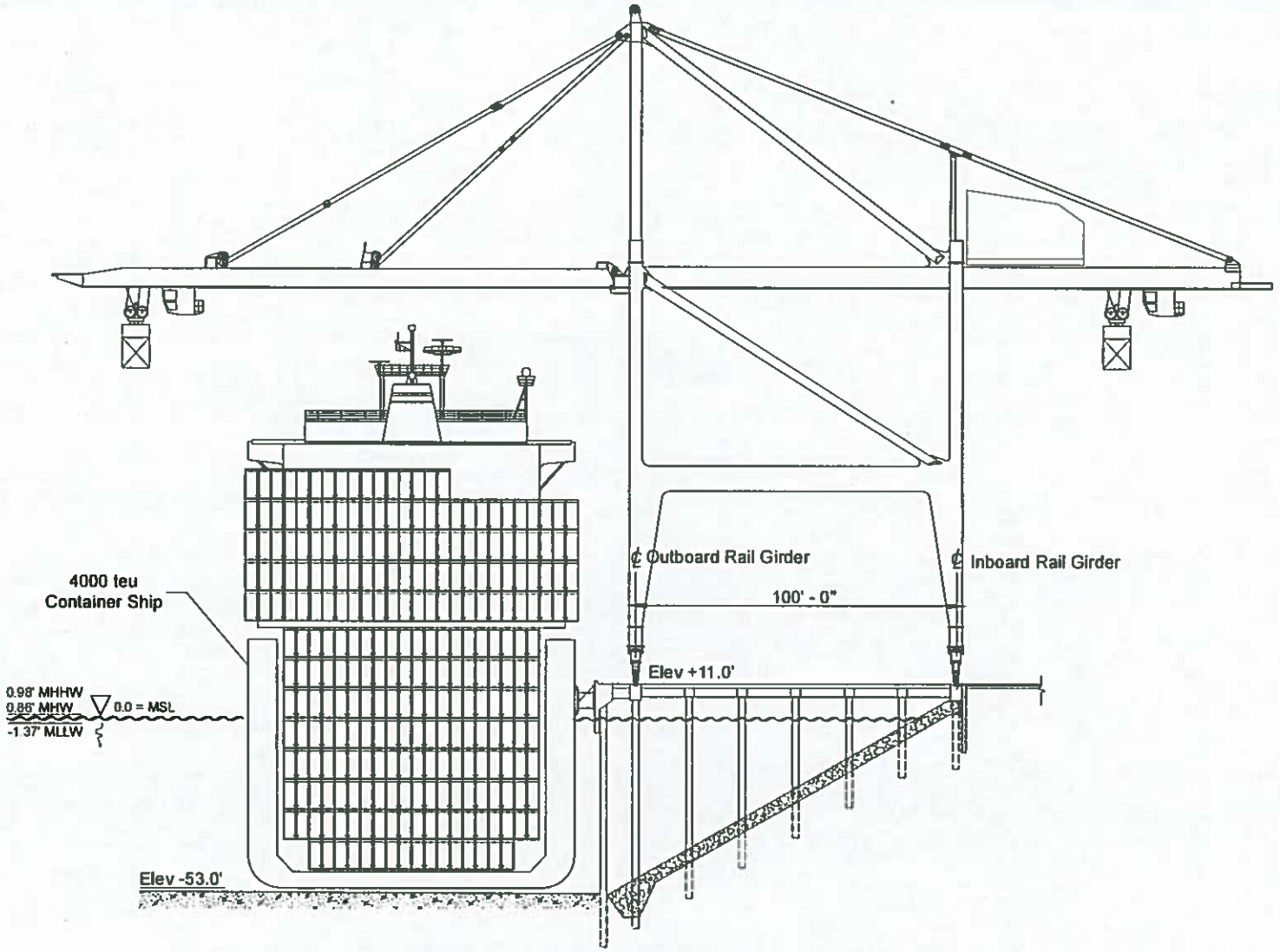
Source: TG Engineers PC, October 2005
Datum: UTM WGS84
UTM Zone: 55 North

PREFERRED ALTERNATIVE, POST-PANAMAX SHIP at BERTH

FIGURE 2-6

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



Source: TG Engineers PC, October 2005

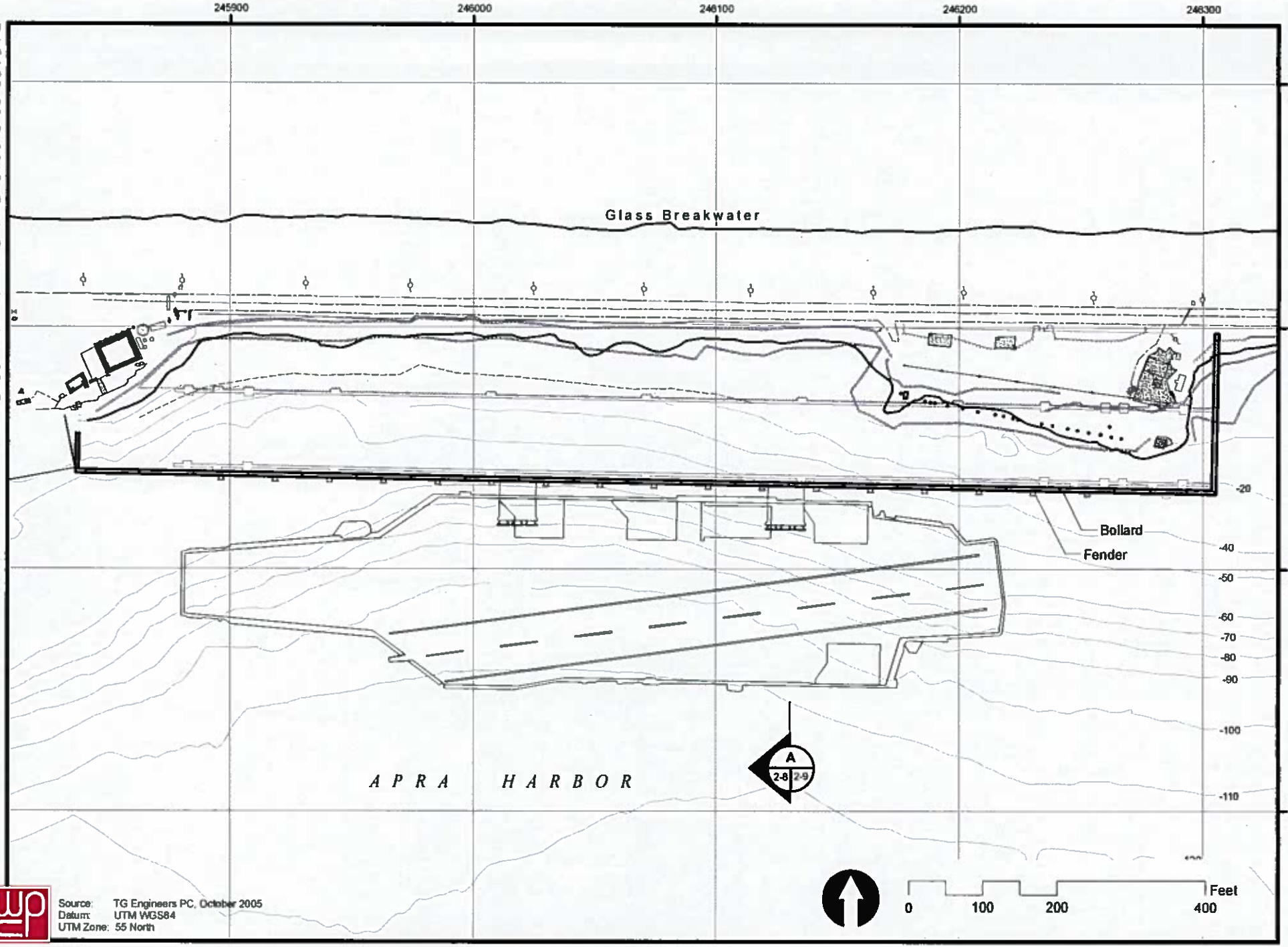
PREFERRED ALTERNATIVE, POST-PANAMAX SHIP at BERTH

FIGURE 2-7

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067



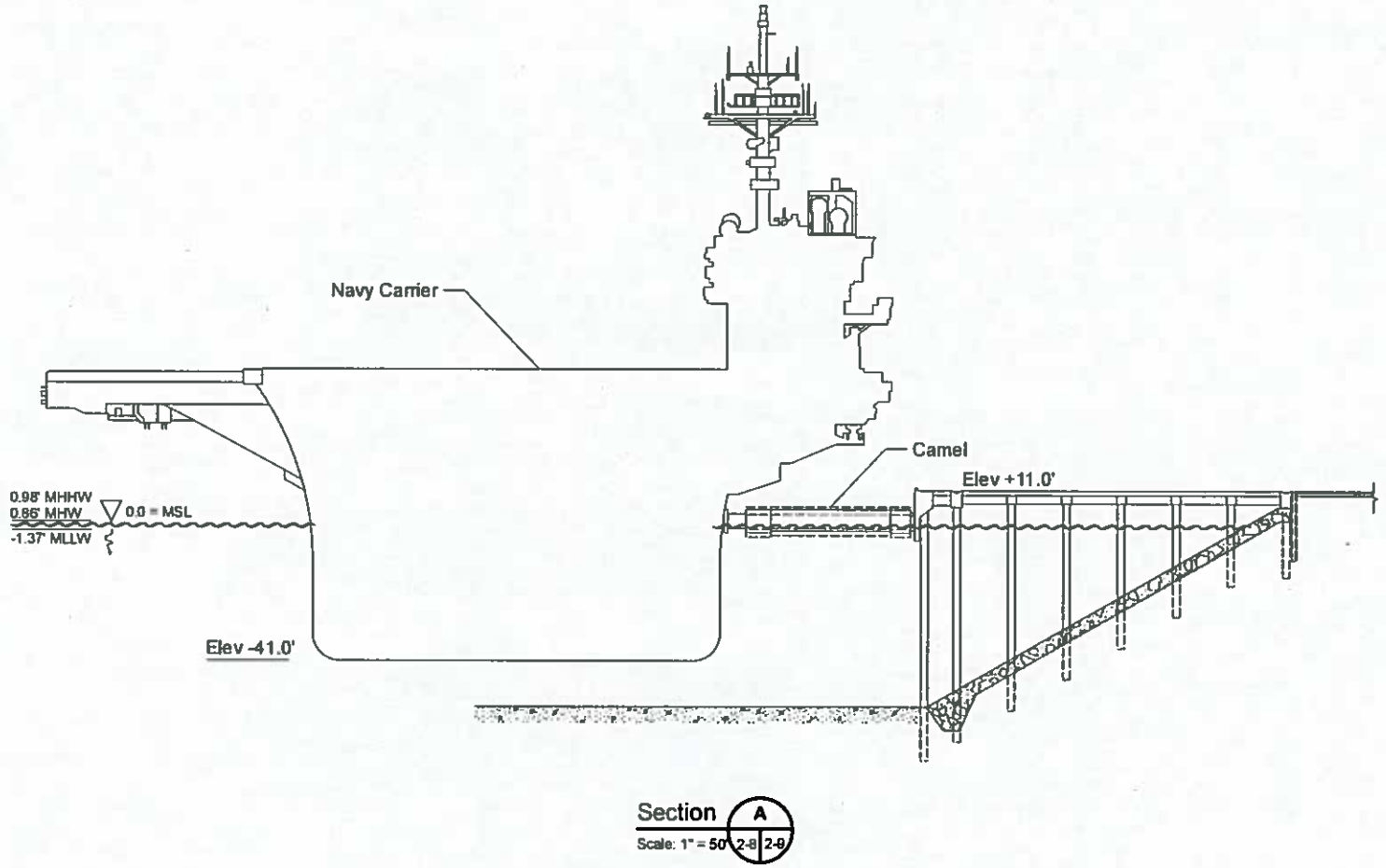
Source: TG Engineers PC, October 2005
Datum: UTM WGS84
UTM Zone: 55 North

PREFERRED ALTERNATIVE, AIRCRAFT CARRIER at BERTH

FIGURE 2-8

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



Source: TG Engineers PC, October 2005

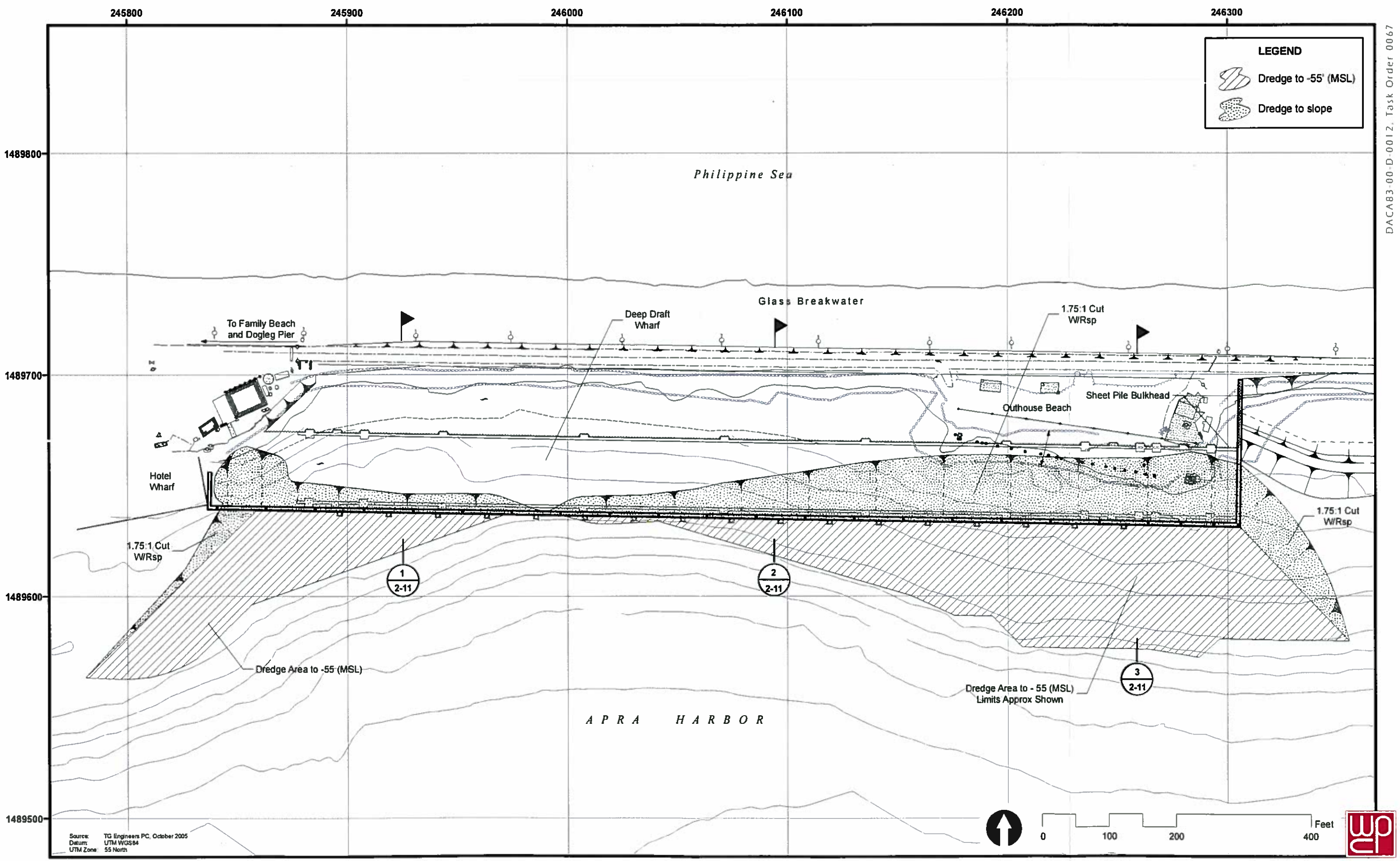
0 25 50 100 Feet

PREFERRED ALTERNATIVE, AIRCRAFT CARRIER at BERTH

FIGURE 2-9

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



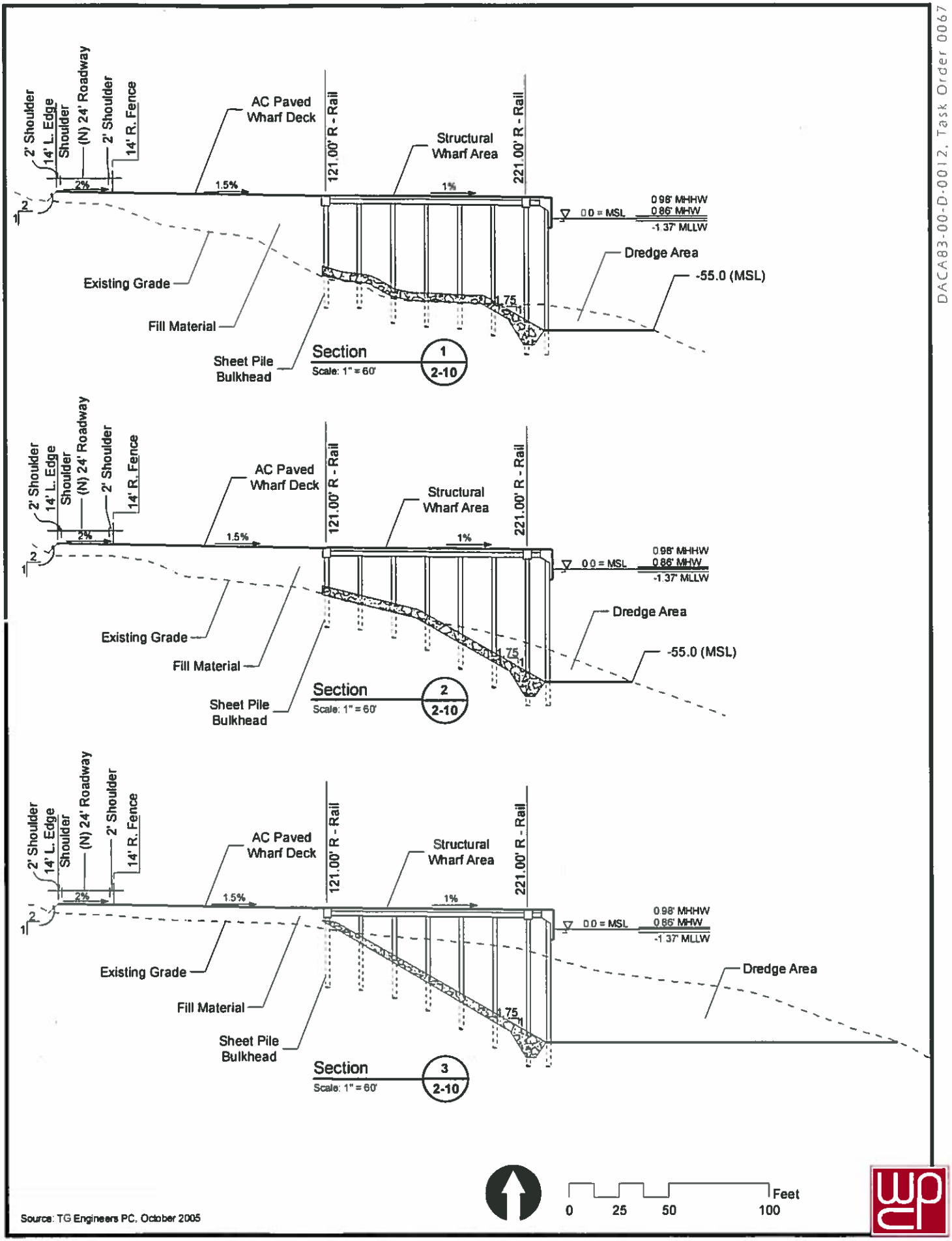
DACA83-00-D-0012, Task Order 0067

PREFERRED ALTERNATIVE - WHARF DREDGING PLAN

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 2-10

Apra Harbor, Piti, Guam



Source: TG Engineers PC, October 2005

DACA83-00-D-0012, Task Order 0067

PREFERRED ALTERNATIVE - WHARF DREDGING SECTIONS

FIGURE 2-11

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

246300 246350 246400 246450 246500 246550 246600 246650 246700

1489750 1489700 1489650 1489600 1489550 1489500

Glass Breakwater

Course Aggregate Surface (Typ)

Connect to Existing Paved Road

Reclamation Site 1 (1.17 acres)

Boulders

Dike No. 1

Riprap Armor Stone or Concrete Cubes

Connect to Existing Paved Road

Course Aggregate Surface (Typ)

Reclamation Site 2 (2.26 acres)

Dike No. 2

Riprap Armor Stone or Concrete Cubes

Golf Pier

Seaplane Ramp

APRA HARBOR

Source: TG Engineers PC, October 2005
Datum: UTM WGS84
UTM Zone: 55 North

0 75 150 300 Feet

DACA83 00 D 0012, Task Order 0067

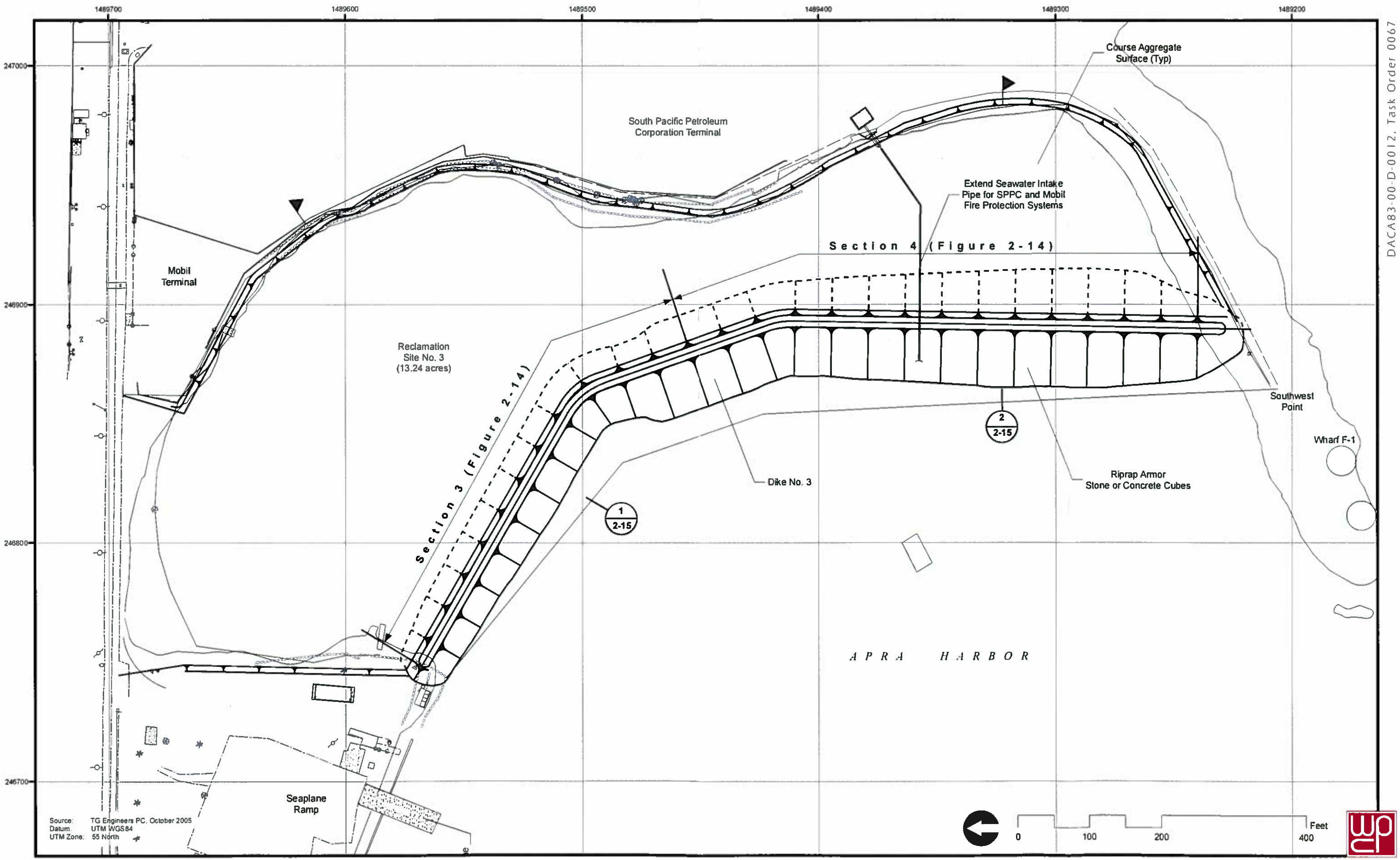
PREFERRED ALTERNATIVE- RECLAMATION SITES 1 & 2

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 2-12

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order 0067

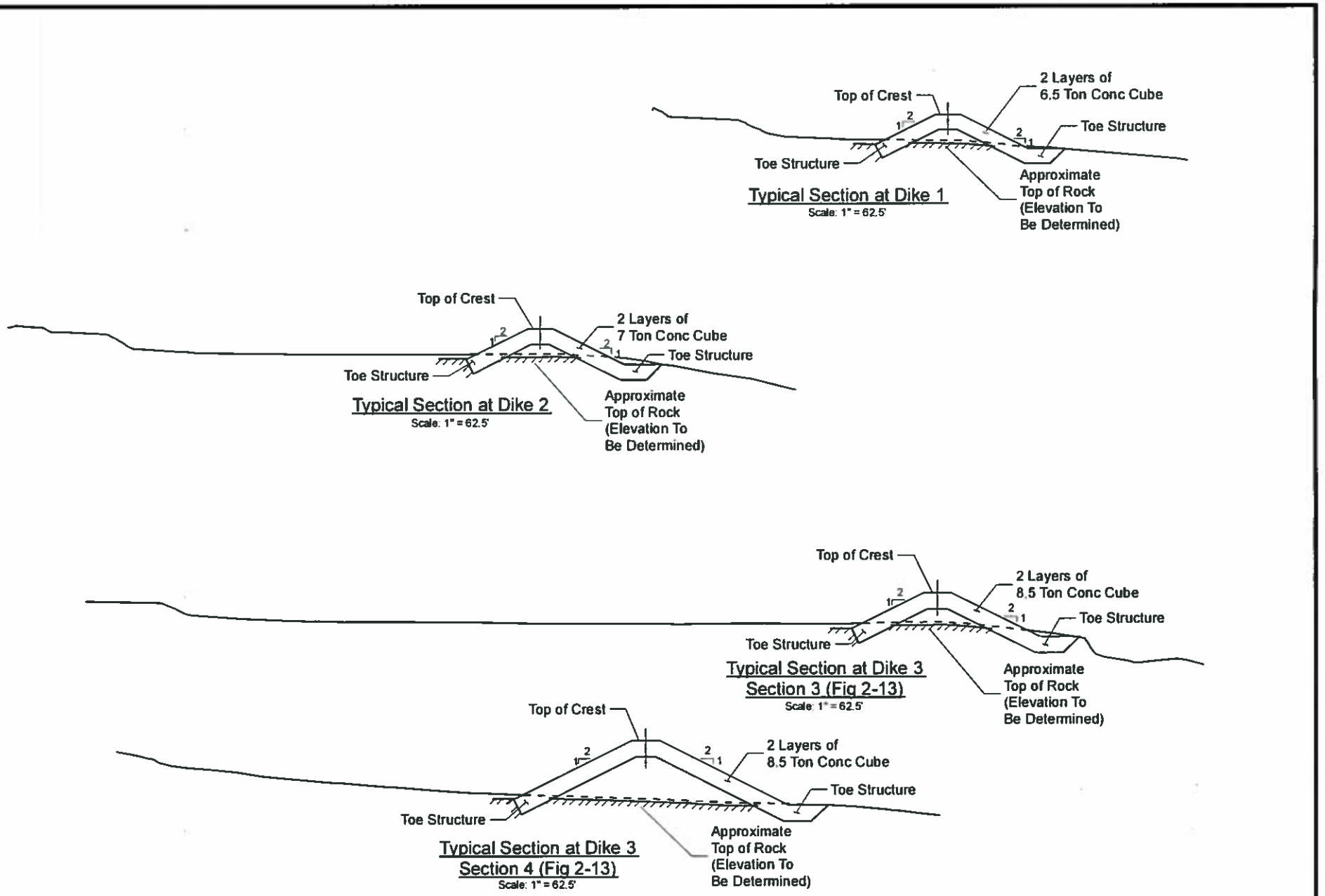


PREFERRED ALTERNATIVE - RECLAMATION SITE NO. 3

FIGURE 2-13

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

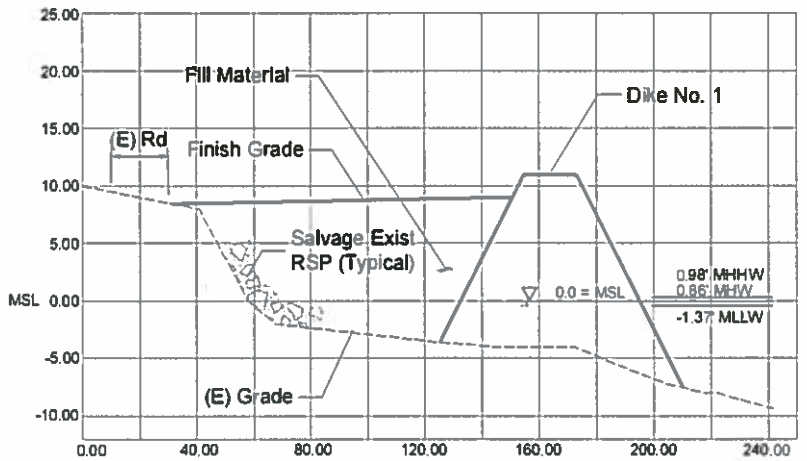
Apra Harbor, Piti, Guam



Source: TG Engineers PC, October 2005

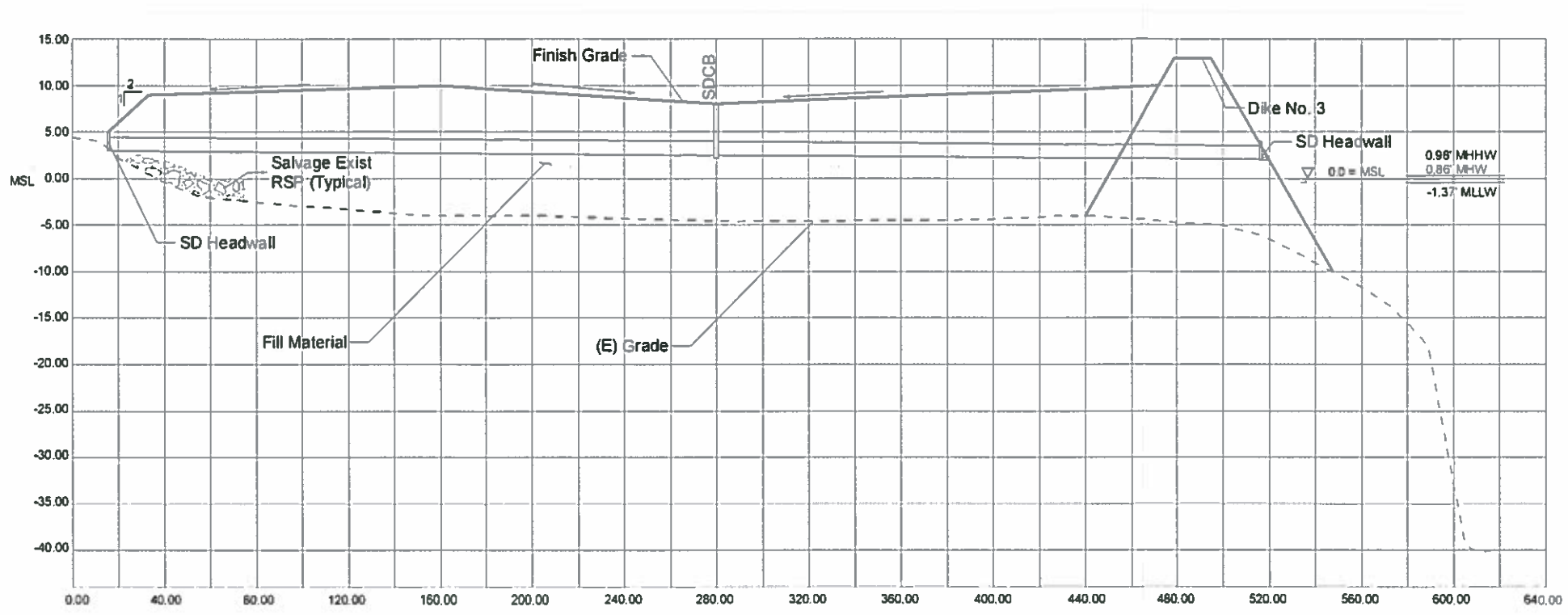
PREFERRED ALTERNATIVE - RECLAMATION SITE Nos. 1, 2, & 3 TYPICAL DIKE SECTIONS

FIGURE 2-14



Reclamation Site No. 1

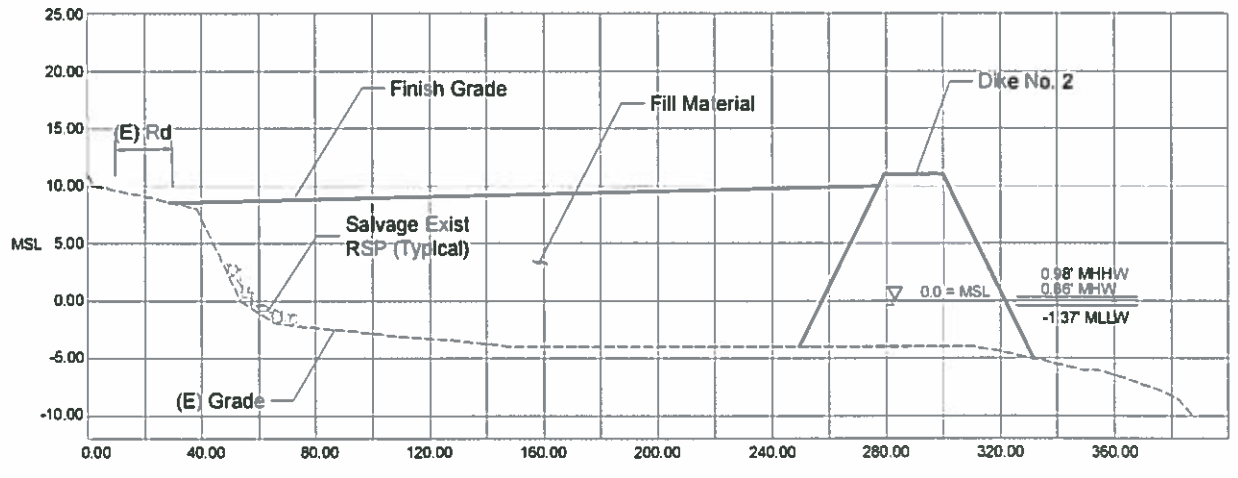
Scale: Hor 1" = 65' - 0"
Ver 1" = 16' - 3"



Reclamation Site No. 3

Section 1 / 2-13

Scale: Hor 1" = 65' - 0"
Ver 1" = 16' - 3"



Reclamation Site No. 2

Scale: Hor 1" = 65' - 0"
Ver 1" = 16' - 3"



Reclamation Site No. 3

Section 2 / 2-13

Scale: Hor 1" = 65' - 0"
Ver 1" = 16' - 3"

Source: TG Engineers PC, October 2005

DACA83 00 D 0012, Task Order 0067

PREFERRED ALTERNATIVE - RECLAMATION SITES ELEVATION (in feet)

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 2-15

Apra Harbor, Piti, Guam

245800 245900 246000 246100 246200 246300

1489800 1489700 1489600 1489500

LEGEND

Dredge to -55' (MSL)

Philippine Sea

Glass Breakwater

Asphalt Pavement

Sheet Pile Cell (15 Total)
(1.49 acres, 232,691 cubic yards)

Interconnecting Arc (14 Total)
(0.53 acres, 82,779 cubic yards)

Dense Gravel Fill

Cells

Area To Be Dredged

Area To Be Dredged

Bollard

Fender

Bulkhead Wall

1 2-18

2 2-18

3 2-18

-20 -40 -50 -60 -70 -80 -90 -100 -110

APRA HARBOR

Source: TG Engineers PC, December 2004
Datum: UTM WGS84
UTM Zone: 55 North

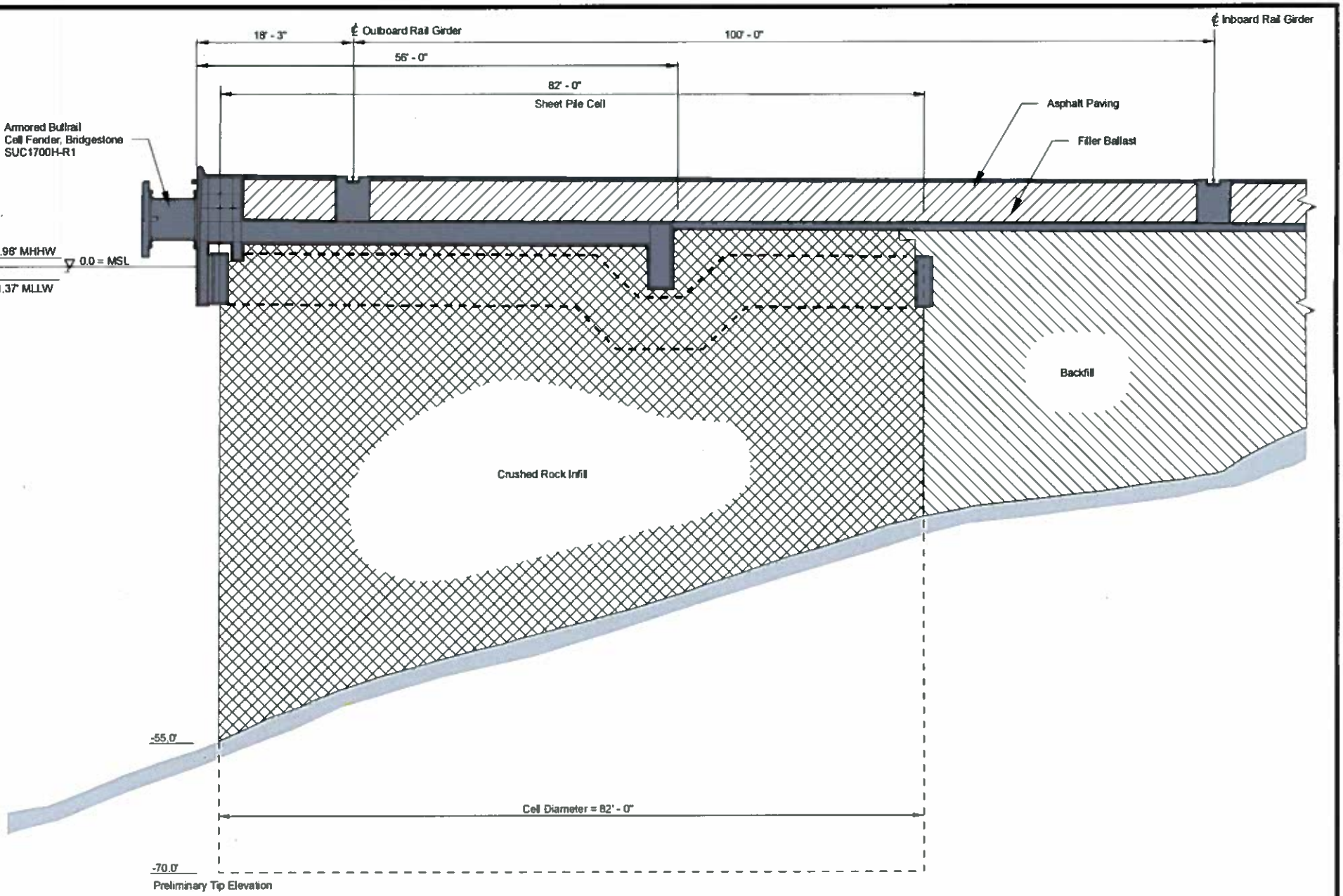
0 100 200 400 Feet

ALTERNATIVE 2 - WHARF GEOMETRY

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 2-16

Apra Harbor, Piti, Guam



Source: TG Engineers PC, December 2004
Datum: UTM WGS84
UTM Zone: 55 North

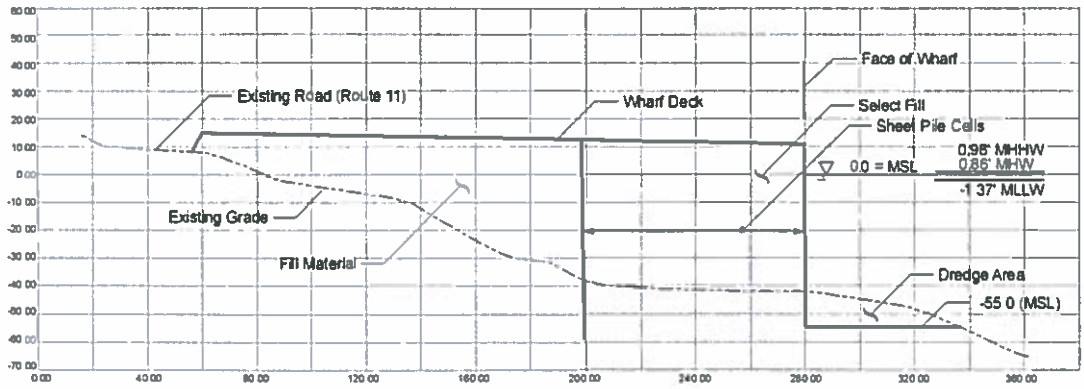
0 10 20 40 Feet

ALTERNATIVE 2 - WHARF SECTION

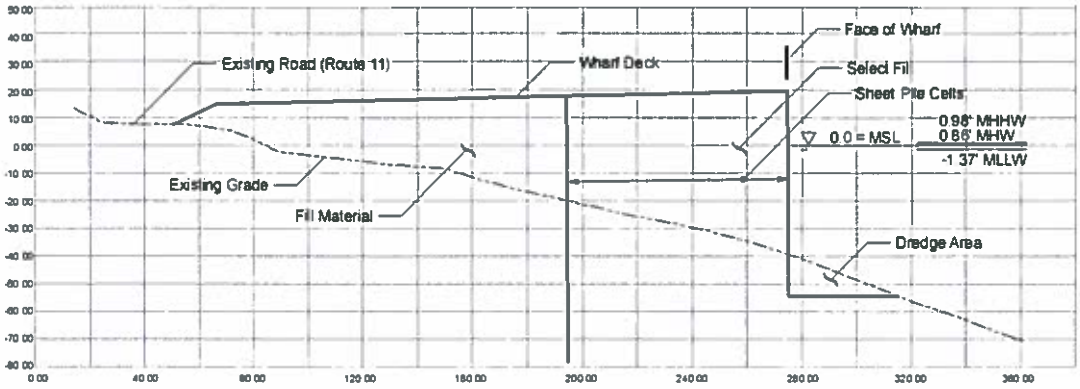
FIGURE 2-17

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

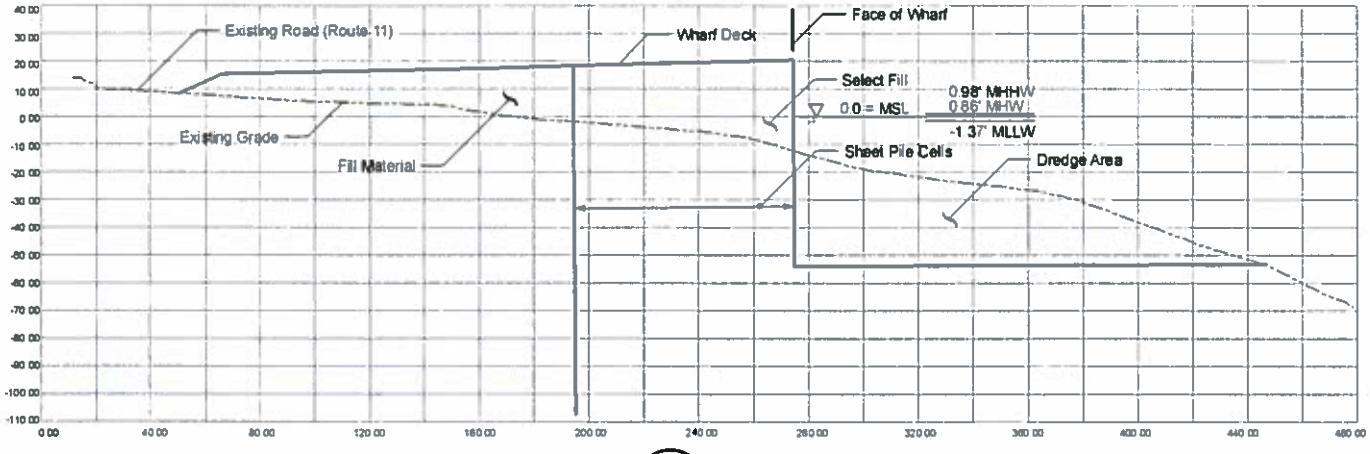
Apra Harbor, Piti, Guam



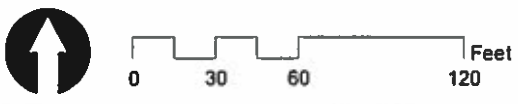
Section 1
Scale: 1" = 60'
2-16



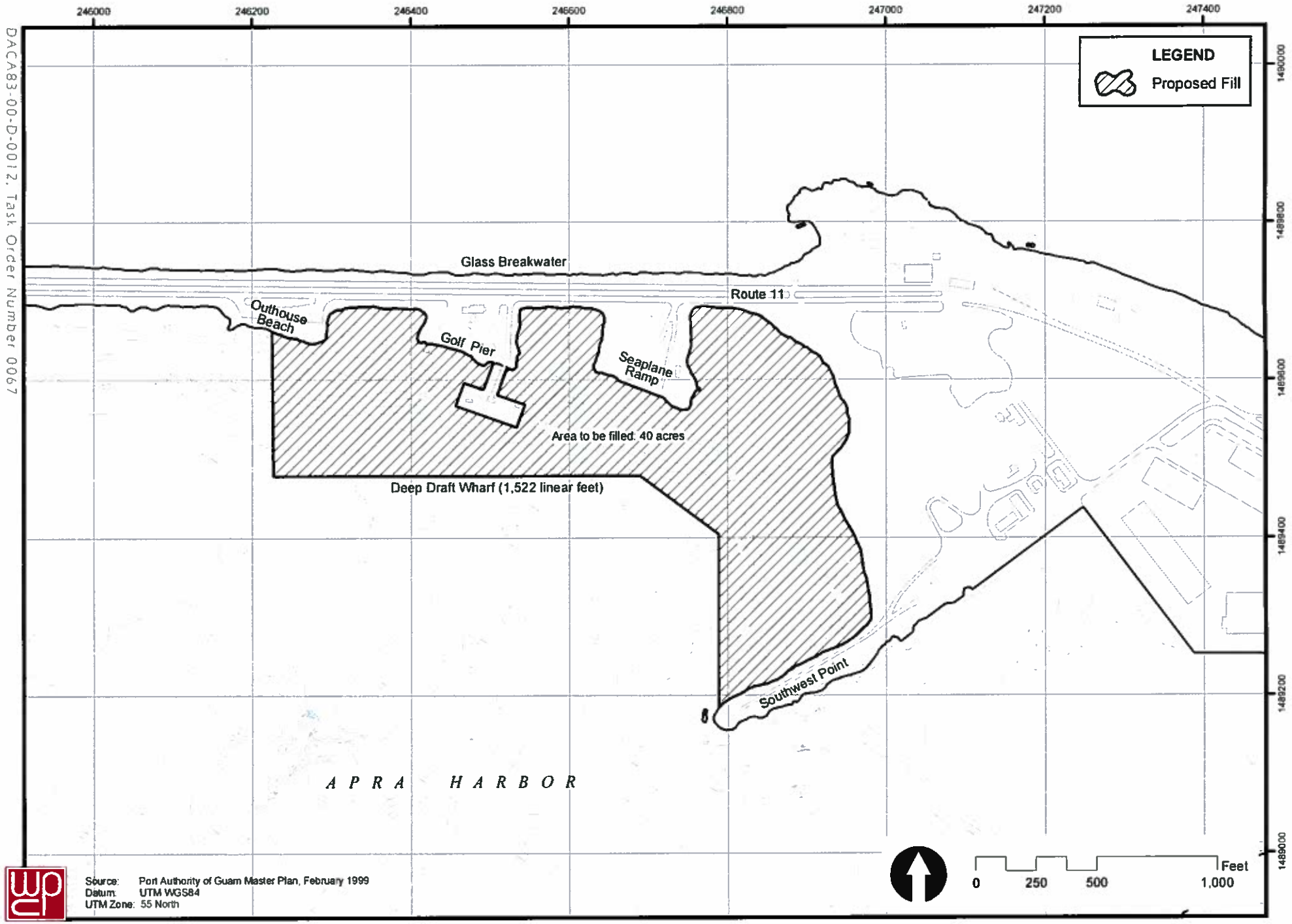
Section 2
Scale: 1" = 60'
2-16



Section 3
Scale: 1" = 60'
2-16



ALTERNATIVE 2 - WHARF ELEVATION
FIGURE 2-18
Deep Draft Wharf Improvements and Fill Environmental Impact Statement
Apra Harbor, Piti, Guam



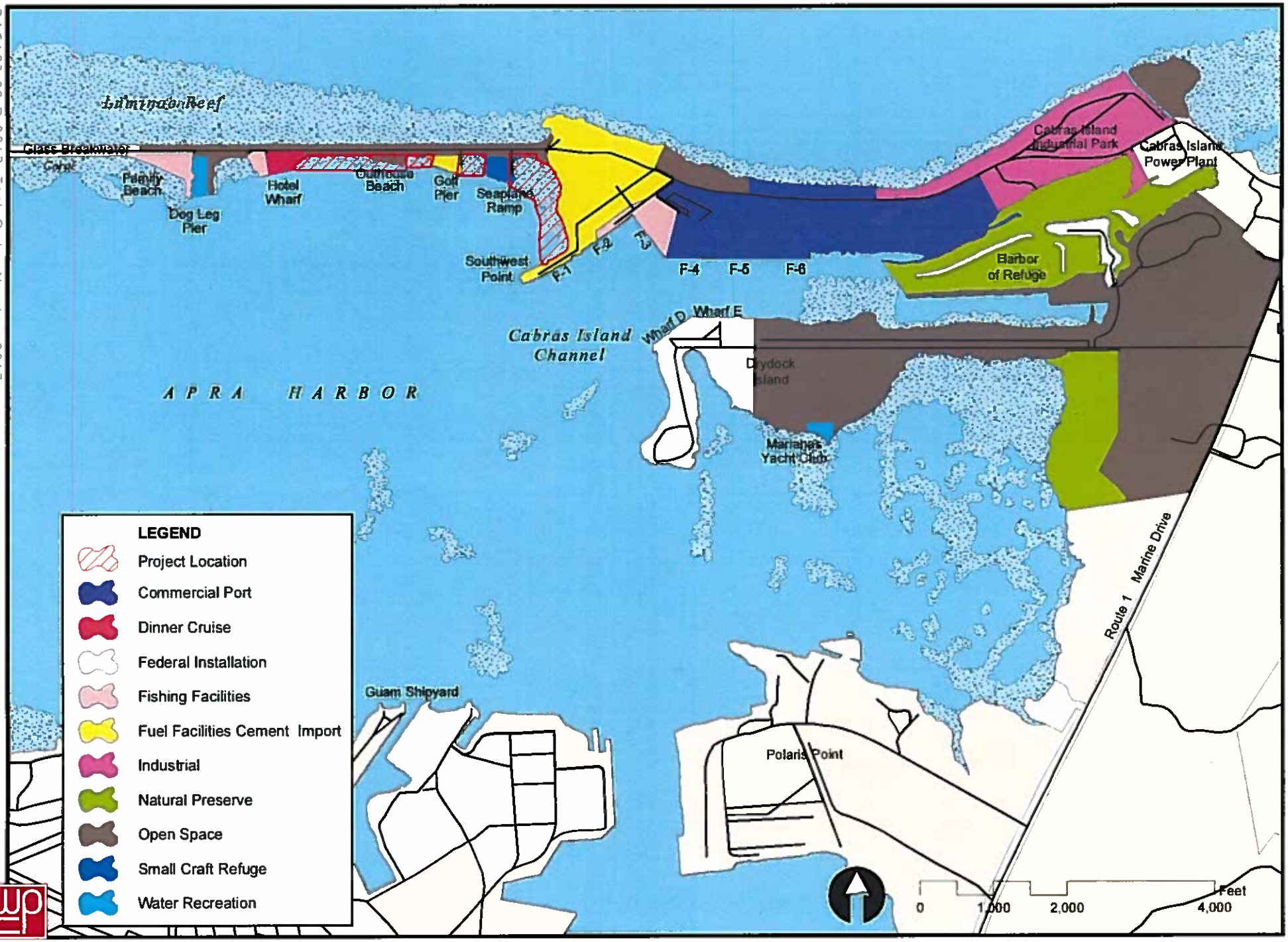
DACA83-00-D-0012, Task Order Number 0067

ALTERNATIVE 3 - CONCEPTUAL LAYOUT

FIGURE 2-19

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

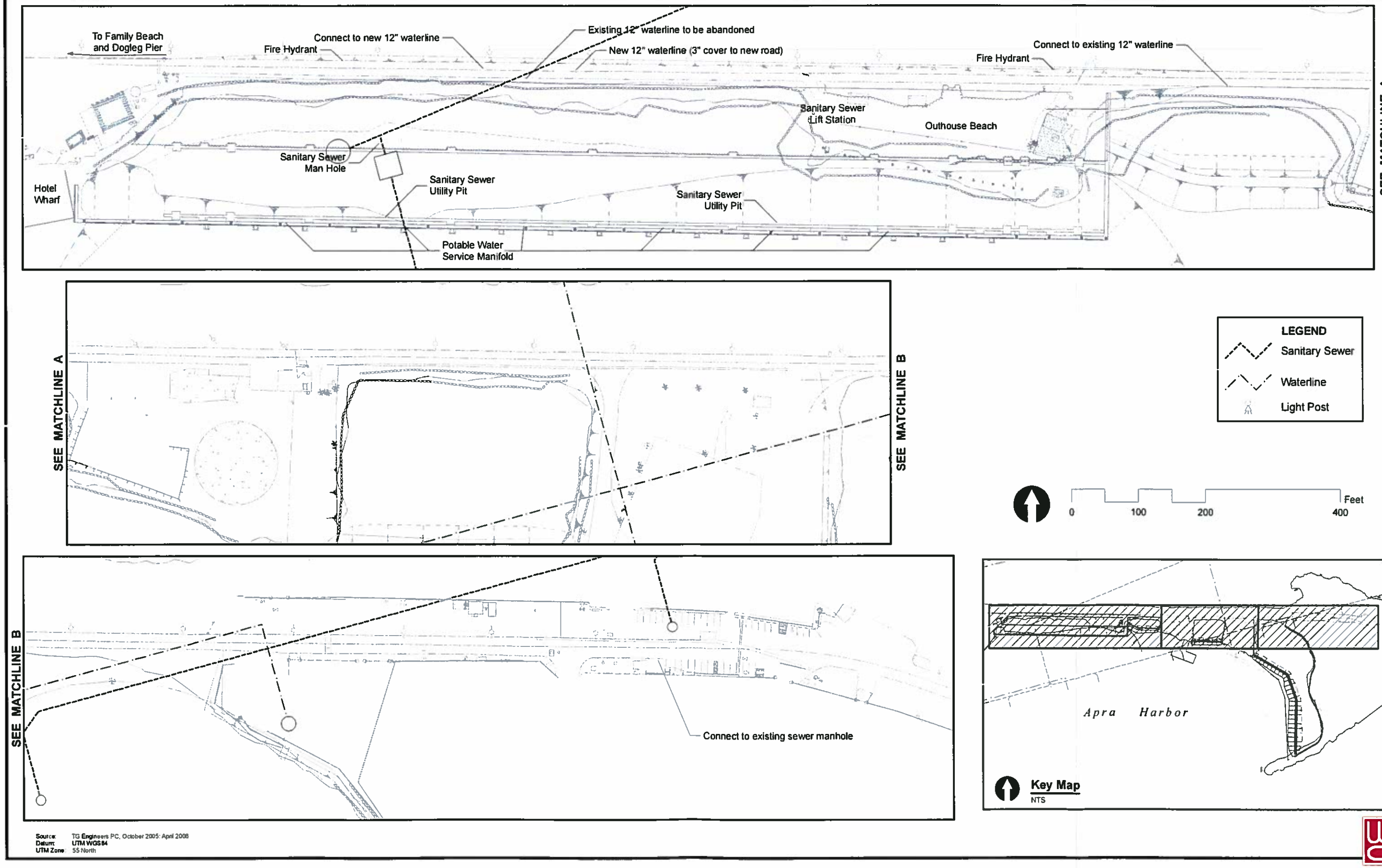


LAND USE

FIGURE 3-1

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



PREFERRED ALTERNATIVE UTILITIES PLAN

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

FIGURE 3-2

Apra Harbor, Piti, Guam

3.9.5 Proposed and Potential Mitigation Measures

During the construction phase, the quality of stormwater runoff would be controlled by provisions of the NPDES permit for construction activities and BMPs. These may include implementation of a stormwater management and pollution prevention (SWMPP) plan, use of sedimentation basins, frequent inspections of temporary stormwater control facilities by construction personnel, and proper operation and maintenance of such facilities during the construction period.

Proposed construction at any of the alternative locations would involve construction of structures within portions of the existing water bodies and/or within the existing regulatory floodplain boundaries.

Minimum criteria for construction in FEMA-designated flood-prone areas are prescribed in 44 CFR 65.3. These regulatory requirements are intended to ensure that construction practices appropriate to FEMA-designated flood zones are maintained for all new construction and substantial improvements. Construction activities could potentially impact existing regulatory base flood elevations, which would require approval by FEMA per 44 CFR 65.3 and acceptance of the revised base flood elevations and floodplain maps. However, all Proposed Project areas would be graded to be safe against coastal flooding. Site drainage systems would be designed to minimize stormwater discharges to Apra Harbor, and residual impacts on existing floodplain areas on the Glass Breakwater are expected to be insignificant.

Future subsurface utilities and drainage system improvements would be designed to produce no adverse effect by storm runoff onsite and to adjacent properties. All drainage system improvements would be constructed in conformance, and coordination with, applicable federal and local governmental standards and agencies.

In Summary, project-related structures located within the 100-year flood boundary would have to comply with all applicable FEMA regulations. These structures would affect the areal extent of areas designated as "Special Flood Hazard Areas Inundated by 100-Year Flood" (Flood Zone A). Compliance may entail revisions or amendments of FIRMs after approval by FEMA. Storm water discharges from the proposed facilities would have to be in compliance with all applicable Territorial and Federal environmental storm water regulations.

3.10 TOPOGRAPHY AND SOILS

3.10.1 Affected Environment

The soils underlying the project site as well as the entire eastern portion of Cabras Island and Glass Breakwater are classified as Urban Land-Ustorthents Complex. The soil types found in the project area and the surrounding Apra Harbor area are shown in Figure 3-8.

The Urban Land-Ustorthents Complex is classified as being comprised of 60 percent Urban land and 30 percent Ustorthents soils. Urban land consists of areas covered by buildings, roads, and parking lots. Some of these areas have a base of crushed coral, and some rest directly on limestone. Areas of Urban land are impermeable to water and runoff is very rapid.

Ustorthents soils consist of quarried fill material. It is commonly crushed coral gravel and cobbles and a few pockets of very gravelly clay and clay loam. Some areas around buildings have been covered with a thin layer of clay or clay loam and have been planted with lawns and other landscaping plants. Weeds and low shrubs cover some unused areas. Permeability of Ustorthents is moderately rapid. Available water capacity is very low. Runoff is slow, and the hazard of water erosion is slight (USDA, 1988)

Most areas within Apra Harbor are developed coastal fill lands covered by roads, buildings, and parking lots. Topography is nearly level with slight elevations of only 0 to 18 feet and slopes of only 0 to 3 percent.

The proposed deep-draft wharf and Reclamation Sites 1 and 2 would be built directly south of Route 11. Elevation of Route 11 is at approximately 8.5 feet above MSL. Elevations in the vicinity of the deep-draft wharf and Reclamation Sites 1 and 2 vary from approximately 6 to 9 feet above MSL. Reclamation Site 3 would be located to the west of the Mobil Oil/SPPC Tank Farm. Elevations bordering the western boundary of Reclamation Site 3 vary between 5 to 9 feet Above MSL.

3.10.2 Significance Criteria

Impacts related to soils and sediments would be considered significant if the Proposed Project resulted in:

- Erosion rates would be increased to such a level that siltation would cause significant impacts on water quality or aquatic habitats.
- Topography is altered to the degree that adversely impacts onsite or adjacent land use, infrastructure, or drainage patterns

3.10.3 Environmental Consequences

Under the No Action alternative existing topography and soils within the onshore project areas and within Apra Harbor would not be affected by construction-related or operational activities of the Proposed Project. Therefore, the No Action Alternative would result in a less than significant impact.

Under the remaining reasonable alternatives potential impacts related to topography, and soils would in large part be similar regardless of project location and/or design. Therefore, analysis of potential impacts relating to topography and soils were not

differentiated by alternative but rather addressed collectively for the proposed improvements.

No significant long-term impacts to topography or soils are anticipated as a result of the proposed improvements. The topography and soils within the project areas would experience temporary disruption as a result of construction activities such as clearing, grading, pile driving, drilling and excavations for utility and drainage improvements. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods. Wind erosion may result in some unavoidable soil loss, and silt runoff is also a potential impact.

The SPPC and Mobil Tank Farms border Reclamation Site No. 3 at the east and south sides. The reclamation site will be graded to abut these properties while providing swales and piped drainage to preclude ponding storm water. Due to the low topography along the project property line, filling across the property line will be required to prevent some areas remaining below sea level. However, the topography within the project areas would not be substantially altered. The proposed Reclamation Site elevations at the three reclamation sites are shown in Figure 2-15.

In summary, completion of the proposed improvements and future harbor operations is not expected to result in adverse impacts to soils of the area. Proposed improvements would only temporarily generate soil erosion and sediment transport from the project sites. Alteration in topography at the proposed reclamation sites is not anticipated to result in long-term adverse impacts. Conversely, the proposed Reclamation Site 3 improvements would result it beneficial impacts to the neighbor Mobil and SPPC Tank Farm facility by shifting the shoreline several hundred feet to the west and providing protection with the barrier dikes and distance away from the typical erosion and scour caused by typhoon storm surges.

In summary, under any of the considered alternatives (with the exception of the No Action Alternative) with appropriate mitigation measures would result in less than significant impacts to site topography and soils.

3.10.4 Proposed and Potential Mitigation Measures

Temporary and permanent erosion control measures would be employed to minimize both short and long term impacts resulting from minor alteration of the topography. These would include the employment of construction dust control measures, landscaping or paving of exposed areas as soon as finished grades are achieved and the construction of necessary drainage facilities.

Typical erosion control measures applied during construction may include the use of berms, cut-off ditches, temporary ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences shall be constructed and continuously inspected and repaired to prevent silt runoff from the project site.

The protection of nearshore waters of Apra Harbor from erodible soils would be accomplished by implementing mechanical retardation and runoff control measures such as: silt fences, berms, diversion ditches, benches, and sediment basins, as required.

3.11 WATER QUALITY AND SEDIMENTS

3.11.1 Introduction

3.11.1.1 Regulatory Framework

The Federal Water Pollution Control Act of 1972, known since its amendment in 1977 as the Clean Water Act, is the primary regulatory basis for water quality protection and pollution control in the waters of the U.S. This includes the waters of Apra Harbor. Stormwater and sanitary wastewater discharges, associated with the construction and operation of the proposed facilities or any other developments, would have to comply with the provisions of the CWA. In addition to CWA regulations Section 10 of the Rivers and Harbors Act and the Marine Protection, Research, and Sanctuaries Act (MPRSA) are also administered by the USACE and regulate dredging activities. A summary of pertinent water quality regulations is given in the following paragraphs.

Section 402 of CWA - National Pollutant Discharge Elimination System (NPDES)

A centerpiece of the CWA is the National Pollutant Discharge Elimination System permit system. The NPDES permitting program is designed to identify point sources of pollution, set levels of pollutant discharges for specific sources to surface waters, and require the implementation of controls to minimize the discharge of pollutants to waters of the U.S. These objectives are implemented by requiring an NPDES permit for discharge of pollutants by any industrial, municipal, or similar source. It is unlawful for any industry, municipality, or similar source to discharge any pollutant from a point source into the waters of the U.S. without an NPDES permit.

Because of the considerable pollutant loads commonly derived from the discharge of storm waters, the 1987 amendments to the CWA required the USEPA to implement an NPDES permit program for discharge of stormwaters. The program established by the USEPA is being implemented in two phases:

- Phase I, promulgated in 1990, generally requires an NPDES permit for discharge of stormwaters by specifically defined industrial sources and municipalities with population in excess of 100,000. Defined industrial sources and activities including port and harbor operations (considered to be a transportation activity) and construction activities.
- Phase II, promulgated in 1999, expands the industrial sources potentially subject to permitting requirements while providing for more uniformity in

permitting requirements for industrial sources. Port operations and construction activities covering one or more acres require permits. Permits for stormwater discharges by municipalities can be extended to smaller communities on a case-by-case basis depending on their size and geographic relation to other smaller and larger municipalities.

Section 404 of the CWA and Section 10 of the Rivers and Harbors Act

Section 404 of CWA authorizes the USACE to issue permits for the discharge of dredged or fill material into waters of the U.S. Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. 403) authorizes the UASCE to issue permits for work and/or structures in navigable waters of the U.S. Section 10 of the RHA requires authorization from the USACE for the construction of any structure in or over any navigable water of the United States, and/or the excavation/dredging or deposition of material in these water or any obstruction or alteration in navigable waters of the U.S.

The regulations containing the procedures and policies used by the USACE in administering the regulatory program are included in 33 CFR Parts 320-330. USEPA maintains general environmental oversight, including Section 404(c) permit veto authority if there will be an "unacceptable adverse effect." The USACE office on Guam facilitates administration of the 404 permit process and coordinates with Government of Guam regulating authorities.

Dredging and placement of dredged material are regulated in accordance with a number of environmental statutes including the CWA, and the Marine Protection, Research, and Sanctuaries Act (MPRSA). The CWA regulates the discharge of dredged material in inland water, near coastal waters, and surrounding environs, while the MPRSA addresses the transport of dredged material to the ocean for purposes of placement. Typically, compliance with the environmental criteria in the MPRSA and/or CWA is used to determine environmental acceptability for the dredged material placement alternatives. Given that none of the alternatives include the possible ocean placement of dredged material, only the CWA regulatory issues are discussed in this EIS.

Section 404 of the CWA establishes guidelines for use in evaluating dredged material to evaluate whether the discharge of the material would have adverse environmental impacts. As specified in Section 404 of the CWA, any dredging proponent who proposes to dispose of dredged or fill material within State or Territorial waters must apply for a permit following 404(b)(1) guidelines. A Section 404 permit is required when dredged material is disposed of in either aquatic or nearshore environments.

Section 401 of the CWA – Water Quality Certification

Section 401 of the CWA requires applicants for a 404 permit to obtain a water quality certification (WQC) from state or territorial governments that the proposed activity will

not violate water quality standards (WQS). Dredging activities may not cause the concentrations of chemicals in the water column to exceed State (Guam) standards. The GEPA, through its Planning Division, administers the 401 permitting on Guam. The USACE and GEPA use a joint public notice to inform the public and governmental entities of the scope of work requiring the Section 404 permit and Section 401 certification.

GEPA has defined marine waters in Section 5102B of the Guam Water Quality Standards 2001 Revision to include all "coastal waters off-shore from the high water mark, including estuarine waters, lagoons and bays, brackish areas, wetlands and other special aquatic sites, and other inland waters that are subject to ebb and flow of the tides" (GEPA, 2001).

These marine waters are further defined in Section 5102B of the standards as:

- Category M-1 (Excellent) – high water quality to protect for whole body contact recreation, and to ensure the preservation and protection of marine life, and enable the pursuit of scientific research as well as aesthetic enjoyment. These waters shall remain substantially free from pollution attributed to domestic, commercial, and industrial discharges, shipping and boating, mariculture, construction and other activities which can reduce the water's quality.

- Category M-2 (Good) – must be of sufficient quality to allow for propagation and survival of marine organisms, aesthetic enjoyment, and whole body contact recreation. Other important intended uses include mariculture activities, aesthetic enjoyment and related activities.

- Category M-3 (Fair) – intended for general, commercial, and industrial use, while allowing for protection of marine life, aesthetic enjoyment, and limited body contact recreation. Specific intended uses include shipping, boating, berthing, industrial cooling water, and marinas.

To facilitate the implementation of the CWA requirements, the USACE and the USEPA have jointly developed the "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual" which provides guidance and procedures to evaluate the potential impacts associated with the discharge of dredged material in inland waters. The guidance provided in this manual, commonly referred to as the Inland Testing Manual (ITM) includes methods for assessing potential impacts to water quality associated with the runoff water (discharge) from an upland CDF.

Therefore, the 97,097 cubic yards of dredged material that would be generated during deep-draft wharf construction would be required to undergo testing to determine its potential environmental effects of its runoff and appropriate disposal whether it is at the Reclamation Sites 1,2, and 3, other upland locations, or suitable for unconfined direct in-water placement..

Some of the tests performed on material proposed for aquatic disposal are designed to evaluate whether the proposed disposal action complies with applicable water quality standards. For ocean disposal, these tests and related analyses would determine whether the dredged material, upon disposal, would meet the limiting permissible concentration for water column impacts. Concentrations of dissolved dredge material constituents would not be permitted to exceed applicable WQS after initial mixing.

The nearest surface water body in the vicinity of the Proposed Project area is Outer Apra Harbor. The nearest inland rivers (Masso, Sasa, and Aguada), and freshwater/estuarine wetlands (Sasa Bay, San Luis Ponds) would not be directly influenced by the Proposed Project as they are located between 1 to 3 miles from the project area Wetlands and inland surface waters are discussed in further detail in Section 3.12.2. The remainder of this section discusses the marine water quality conditions in the project area and the surrounding Outer Apra Harbor.

A coastal engineering assessment and water quality survey of the coastal waters in Apra Harbor were conducted in support of this EIS and are attached as Appendices G and H, respectively. The information presented in the remainder of this section is based in large part on the survey and the assessment reports.

3.11.1.2 Required Permits

Department of the Army (DA) Permit (Section 10, Rivers and Harbors Act, Section 404, CWA)

A DA Individual permit would be required for the construction and installation of the deep-draft wharf and the associated dredging activities under Section 10 of the Rivers and Harbors Act of 1899. The DA Individual permit would be required under section 404 of the CWA for the deposition of dredge and/or fill material into the waters of Outer Apra Harbor as well as construction of the Reclamation Site dikes. The PAG would apply for a DA Individual permit to cover the construction, and placement of dredge and fill activities. On average, the time frame to obtain a DA Permit could range from 6 to 24 months.

Water Quality Certification (Section 401, CWA)

A Section 401 WQC is required Under the Federal CWA and Guam Administrative Rules (GAR) Water Quality Standards, for activities that result in discharges into waters of the U.S. Discharges from the Polaris Point CDF would require a WQC. A Section 401 WQC would be required for the discharge of dredged or fill material into Apra Harbor, as well as for any return water and runoff from an upland CDF if constructed. The PAG would apply for a Section 401 WQC with the GEPA for these construction-related activities. On average, the time frame to obtain a Section 401 WQC could range from 12 to 24 months.

NPDES (Section 402, CWA)

Discharges of point source pollutants into surface waters of the U.S. are controlled under the NPDES program, Section 402 CWA. The USEPA administers the NPDES program in Guam. NPDES permit coverage is required for construction activities that disturb 1 acre or more under the Phase II storm water regulations, published by the USEPA on December 8, 1999. Therefore, PAG would be required to apply for NPDES permit coverage for storm water discharges associated with construction-related activities. On average, the time frame to obtain a Section 402 NPDES Permit could range from 12 to 24 months.

3.11.2 Affected Environment

3.11.2.1 Coastal Waters

As mentioned above marine waters in Guam are categorized as either M-1, M-2, or M-3 waters. Most of the waters in Apra Harbor are classified as M-2 or M-3 waters. The waters in the central portion of Outer Apra Harbor and immediately offshore of the proposed deep-draft wharf and reclamation sites are designated as M-2 waters. The waters within the Cabras Island Channel and in the vicinity of the commercial port are designated as M-3 waters.

The waters adjacent to the Proposed Project site are classified as M-3 Waters. In accordance with Section 5102B of the Guam Water Quality Standards M-3 waters are "intended for general, commercial, and industrial use, while allowing for protection of marine life, aesthetic enjoyment, and limited body contact recreation.

During field survey efforts water samples were taken at six locations within Apra Harbor to characterize the coastal waters in the immediate vicinity of the Proposed Project. Four of the sampling stations were located in class M-2 waters and two stations were located in class M-3 waters. Water classifications and the locations of the six sampling stations within Apra Harbor are shown in Figure 3-9.

The outer harbor area of Apra Harbor is characterized by little variation in temperature, salinity, pH and nutrients, while particulates (TSS, turbidity, and chlorophyll) were somewhat more variable.

Water quality conditions within the outer Apra Harbor are representative of well-mixed open coastal waters showing little spatial variation in temperature, salinity, and pH. This is also evidenced by current studies within the harbor have shown that there is a continuously strong outward (westward) flow of surface waters. By contrast subsurface waters tend to flow in an easterly direction. In general, currents within the harbor are primarily wind driven during trade wind conditions, and characterized by an opposing two-layer flow pattern. This two-layer flow results from the movement of the surface layer out of the harbor being balanced by an inward moving deeper layer (Sea Engineering, 2005)

The waters also appear to have little influence from terrestrial runoff as indicated by the low nutrient concentrations and particulate levels. Turbidity demonstrated the greatest range of variation of any water quality parameter measured during the water quality survey. Table 3-18, presents a summary of the Guam water quality standards for specific parameters measured during the survey along with mean values and ranges recorded in Apra Harbor. A summary of water quality characteristics for selected parameters in Apra Harbor is provided in Table 3-19.

Table 3-18
Summary of Selected Guam Water Quality Standards
And Measured Parameters in Apra Harbor

Parameter	M-1 Ranges or Not to exceed values	M-2 Ranges or Not to exceed values	M-3 Ranges or Not to exceed values	Survey Mean Values*	Survey Ranges
Temp (°C)	+/- 1 ambient			28.5	28 – 30
Salinity (ppt)	+/- 10% ambient			34.28	34 – 34.36
Dissolved Oxygen (DO) (% saturation)	minimum 75			94	84 – 115
Total Suspended Solids (TSS) (mg/l)	5 mg/l	20 mg/l	40 mg/l	5.1 mg/l	3 – 7.6
pH	6.5 – 8.5			8.2	8.14 – 8.24
Nitrate+Nitrite (mg/l)	0.100	0.200	0.500	0.001	<0.001 – 0.002
Turbidity (NTU)	0.5 above ambient	1.0 above ambient	1.0 above ambient	0.67	0.46 – 1.28

Note * - Arithmetic means are calculated for pH, salinity, and Temperature. Geometric means are calculated for Nitrate+Nitirte, TSS, and turbidity. NTU = Nephlometric Turbidity Units, ppt = parts per thousand, mg/l = milligrams per liter

Table 3-19
Water Quality Characteristics for Apra Harbor [(a)(b)]

Sampling Station	DO (% Sat.)	TSS (mg/l)	Turbidity (NTU)	Chl. α (ug /l)	Nitrate+Nitrite (ug /l)	Total N (ug /l)	Total P (ug /l)
Station 1	5.51	6.2	0.64	0.17	2.0	115	14
Station 2	6.98	5.0	0.53	0.19	1.5	109	11

Sampling Station	DO (% Sat.)	TSS (mg/l)	Turbidity (NTU)	Chl. α (ug /l)	Nitrate+Nitrite (ug /l)	Total N (ug /l)	Total P (ug /l)
Station 3	6.23	5.5	0.65	0.28	1.5	121	12
Station 4	6.00	5.8	1.14	0.43	<1.0	111	11
Station 5	5.69	4.5	0.51	0.26	<1.0	104	10
Station 6	5.68	3.6	0.54	0.21	<1.0	114	10

(a) Sample date: April 11, 2005
(b) The above water quality measurements characterize the existing marine environment at the time of sampling, and do not set baseline values or determine compliance with Guam's Water Quality Standards. Nonetheless, results can be evaluated against the water quality criteria for embayments as long as the limitations are realized.

Table 3-19 shows that, dissolved oxygen was high at all stations and Station 2, situated on the ocean side of Glass Breakwater, was supersaturated with respect to oxygen.

Turbidity levels for all stations except Station 4 were between 0.46 and 0.64 NTU. In general, chlorophyll levels were low and ranged from 0.09 to 0.47 µg/l. Water quality at Station 4 is indicative of the waters flowing out of Piti Channel from the shallow basin where power plant effluent waters are discharged and daily vessel traffic resuspends fine bottom sediments. On average, Station 4 had twice the turbidity (1.14 NTU) of other stations (0.67 NTU), elevated TSS (5.8 mg/l), the highest average chlorophyll concentration (0.43 µg/l).

Higher turbidity levels were associated with increased chlorophyll α concentrations and indicate that variation in turbidity is related to changes in chlorophyll concentration. The fact that increased chlorophyll concentrations were not associated with increased levels of nitrate+nitrite indicates that inorganic nitrogen may be limiting to marine plant productivity (algae/phytoplankton) in these waters.

Overall, nutrient levels are low and fairly uniform throughout the sampling area. The amount of inorganic nitrogen was low at all sample locations the concentration of nitrate + nitrite was 2 µg/l or less. Total nitrogen ranged from 91 to 138 µg/l, (highest and lowest values recorded at Station 1) with an overall mean of 112 µg/l. Average total phosphorus was highest at shallow nearshore Station 1 (13.5 µg/l) and lowest at deepwater Station 5 and Station 6 (10.0 µg/l).

All of the water quality parameters measured are in compliance with M-2 and M-3 water quality standards. Also, with the exception of TSS and one value for turbidity, all measured water quality parameters were in compliance with M-1 standards. In fact, recorded nitrate-nitrite concentrations were two orders of magnitude lower than M-1 standards and often present in undetectable amounts. This demonstrates that nutrient-enrichment is not an issue of concern in the outer harbor area and that water quality is generally excellent in the Proposed Project vicinity.

3.11.2.2 Coral Reefs

Coral reef ecosystems in U.S. and Territorial waters are afforded special protection under several regulatory programs including the CWA Section 404 regulatory program. Section 404 of the CWA provides for a permit program to regulate the discharge of dredged or fill material into waters of the United States. The CWA Section 404 Guidelines establish a higher level of review for activities affecting special aquatic sites. The Guidelines specifically recognize coral reefs as one of only five examples of special aquatic sites deserving this higher level of protection. Special Aquatic Sites are generally characterized as "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. Coral reefs are discussed in further detail in Section 3.12

3.11.2.3 Marine Sediments

In an effort to address concerns over sediment contamination and dredge material in the harbors of Guam, the GEPA in cooperation with the GCMP and the University of Guam's Water and Environmental Research Institute initiated a three-year sediment study in 1996. The study was completed in 1999 and GEPA published the final report in September 2000 under the title "Management of Contaminated Harbor Sediments in Guam. Guam Harbors Sediment Project, Phase III, Final Report (hereafter referred to as the GHSP).

The GHSP began with a first-year analysis of sediments, followed the second-year analysis of contaminants in harbor organisms and culminating in a study of controls on impacts of sediment contamination on Guam.

Under the GHSP sediment samples were analyzed for contamination by arsenic, cadmium, copper, chromium, mercury, nickel, lead, silver, tin, zinc, polychlorinated biphenyls (PCB's), and polycyclic aromatic hydrocarbons (PAH's). Results showed enrichment of all the contaminant groups at Agana Boat Basin, Outer Apra Harbor, and Merizo Pier. Overall, the majority of sites were found to be relatively clean, compared to harbors world-wide.

The GHSP found that the highest levels of contaminants were at Apra Harbor, where moderate to heavy enrichment of copper, lead, mercury, tin, zinc, PCB's and PAH's were identified in sediments collected near Hotel Wharf, Commercial Port and Dry Dock Island (GEPA, 2000).

Marine organisms were sampled in Guam harbors and their tissues were analyzed for contaminants previously measured in sediments. A wide variety of organisms was screened to help assess appropriateness of various possible indicator species. Of these, only the octopus and the bony fishes are regularly consumed on Guam, while the bivalves, mantis shrimp and one of the sea cucumbers are rarely harvested for food and none of the other organisms are eaten. Contaminants measured were arsenic,

cadmium, copper, chromium, mercury, nickel, lead, silver, tin, zinc, PCB's (PCB homologues and congeners were addressed) and PAH's. Mild levels of arsenic, copper, lead, mercury, tin and PCB's were recorded in certain biota at localized sites, mostly in Apra Harbor (Ibid).

Although the Proposed Project is located within the Outer Apra Harbor, it should be noted that Inner Apra Harbor may have the highest levels of sediment contamination on Guam, based on limited sampling for the Navy which showed, for example, elevated levels of tin, probably related to antifouling tributyl tin on ships, which were several times as high as sampled in other Guam harbors (Marine Research Consultants, Inc., 1992). These tin levels rank among the highest concentrations ever recorded in harbor sediments world-wide (Denton *et al.*, 1997).

3.11.3 Significance Criteria

For the purposes of the EIS water quality impacts would be considered significant if a project:

- Violates Federal, or Territorial water quality standards or objectives
- Increases contaminant levels in the marine sediments, water column, or biota to levels shown to have potential to harm marine organisms, even if the levels do not exceed the formal water quality criteria;
- Changes background levels of chemical and physical constituents or causes elevated turbidity that would produce long-term changes in the receiving environment of the site, area, or region that would impair the beneficial uses of the receiving water
- Causes resuspension of contaminated bottom sediments that would degrade the quality of water in violation of Federal or Territorial agency water quality standards or objectives

3.11.4 Environmental Consequences

Under the No Action Alternative there would be no direct adverse impacts to the existing surrounding coastal waters. No wharf improvements or land reclamation activities would occur and surrounding nearshore waters would not be disrupted by project-related construction or operational activities in either the short-term or long-term.

However, it should be noted that under the No Action Alternative adverse impacts to the marine environment resulting from disturbed harbor sediments could potentially be greater than impacts incurred as a result of any of the considered alternatives. This possibility is based on the conclusions presented in the GHSP which notes that "Storms and typhoons, which regularly impact Guam, may generate waves and currents which stir up harbor sediments as much as dredging, but preclude the controls and management measures that can be applied to permitted dredging. In other words,

contaminated sediments in Guam harbors may lead to worse impacts than would be caused by dredging, even in the absence of dredging" (GEPA, 2000).

Additionally, under the No Action Alternative increasing traffic conditions at the existing commercial dock could contribute to increased vessel congestion and create an environment where the risk direct water quality impacts from vessel collisions and groundings may increase. Vessel collisions or groundings may result in the release of petroleum products into the harbor, posing a serious contamination threat. The extended residence time for released petroleum products within Apra Harbor would contribute to an elevated risk of potential adverse impacts to water quality and other marine resources.

Under the three remaining reasonable alternatives potential impacts relating to water quality would in large part be similar regardless of project location and/or design. Thus, for the remainder of this section, analysis of potential impacts relating to water quality were not differentiated by alternative but rather addressed collectively for the proposed improvements.

Potential impacts to coastal water quality at Apra Harbor could result from either construction or operational activities associated with the proposed improvements. In particular, the impacts to water quality from dredging and/or resuspension of bottom sediments pose the greatest potential to adversely impact water quality. Potential impacts resulting from these activities are further discussed below.

3.11.4.1 Marine Sediments

Potential Impacts on Human Health

Physical contact with sediment contaminants found in Guam harbors, at the levels noted in the GHSP, would not pose a notable health risk. Ingestion of measurable amounts of the contaminated sediments would also not reasonably be expected. However, sources of health risk may arise through uptake of contaminated sediments or their pollutants by harbor organisms and passage through food chains to human consumers. Bio-accumulation of heavy metals and PCB's from sediments potentially can make marine organisms unacceptable for human consumption (GEPA, 2000).

PCB's are potentially toxic even in very small concentrations, greater than an order of magnitude less than other contaminants studied in Guam sediments. They are linked to increased cancer risks, disruption of women's reproductive function and to neurobehavioral and developmental problems in children born to women exposed to PCB's and are also associated with other systemic effects (e.g., liver disease and diabetes, compromised immune function, and thyroid effects).

A comparative analysis of PCB levels in organisms in Guam harbors with levels in related species elsewhere indicates only mild enrichment extending to moderate levels in certain species at localized sites in Apra Harbor (*Caranx melampygus* at Dry Dock

Island and *Monodactylus argentius* at the western end of Commercial Port). The highest value of PCB's recorded from Guam samples is an order of magnitude below the US Food and Drug Administration's food standard (GEPA, 2000, Denton, et al. 1999).

The levels of copper and zinc in filter feeding oysters from Agana Boat Basin and parts of Apra Harbor exceed standards applied in Australia for fishery products. However, these metals are not usually causes of seafood poisoning. A single octopus from Apra Harbor had arsenic concentrations comparable to those found in related species in other countries, but could cause deleterious health effects to a person consuming in excess of 60 grams of this per day (Denton et al., 1999).

There have been no reported cases of shellfish contamination in recent years anywhere on Guam. Typical shellfish poisoning as seen in Palau, the Philippines and many temperate coastal areas is triggered by toxins produced in single celled planktonic dinoflagellates and related organisms filtered and concentrated by oysters and other bivalves, not by sediment contaminants.

Recent and more common seafood toxicity recorded in Guam involves bacterial toxicity (including histamine poisoning, from poorly handled fish catches) and ciguatera from reef fishes, both of which are unrelated to chemical contaminants in harbor sediments. Ciguatera causes serious and sometimes deadly toxins to enter the food chain from sources of benthic epiphytic dinoflagellates living on reef crest macroalgae at unpredictable localized sites. Damage to coral reef crest and reef margin zones and deposit of iron sources into these habitats have been suspected to contribute to ciguatera occurrence, but contaminated harbor sediments have not been linked to this toxicity, which arises in normal salinity, high wave action areas (Gawel, 1984).

Potential Impacts on Natural Resources

The pollutant chemicals of concern in Guam harbor sediments may have adverse effects on the survival, development, growth or reproduction of marine organisms and can greatly modify diversity and composition of marine communities. Contaminants suspended/re-suspended in the water column by dredging could chemically alter coral gametes and larvae, and prevent normal fertilization and development.

Copper and organic tin are well known inhibitors of fouling organisms and undoubtedly are toxic to marine invertebrates, especially their juvenile stages. The University of Guam studies have shown copper's impacts on larvae of a common species of sea urchin from Guam's reefs (GEPA, 2000).

Copper can be acutely or chronically toxic to aquatic organisms through exposure in water or in sediments. But if copper is not at levels of immediate toxicity, organisms tend to regulate its intake and use it as an essential nutrient (USEPA, 1997).

The main ecological threat of PCBs is not through direct exposure and acute toxicity,

but through accumulations through food chains. Reproductive impairment in high trophic level species is the more typical negative impact of PCBs (USEPA, 1997). They have also been linked to deformities in wildlife. PCBs are known to induce catalyses that impact enzymatic activities in marine life, which may harm organisms directly or increase their sensitivity to other pollutants in their environment (Monosson and Stegeman, 1991).

3.11.4.2 Construction Impacts

Construction-related activities would temporarily increase turbidity of the water column during dredging and pier construction. Increased turbidity could potentially harm remaining coral communities in the harbors. High levels of suspended sediment in the water column may cause siltation-induced stresses to corals and filter feeding invertebrates in the outer harbor. The species-rich reef slope surrounding Piti Point and the species rich coral reef community at Jade Shoals are vulnerable to siltation impacts. Furthermore, the disturbance and mixing of bottom sediments into the water column could result in secondary impacts to the harbors benthic communities by lowering dissolved oxygen (DO) levels and increasing nitrogen and phosphorus levels.

The dredging for construction of a new wharf would result in the formation and transport of a turbid suspended sediment plume in the harbor. A coastal engineering assessment was prepared in support of this EIS to determine potential impacts from a sediment plume as a result of dredging activities. The coastal engineering assessment is attached as Appendix G. As previously noted in Section 2.4.2.1, although it is preferred to utilize hydraulic dredging methods, as a worst case scenario, sedimiment plume analysis was based on mechanical dredge methods utilizing a clamshell/bucket.

Plume transport and mixing in coastal waters is a complex process that depends on the characteristics of both the discharge plume and the ambient receiving waters. The plume would be transported and dispersed due to currents driven by winds and tides, and modified by local and regional bathymetric features. Methods for defining the dredge plume, or amount of dredge material released into a water column can be described as a percentage of material lost or relaeased from the total dredging production rate (Sea Engineering, 2005, DOER, 2000).

Since a dredge plume is defined by a concentration of suspended sediment in a water column, to adequately characterize a potential dredge plume for impact analysis modeling requires information on the following key input variables briefly discussed below.

1. Amount of suspended sediment released into the water (TSS load) - the amount of suspended sediment released into the water column can be determined as a percentage of the total dredging production rate. Based upon existing industry operational data, average clamshell production rates in hard material are approximately 1,000 cubic yards per day (760 cubic meters). For impact analysis purposes in this EIS a higher dredging rate of 2,000 cubic yards per day

was used as a worst case scenario because dredge plume creation, and thus possible environmental impacts, would be greatest during periods of sustained maximum dredging. A daily dredging rate of 2,000 cubic yards corresponds to a rate of 74 lbs. of material removed per second.

2. TSS grain size distribution - The transport and deposition of the suspended sediment in the dredge plume depends on the current patterns and the grain size distribution of the suspended sediment. Larger grains settle rapidly through the water column and will be deposited close to the dredging, while fine-grained material (silt and clay) will remain suspended for long periods of time, and will likely be transported out of the project area. For impact modeling purposes measured suspended solids grain size distributions were based on operational data from a hydraulic dredge project in Kawaihae Harbor on the island of Hawaii. This is the only known published information on grain size distribution resulting from dredging in reef environments, and was considered to reasonably represent the suspended grain size characteristics near a dredge source.

3. Water Column distribution of TSS - The amount of material spilled or released from the clamshell bucket into the water will vary with depth in the water. Typically, material is released in decreasing amounts from bottom to surface. Based on existing modeling studies show that typically 40% of the material is released in the bottom 20% of the water column, decreasing to 5% of the material in the uppermost 20% of the water (Sea Engineering, 2005 DOER, 2000).

In assessing the dredge plume impacts to water quality a three-dimensional circulation and transport model of the project area was developed using the Environmental Fluid Dynamics Code (EFDC). The model included wind and tide forcing; the dredge plume was simulated by loading the water column with specified quantities of suspended sediment composed of 5 different grain sizes. The model calculated transport, dispersion and deposition of the plume suspended sediments. The modeling results can be considered representative of the general impact footprints, assuming the general wind-driven currents that prevail in the area. During the actual dredging operations, however, different wind and current conditions may occur that will result in different transport patterns.

Three model cases were completed, simulating different wind forcing conditions and total suspended solids (TSS) loading. The TSS loading is simulated by assuming that a specified percentage of the material being dredged is released (or spilled) into the water column. The release rates utilized included an average value of 0.45%, and a worst-case value of 4%. Wind conditions included steady 15mph (7 m/s) trade winds, and the measured trade wind time series for April 8 to 11. An average release rate of 0.45% results in surface TSS plumes and sediment deposition being confined to the immediate vicinity of the dredging. TSS concentrations in the surface plume exceeded background levels only within 110 yards of the dredge site. TSS concentrations exceeding 2 mg/L extend about 546 yards east of the dredge site. The limited surface plumes are partly

attributable to the vertical distribution of sediment release in the water column. The analysis assumed that the amount of material released into the water column decreases from 40% in the bottom 20% of water to 5% in the surface 20%. This distribution assumes that best management practices are adhered to during construction that minimize the amount of spillage and barge overflow during dredge material loading. Sediment deposition of greater than 0.2 mm is confined to within 60 meters of the dredge site. A sediment deposition of 0.2 mm represents a conservative, outer bound for possible impacts due to sedimentation (Sea Engineering, 2005).

Worst case scenarios were analyzed by assuming a release rate of 4%, the highest figure found in the literature for clamshell dredging operations. The model results showed that during worst case TSS loading a TSS plume exceeding background levels of 5mg/L could extend 1,094 yards to the west along the shoreline, and thus, could impact Family Beach and Hotel Wharf Beach. The primary zone of sediment deposition extends to the west of the dredge site, following the initial transport of the plume. Sediment deposition greater than 0.2 mm occurs to a distance of 656 yards from the dredge site.

The time series plots of the dredge plume concentrations show that during both average and worst case loading scenarios, the dredge plumes dissipate rapidly, usually within 2 to 3 hours after the dredging has stopped.

The material to be dredged has not been sampled or analyzed for chemical constituent makeup. The sediments to be dredged would first need to undergo analysis in order to determine potential release of chemical constituents into the adjacent coastal waters. However, the proposed dredged material would be utilized for beneficial purposed in constructing backlands for the proposed deep-draft wharf and in the proposed reclamation sites. The chemical constituents of the dredged material generated during wharf construction would be the same as those of the sediments in Outer Apra Harbor. Likewise, the chemical constituents of any runoff from the dredged material placed the proposed in reclamation sites would be the same as those in the adjacent bay.

3.11.4.3 Operational-Related Impacts

Operational impacts on water quality could result from increased harbor traffic and/or contaminant discharges. Additionally, with the construction of a new, deep darft wharf there is always a possibility of leakage or accidental spillage of petroleum, oil, lubricant (POL), or other contaminants into harbor waters. Discharges of such materials could have an adverse impact on coastal waters within Apra Harbor. Potential contaminant discharges from vessels could result in adverse impacts to water quality within Apra Harbor.

There are several potential waste discharges from large vessels (both cargo and cruise ships) that could potentially contaminate and adversely impact harbor water quality. These include:

- Black water – sewage wastes from toilets, urinals, medical sinks and other similar facilities
- Gray water – discharges from dishwashers, showers, baths, washbasins, and laundry facilities
- Bilge water - water, oil, and grease collecting in the bilge (bottom of the ship's hull) from engine and machinery operations
- Fuel – spills or leaks from diesel fuel tanks

The numerical model EFDC was also used to model possible impacts of contaminant discharges, such as oil, during project construction or future wharf operations. Spill trajectories were simulated by releasing drifters in the model at the model dredging site at the proposed deep-draft wharf site, and from the center of proposed Reclamation Site 3. The results indicate that during typical trade wind conditions, surface spills from the project vicinity will most likely flow to the west-southwest toward the harbor entrance. Spills in the area of the proposed deep-draft wharf site would reach the entrance channel over a period of approximately 1.4 days, and spills occurring in the vicinity of proposed Reclamation Site 3 would reach the entrance channel over a period of approximately 1.7 days (Sea Engineering, 2005)

The proposed improvements are primarily intended to provide new berthing facilities to accommodate large Post-Panamax cargo vessel traffic. The resultant in water movement and docking of vessels at the proposed deep-draft wharf facilities would result in the re-suspension of bottom sediments, increased turbidity of the water column, and other associated particulate-related impacts.

Vessel movement and maneuvering within Apra Harbor's waters would result in re-suspension of bottom sediments due to turbulent water motions induced by ships' screws and thrusters. As a result, water quality in the harbor would be adversely impacted. Direct impacts from harbor traffic would be the re-suspension of bottom sediments. Sediment re-suspension would result in increased turbidity and suspended solid levels in the water column, which would in turn result in an increase and decrease in nutrient concentrations (nitrogen and phosphorus) and dissolved oxygen levels, respectively. Additionally, transport of re-suspended sediments out of the harbor could possibly have a negative impact on benthic reef communities in nearby open coastal waters (AECOS, 2006).

In the longterm, the proposed improvements would result in an increased amount of impervious surface area surrounding the harbor. Increased impervious surfaces could lead to increased stormwater runoff into Apra Harbor. Stormwater from paved areas at the project sites might include dust and grit from paved areas and rooftops. Small quantities of oil and grease and Total Petroleum Hydrocarbons (TPHs) similar to those found in surface runoff from parking lots and roadways and washings of vehicles may also occur in the stormwater.

It is expected that there would be no significant quantities of nutrients, BOD, toxic

substances, PCBs, pesticides, fecal coliform, and heated or saline water associated with stormwater discharges from the Proposed Project.

In summary, all considered alternatives (with the exception of the No Action Alternative) with appropriate mitigation measures would result in less than significant impacts to water quality and sediment resources.

3.11.5 Proposed and Potential Mitigation Measures

Prior to construction, PAG will comply with all applicable federal and territorial laws and regulations, including but not limited to, obtaining a DA permit for Section 10 RHA and Section 404 CWA, and a Section 401 WQC and NPDES authorization from Guam EPA. All permit requirements and special conditions will be implemented in their entirety. Dredging activities would include best management practices (BMPs) to minimize water quality impacts.

As previously noted in Section 3.11.1.1 sediment that would be dredged as part of the Proposed Project would need to be analyzed for contaminant risk per ITM guidance. Contaminants suspended/re-suspended in the water column by dredging have the potential to chemically alter coral gametes and larvae, and prevent normal fertilization and development. Dredged sediment would be staged, dewatered, and otherwise handled in accordance with applicable GEPA laws and regulations.

Should a CDF be constructed to manage contaminated sediments, the CDF would be lined and managed to prevent contaminants from entering soil and ground water. Also, the CDF would be netted to prevent migratory bird exposure to possible contaminated sediment through dermal contact or ingestion of water or invertebrates that may be contained within the sediment.

During the construction phase, the quality of stormwater runoff would be controlled by provisions of the NPDES permit for construction activities and BMPs. These may include implementation of a SWMPP plan, use of sedimentation basins, frequent inspections of temporary stormwater control facilities by construction personnel, and proper operation and maintenance of such facilities during the construction period.

Details of a SWMPP plan and BMPs for the proposed alternative have not been developed. Unknown factors such as pile driver size and type, construction equipment to be used, construction site staging areas, etc. would determine the most effective BMP's in mitigating construction related impacts on coastal waters. Mitigation measures may include, but not be limited to, the on-site utilization of the following BMPs:

- Conduct background water quality analysis to reduce potential impacts from construction, a background water quality analysis could be conducted in each harbor prior to commencement of initial construction activities. Throughout the remainder of

the construction period, regularly scheduled (preferably daily) monitoring would continue to measure any degradation in water quality.

- Construction of silt curtains (or other silt containment devices) to limit the suspension of fine sediments from activities associated with dredging, pile installation, debris removal, and placement of fill material.

- Use of siltation basins to capture muddy water and only allow clear water to be discharged into the harbor.

- Construction of drainage swales to convey on-site runoff while limiting erosion.

- Protection of storm drains through the placement of measures around inlets and drains to trap sediment, preventing it from entering inlets and receiving waters.

- Construction of sediment traps to retain site runoff and allow suspended sediments to settle out.

- Use of soil stabilization practices designed to prevent the loss of disturbed or exposed soil areas through the use of vegetation and/or geotextiles.

- Construction-related materials would not be stockpiled in the marine environment and will be placed or stored in ways to avoid or minimize disturbance to the marine environment.

- Under-layer fills for the wharf and embayment levies would be protected from erosion with core-loc units or similar construction material as soon after placement in the water as practicable.

- All construction-related materials and equipment (dredges, barges, backhoes etc) to be placed in the water would be cleaned and reasonably free of pollutants prior to use.

- No contamination (trash or debris disposal, etc.) of the marine environment will result from construction-related activities.

- The curtailment of work during adverse sea conditions (i.e., in advance of typhoons and other storms).

- Debris extracted from harbor sediments would not be stockpiled in the marine environment and would be disposed of at an approved upland or ocean dumping site.

The small quantities of oil and grease and TPHs that may also occur in the stormwater would be controlled by provisions in the SWMPP plan, and stormwater BMPs which

would be developed. Structural and non-structural stormwater BMPs for these small quantity constituents may include:

- Use of oil and grease separators;
- Use of facilities to respond to leaking containers, such as holding tanks vacuum trucks,etc.;
- Installation of automatic samplers and flow meters at outfalls to monitor water quality of stormwater discharges

In general, construction activities are most likely to influence the water quality parameters of turbidity and TSS; therefore, turbidity should be the primary water quality monitoring parameter measured prior to, during, and post construction activities. Following BMPs for land side construction and dredging operations should greatly reduce the likelihood of significant adverse impacts to water quality.

3.12 BIOLOGICAL RESOURCES

3.12.1 Introduction

The areas proposed for the new deep draft wharf and backland areas (Figure 2-2) lie immediately to the west of Cabras Island and the existing commercial port. The area makes up the former back reef portion of Luminao Reef (the lagoon's northern barrier reef), which is now separated from the open ocean and the majority of the reef flat by the Glass Breakwater. The areas proposed for the deep-draft wharf construction and the shallow inlet areas proposed for reclamation are remnants of the back reef flat and reef slope that remained after construction of various wharves, piers, and fingers of fill. Thus, each of what are now small, shallow inlets is bordered by artificial fill of rocks and boulders, with a beach deposit formed along the backshore and a shallow reef flat extending out to a back reef slope that descends steeply into deeper water and the soft bottom sediments of the Harbor. The proposed land reclamation sites are comprised of shallow inlets generally less than 6 feet to 8 feet in depth (Paulay et al., 2004).

The physical features and ecological setting of the Proposed Project areas are summarized below:

Deep-Draft Wharf – The proposed site for the deep draft wharf is located between the eastern end of the concrete bulkhead of Hotel Wharf and the consolidated sand and rock outcropping to the west of proposed Reclamation Site 1. This area includes a narrow shallow near shore area which slopes to a depth of approximately 45 feet within 165 feet of the shore.

Reclamation Site 1 - The area comprising Reclamation Site 1 is located between Outhouse Beach and Golf Pier and is comprised of a shallow inlet with an area of

approximately 1.17 acres and water depths varying between 4 feet to 7 feet below MSL. The inlet shoreline is made up of boulder revetment at the far ends with a rocky area off the Outhouse Beach parking area, and a mixture of boulder revetment and sand in its northeast quadrant.

Reclamation Site 2 - The area comprising Reclamation Site 2 is located between Golf Pier and the Seaplane Ramp and comprises an area of approximately 2.26 acres. Water depths in this inlet are also shallow varying between 4 feet to 7 feet below MSL. This inlet area is comprised mainly of a rocky shoreline except for a small sand beach in the northeast quadrant.

Reclamation Site 3 - The area comprising Reclamation Site 3 is located at the western end of Cabras Island and comprises the area between Seaplane Ramp and Southwest Point. It is the largest of the three proposed reclamation sites covering an area of approximately 13.24 acres. This inlet area is deeper than the inlets comprising Reclamation sites 1 and 2 with water depths varying between 5 feet to 30 feet below MSL. The inlet is shallow only in the northern portion that borders Glass Breakwater as well as a narrow near shore strip along its southern portion bordering Cabras Island. The southern portion of the inlet generally has water depths up to 30 feet below MSl. However, this area of the inlet also encompasses reef slope that drops to a maximum depth of 50 feet below MSL at a distance of approximately 60 feet from the shore. The inlet shoreline is comprised of a rocky boulder revetment bordering the east perimeter and a sandy shoreline bordering the northern perimeter.

Regulatory Framework

This section presents the key Federal and Government of Guam regulations that address potential impacts to biotic communities.

Fish and Wildlife Habitat

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661 et seq.; 48 Stat. 401), as amended (FWCA) provides that water resources development programs must consider fish and wildlife conservation. Under this act, Federal agencies proposing actions, including funding of design and construction projects, which will affect any body of water, must consult with the USFWS, the NMFS, and the affected state or territory's fish and wildlife management agency. Review agencies determine the possible damage to fish and wildlife resources by a proposed activity, and develop means and measures designed to prevent the loss or damage to fish and wildlife resources. The Guam Department of Agriculture's Division of Aquatic and Wildlife Resources (DAWR) serves as the territorial fish and wildlife agency.

Pursuant to the FWCA consultation was undertaken with the USFWS to address potential project-related impacts to fish and wildlife resources. The USFWS, In coordination with other Federal and Territorial Resource agencies, prepared a draft FWCA Report in August of 2006 as part of the consultation process. The primary objective of the draft FWCA Report is to ensure that fish and wildlife conservation receives equal consideration with other Proposed Project objectives as required under the FWCA. The draft FWCA Report includes a detailed assessment of the significant fish and wildlife resources at the Proposed Project site, an evaluation of potential impacts associated with the Proposed Project design alternatives, and preliminary guidance on development of mitigation measures commensurate with anticipated fish and wildlife impacts. The draft FWCA Report is attached as Appendix I.

Essential Fish Habitat

Marine fisheries constitute economically important and renewable resources that contribute to the food supply, the economy, recreational opportunities, and the health and welfare of the nation. Growing concern about the depletion of these resources led to the creation of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (Magnuson Stevens Act). The Magnuson Stevens Act established eight Regional Fishery Management Councils (FMC) consisting of representatives with expertise in marine and anadromous fisheries from the constituent states responsible for the protection of marine fisheries.

A 1996 amendment to the Magnuson Stevens Act set forth a new mandate to identify and protect important marine and Essential Fish Habitat or (EFH). The FMCs, with assistance from the NMFS, are required to delineate EFH in fisheries management plans for all Federally managed fisheries. The purpose of addressing habitat in the Magnuson Stevens Act is to further one of the Nation's important marine resource management goals - maintaining sustainable fisheries.

Guidance and procedures for implementation of the 1996 amendments of the Magnuson Stevens Act were provided through final rules established by the NMFS in 2002 (50 CFR Sections 600.805 - 600.930). These rules specify that Fisheries Management Plans (FMP) be prepared to describe and identify EFH and to identify appropriate actions to conserve and enhance those habitats. In addition, the rules establish procedures to promote the protection of EFH through interagency coordination and consultation on proposed Federal and state actions.

EFH may be designated for an individual fish species or an assemblage of species, as appropriate. It may be a subset of all areas occupied by a species. EFH is defined in the Magnuson Stevens Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

The Magnuson Stevens Act specifies that an agency shall consult with the NMFS when an activity proposed to be permitted, funded, or undertaken by a Federal agency may have adverse impacts on designated EFH. An adverse effect is any impact that reduces quality and/or quantity of EFH and may include direct (contamination or

physical disruption), indirect (loss of prey or reduction in a species fecundity), site specific, or habitat wide impacts. These impacts include individual, cumulative, or synergistic consequences of actions. In addition, NMFS is directed to comment on any state agency activities that would impact EFH.

The Western Pacific Fishery Management Council (WPFMC), was created pursuant to the Magnuson Stevens Act, to develop FMPs and manage living marine resources for fishery resources in Federal waters off the coasts of American Samoa, Guam, Hawaii, the Northern Mariana Islands and other US Pacific islands.

Wetlands

Activities involving the discharge of dredged and fill material into waters of the U.S., including wetlands, are regulated by the USACE and GEPA. This section provides a brief regulatory overview of USACE and GEPA responsibilities and oversight authority in relation to wetlands development on Guam

The USACE and the USEPA define wetlands as follows:

> "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

The Government of Guam, in its existing wetland regulations, define wetlands the same as the federal definition but includes references to aquatic life along with aquatic vegetation and makes references to mangroves, natural ponds, surface springs, and estuaries, in addition to swamps, marshes, bogs and similar areas.

Wetlands are areas that are covered by water or have waterlogged soils for long periods during the growing season. Plants growing in wetlands are capable of living in saturated soil conditions for at least part of the growing season. Wetlands such as swamps and marshes are often obvious, but some wetlands are not easily recognized because they are dry during part of the year or do not fit the appearance expectation of a swamp, marsh, or bog.

Regulatory authority for Guam's wetlands rests with the U.S. Federal Government and Government of Guam. The USACE is the primary federal agency with responsibility for wetlands. Its authority is derived mainly from Section 404 of the Clean Water Act.

Section 404 of the Clean Water Act requires that the discharge of dredged or fill material into waters of the U.S., including wetlands, must receive authorization for such activities. The USACE has been assigned responsibility for administering the permitting process under Section 404. Activities in wetlands for which permits may be required include, but are not limited to:

- Placement of fill material,
- Ditching activities when the excavated material is sidecast into wetlands,
- Levee and dike construction,
- Mechanized land clearing,
- Land leveling, and
- Most road construction.

In a parallel process, the GEPA must issue a state water quality certification under Section 401 of the Clean Water Act before impacts to wetlands may occur. The GEPA, acting under the authority of the U.S. Environmental Protection Agency, issues Water Quality Certificates through Section 401 of the federal Clean Water Act. In addition, several executive orders apply to wetlands including:

- Executive Order 78-21, which allows the Territorial Land Use Commission to designate wetlands as Areas of Particular Concern and promulgate a set of Wetland Rules and Regulations.
- Executive Order (E.O.) 119900, Protection of Wetlands, applies to all federal agencies including the military that have projects involving the wetlands.
- Executive Order 78-23, which established conservation districts to protect wetlands and other natural resources.
- Executive Order 78-20, which established flood hazard zones.
- Executive Order 90-13, which requires several local agencies to update wetland regulations.
- Executive Order 90-10, which requires that an Environmental Impact Assessment be written for all new development.

Coral Reefs

Coral Reefs are designated as "special aquatic sites" under Section 404(b)(1) of the Clean Water Act. Special aquatic sites are "geographic areas, larger or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region." (40 CFR 230.3(q-1)). As such, coral reefs are provided additional consideration for protection from any dredge or fill activity needing approval under Section 404 of the Clean Water Act.

In addition, through the Section 10 RHA and the Section 103 MPRSA application review process, impacts to coral reefs are also evaluated with other environmental impacts. Executive Order 13089 states that "all Federal agencies whose actions may affect U.S. Coral reef ecosystems shall: (a) identify their actions that may affect U.S. coral reef ecosystems; (b) utilize their programs an authorities to protect and enhance the conditions of such ecosystems; and (c) to the extent permitted by law, ensure that any actions they authorize, fund or carry out will not degrade the conditions of such ecosystems.

Coral reef ecosystems are unique and among the most complex and biologically diverse ecosystems on earth. The United States contains an estimated 6,564 square miles of coral reef habitat in Hawaii, Guam, American Samoa, Commonwealth of the Northern Mariana Islands, Florida, Texas, U.S. Virgin Islands, and Puerto Rico. The U.S. Compact States of the Republic of Palau, Federated States of Micronesia, and Republic of the Marshall Islands contain as many as 31,467 square miles of coral reef habitat (U.S. Coral Reef Task Force, 2000, Holthus et al., 1995).

Coral reef resources are important to humans because they provide a number of directly beneficial ecosystem functions and services, including coastal shore protection, diverse opportunities for jobs and recreation, sources of food and raw materials, and can have societal importance and cultural significance. However, coral reef resources have become over exploited by fishing, recreation, and other uses, and degraded by dredging and shoreline modifications, decreases in water quality, sedimentation, aquatic nuisance species or invasive native species, destructive fishing practices, vessel groundings and anchoring, disease outbreaks, and global climate change (U.S. Coral Reef Task Force, 2000).

Executive Order 13089 established the U.S. Coral Reef Task Force (CRTF), which developed the National Action Plan to Conserve Coral Reefs, a comprehensive plan for protection, restoration, and sustainable use of U.S. coral reefs. In 2000, the CRTF estimated that 10 percent of all coral reefs were degraded beyond recovery and that 30 percent were in critical condition and may die within 10 to 20 years, particularly those reefs near human populations. It was also estimated that if current pressures continue unabated, another 30 percent may perish completely by 2050 (Ibid).

A major recommended item in the National Action Plan to Conserve Coral Reefs is to assess the effectiveness of recent coral reef mitigation for Federal projects and provide guidance for future mitigation activities related to Federal actions. In the U.S. Pacific Islands (including Guam) many such actions entail permitting by the USACE under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.

3.12.2 Terrestrial Environment

Flora and Fauna

The landscape in the project area is that of a highly disturbed nature being originally created as man-made fill, and perhaps regularly cleared of much vegetation by overwash of typhoon waves. Thus, the area is colonized by salt-tolerant, fast-growing species most of which are less than 7 feet in height with the exception of ironwoods (*Casaurina equisetifolia*) and coconut palms (*Cocos nucifera*). The plants are all common coastal plants and ruderal weeds, equipped to deal with environmental conditions associated with this harsh coastal environment. The fast lands of the project area are dominated by Indian fleabane (*Pluchea indica*), beach morning glory or *alahai tasi* (*Ipomoea pes-caprae* subsp. *brasiliensis*), *tangan tangan* (*Leucaena leucocephala*), and *nanaso* (*Scaevola sericea*).

A total of twenty-two different plant species were recorded at the project site, nine of which are considered native (indigenous) to the Mariana Islands, however no endangered or endemic (unique to the Mariana Islands and found naturally nowhere else) plants were identified in the project area. Table 3-20 provides a listing of flora identified at the project site and provides information on species status and local abundance.

Table 3-20
Terrestrial Flora Surveyed Within Project Area

FAMILY *Genus species*	***Chamorro name,* common name**	**Status**	**Local Abundance**
	FLOWERING PLANTS		
DICOTYLEDONAE			
ASTERACEAE (COMPOSITAE)			
Bidens alba (L.) DC	---	Nat.	C
Bidens pilosa Kunth.	---	Nat.	C
indet.	---	—	O
BORAGINACEAE			
Heliotropium procumbans Mill.	---	Nat.	O
Tournefortia argentea L. fil.	*hunek*, tree heliotrope	**Ind.**	R
CASUARINACEAE			
Casuarina equisetifolia L.	*gago*, ironwood	Nat.	C
COMBRETACEAE			
Terminalia catappa L.	*talisai*, tropical almond	**Ind.**	R
CONVOLVULACEAE			
Ipomoea pes-caprae (L.) R. Br.	*alahaitasi*	**Ind.**	A
CUSCUTACEAE			
Cuscuta campestris Yuncker	dodder	Nat.	U

EUPHORBIACEAE			
Chamaesyce hirta (L.) Millsp.	garden spurge	Nat.	U
Euphorbia cyathophora Murray	dwarf poinsettia	Nat.	U
Euphorbia sp.	---	Nat.	R
FABACEAE			
Leucaena leucocephala (Lam.) deWit	*tangan tangan*	Nat.	A
Macroptilium atropurpureum (DC) Urb.	---	Nat.	U
GOODENIACEAE			
Scaevola sericea Vahl	*nonasu*	**Ind.**	C
LAURACEAE			
Cassytha filiformis L.	false dodder	Nat.	U
LYTHRACEAE			
Pemphis acidula	*nigas*	**Ind.**	U
MALVACEAE			
Hibiscus tiliaceus L.	*pago*	**Ind.**	C
Thespesia populnea L.	*banalo, kilulu*	**Ind.**	O
RHAMNACEAE			
Colubrina asiatica (L.) Lam.	*gasoso*	**Ind.**	A
SCROPHULARIACEAE			
Bacopa procumbans (Miller) Greenman	---	Nat.	U
VERBENACEAE			
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	Nat.	
MONOCOTYLEDONAE			
ARECACEAE			
Cocos nucifera L.	*niyok*, coconut palm	**Ind.**	O
CYPERACEAE			
Cyperus ligularis L.	---	Nat.	U
Cyperus polystachyos Rott.	---	Nat.	C
indet.	---		
POACEAE (GRAMINEAE)			
Cenchrus echinatus L.	sandbur	Nat.	U
Chloris radiata (L.) Sw.	radiate finger grass	Nat.	
Cynodon dactylon Kuntze	Bermuda grass	Nat.	
Dactyloctenium aegyptium (L.) Willd.	beach wiregrass	Nat.	

Status = distributional status
- **End.** = endemic; native to the Mariana Islands and found naturally nowhere else.
- **Ind.** = indigenous; native to the Mariana Islands, but not unique to the Marina Islands.
- Nat. = naturalized, exotic, plant introduced and well-established outside of cultivation.
- Orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).

Abundance = occurrence ratings for plants by area on April 10, 2005
- R = Rare - only one or two plants seen.
- U = Uncommon - several to a dozen plants observed.
- O = Occasional - found regularly, but not abundant anywhere.
- C = Common - considered an important part of the vegetation and observed numerous times.
- A = Abundant - found in large numbers; may be locally dominant.
- AA = Abundant - abundant and dominant; defining vegetation type.
- P = Present - noted just outside of study area; abundance not recorded.

Given the highly disturbed and developed character of the project areas, terrestrial fauna was not observed during the biological reconnaissance survey. Considering the project site characteristics and the urban and industrial nature of the immediate surrounding areas it terrestrial fauna which might be expected to occur in the project areas include feral animals such as cats (*Felix domesticus*), rats (*Rattus spp.*), and dogs (*Canis familiaris).*

Wetlands

Guam has considerably more wetlands and a wider variety of types than any of the other Mariana Islands. All of its rivers and nearly all wetlands occur in the southern and central parts of the island, where clay or argillaceous limestone soils retard water percolation and permit surface waters to accumulate. Many interior wetlands are located along the upper drainages of rivers and smaller tributaries. In contrast, the northern limestone plateau allows rapid water seepage, and consequently only a few marshy areas and ephemeral streams exist in the vicinity of Mt Santa Rosa.

Guam's wetlands act as natural filters and settling ponds for eroded soils, thereby greatly reducing the amount of sediment dumped on the island's fringing coral reefs. These reefs are a major source of fish for local fishermen and an important tourist attraction. Mangroves serve as important breeding areas for a wide variety of harvestable reef fish. The Agana Swamp has long played a beneficial role by limiting downstream flooding in the city of Agana.

Substantial losses of wetland have occurred historically on Guam, although it is difficult to quantify the extent of the losses. Reclamation of wetlands by the U.S. military was extensive in and around Apra Harbor from 1945 to 1950 during the expansion of port facilities by the Navy. An estimated 1,235 acres of land area was filled during this period, and involved the destruction of mangrove communities fringing the eastern harbor and freshwater wetlands along the Sasa, Atantano and Namo Rivers and at the present-day Naval Station (Wiles and Ritter, 2006).

Historically, four species of birds were dependent on Guam's wetlands. Three of these, the Marianas Mallard (*Anas oustaleti*), White-browed Crake (*Porzana cinerea*) and Nightingale Reed-warbler (*Acrocephalus luscinia*), became extirpated between 1945 and 1970. The fourth species, the Common Moorhen, is endangered and has an estimated population of only 100-125 birds (USFWS, 2006)

Small numbers of migratory shorebirds, ducks and herons annually visit and overwinter in the island's wetlands. Yellow Bitterns (*Ixobrychus sinensis*) commonly nest and feed in freshwater marshes (Wiles and Ritter, 2006).

According to estimates made from the USFWS National Wetland Inventory mapping project for Guam, issued in 1983, today Guam's wetland resources total approximately 5,000 acres. This acerage equals slightly less than four percent of the islands total land area (GEPA, 2005).

Guam's wetlands fall into four of the major wetland categories (with larger sites often having more than one type) used by the USFWS to describe wetlands and are as follows:

1. Palustrine, forested; (freshwater swamps of woody vegetation). 2,170 acres in river valleys in southern Guam. Primarily Hibiscus and Pandanus typically along edges of emergent wetland areas and in areas with less water than emergent wetlands. In the Talofofo River valley there is an extensive forested wetland which is dominated by Barringtoinia racemosa.

2. Palustrine, emergent; (freshwater marshes dominated by reeds and sedges) 1,386 acres typically dominated by Phragmites karka. The largest is the Agana Marsh.

3. Lacustrine , (manmade open water impoundments); 27 acres; wetland margins of the fena reservoir and small man made ponds. Small in area but important as habitat for the endangered Mariana common moorhen.

4. Estuarine (mangrove and lower channels of rivers) 176 acres primarily mangroves located within the inner Apra harbor area and to a lesser extent in Merizo.

Estuarine wetlands are the main wetland type that occur in the Apra harbor vicinity. Estuarine wetlands occur in areas of tidal intrusion or brackish water, and consist primarily of mangroves and the lower channels of rivers. These habitats are facilitated by a daily tidal variation. The largest concentrations of mangroves exist along the eastern shores of Apra Harbor, with smaller zones present in Merizo and Inarajan. Guam's mangroves are the most extensive and diverse in the Mariana Islands. Species include *Rhizophora mucronata*, *R. apiculata*, *Bruguiera gymnorrhiza*, *Avicennia marina*, *Lumnitzera littorea*, *Nypa fruticans*, *Xylocarpus moluccensis*, *Heritiera littoralis*, *Hibiscus tiliaceus* and *Acrostichum aureum*. Nine of the island's 46 rivers that empty into the ocean have true estuarine zones. *Nypa fruticans* is a common indicator plant of river zones with brackish water regimes. Marshes of bulrushes (*Scirpus littoralis*) are a third estuarine community, and are found at several locations in the Apra Harbor vicinity. The largest area is the artificial San Luis Ponds (Wiles and Ritter, 2006).

The mangroves in Apra Harbor serve as nursery grounds for jacks (Carangidae), barracudas (Sphyraenidae), snappers (Lutjanidae) and groupers (Serranidae) (G. Davis, pers. comm). Estuarine areas are also inhabited by adult ponyfish (Leiognathidae), rabbitfish (Siganidae), mojarras (Gerreidae), milkfish (*Chanos chanos*), mullets (Mugilidae), mudskippers (*Periophthalmus koelreuteri*), crabs (*Uca* spp., *Cardisoma carnifex* and *Scylla serrata*) and various snails, clams and oysters (Wiles and Ritter, 2006).

No delineated wetlands are known to occur within the Proposed Project areas. However, six wetlands occur within the vicinity of the project area, the nearest of which is the Sasa Bay Wetland situated approximately one mile to the east of the project site.

Figure 3-10 shows the locations of the six wetlands nearest to the project site, and each is briefly discussed in further detail below.

Sasa Bay Wetlands – This is a large coastal wetland approximately 250 acres in size and contains the largest stand of mangroves in the Marianas. It is located approximately one mile to the east of the Proposed Project site along the southern shorelines of Sasa Bay in eastern Apra Harbor. The wetland occurs on flat low-lying ground with both freshwater and estuarine habitats present. Marine Drive divides the wetland into two areas and acts as a dike by altering drainage patterns. The largest portion of the wetland (approximately 160 acres), occurs west of Marine Drive. The wetland contains a variety of plant communities. Mangroves occupy almost 30% of the entire wetland with *Rhizophora mucronata*, *R. apiculata*, *Bruguiera gymnorrhiza*, *Avicennia marina* and *Lumnitzera littorea* being the dominant species A few *Heritiera littoralis*, *Terminalia catappa* and *Hernandia sonora* grow along the back edges of the mangroves, as does a small grove of *Nypa fruticans* near the Sasa River (Wiles and Ritter, 2006).

San Luis Ponds – This wetland is roughly 18.5 acres in size and is located within the Apra Harbor Naval Reservation approximately 1.5 miles to the south of the project site on the Orote Peninsula. It is comprised of two man-made estuarine ponds. Both ponds support lush beds of Scirpus littoralis, with Acrostichum aureum growing along many of the edges. The shorelines of the ponds support dense weedy growth (Wollastonia biflora and Pluchea x fosbergii) and some woody vegetation, primarily Casuarina equisetifolia, Leucaena leucocephala and Thespesia populnea. Mature limestone forest grows on the hillside to the south. Common Moorhens (*Gallinula chloropus guami*) have at ponds at least part of the year, but their occurrence is not well documented and historic sightings have been few. Yellow Bitterns (*Ixobrychus sinensis*) also use the ponds. The ponds also support dense populations of two species of tilapia (*Oreochromis mossambicus* and *Tilapia zilli*) and flagtails (*Kuhlia rupestris*) (Ibid).

Masso Reservoir – This wetland is a small man-made pond located approximately 1.75 miles to the east of the project site. It is approximately 5 acres in size and was built as a potable water reservoir. Approximately, 75% of the wetland is open water, with large aquatic beds of *Hygrophila difformis* common with dense stands of *Phragmites karka* grow along the southeastern and northeastern shores. Common Moorhens are seen occasionally, and aquatic fauna of within the wetland include two species of eel (*Anguilla marmorata* and *A. bicolor*), three species of gobies (*Awaous guamensis*, *Stiphodon elegans* and *Sicyopterus macrostetholepis*), a sleeper (*Eleotris fusca*) and several shrimp (*Macrobrachium lar*, *Atya* sp. and *Caridina* sp.) (Ibid).

Atatano Wetlands – This is one of Guam's largest wetlands approximately 320 acres in size. This is a large natural coastal wetland located on the southeast side of Apra Harbor containing both freshwater and estuarine habitats. The wetland is comprised of two distinct subdivisions that are separated by Marine Drive. The area east of Marine Drive is a large freshwater marsh approximately 278 acres in size. The area to the west of Marine Drive is smaller (approximately 148 acres in size) and comprised largely of an

estuarine mangrove swamp. The freshwater marsh is dominated by monotypic stands of *Phragmites karka* and thickets of *Hibiscus tiliaceus*, *Panicum muticum* and various species of sedges. The esuarine marsh is dominated by large stands of mangrove species including, *Avicennia marina* and *Rhizophora apiculata*, *Bruguiera gymnorrhiza* and *R. mucronata.* Common Moorhens nest in the freshwater marsh, but their abundance and seasonal occurrence are poorly known. Yellow Bitterns (*Ixobrychus sinensis*) also make use of this wetland. The Nightingale Reed-warbler (*Acrocephalus luscinia*), an endangered species now extinct on Guam, inhabited this wetland until 1968 (Ibid.).

Naval Station Marsh - This wetland is roughly 98 acres in size and is located within the Apra Harbor Naval Reservation approximately 3 miles to the south of the project site. It is a natural wetland dominated by dense beds of *Phragmites karka* and *Panicum muticum.* Several small areas of open water occur near the north end of the marsh and cover only 2% of the total wetland area. A few scattered mangrove trees (*Rhizophora apiculata*) also grow in the northern end, which is nearest the southern shores of Inner Apra Harbor. Small numbers of Common Moorhens were regularly seen here in the past, but increasingly dense reed beds have resulted in fewer sightings. It is likely that Common Moorhen nesting has occurred within this wetland. Additionally, small migratory flocks of Cattle Egrets (*Bubulcus ibis*) roost in the mangrove trees during the fall and winter months of most years (Ibid).

Shell Oil Wetlands – This wetland consists of a group of four small ponds located on the grounds of the Shell Oil refinery complex approximately, 3 miles southeast of the project site. The four ponds are man-made and combined comprise an area of approximately 5.5 acres. Vegetation within the ponds varies considerably comprised of a wide range of species including, *Panicum muticum, Panicium muticum*, *Saccharum spontaneum*, *Fuirena umbellata*, *Eleocharis geniculata*, *Fimbristylis* sp., *Phragmites karka, Leucaena leucocephala*, *Hibiscus tiliaceus*, *Vitex parviflora*, *Cocos nucifera* and *Casuarina equisetifolia.* The ponds are used extensively by Common Moorhens. Pairs of moorhens inhabit each pond for part or all of the year, with regular nesting occurring in at least three ponds. A variety of migratory ducks, shorebirds and egrets visit the site in small numbers (Ibid.).

3.12.3 Marine Environment

As part of the EIS effort, a biological survey of the marine environment was undertaken to characterize the biological communities and benthic environs present in the Proposed Project area. The marine biological survey is attached herein as Appendix H. Based upon the findings of the marine biological survey and the findings presented in the USFWS draft FWCA Report (discussed in Section 3.12.1 and attached as Appendix I) potential project-related impacts to the marine environment were assessed.

3.12.3.1 General

Apra Harbor has been substantially altered from its original form following the liberation of Guam in 1945. The deep water lagoon was originally bounded by the Orote peninsula along its southern shore, by the bulk of Guam along the east, and by Cabras Island along its northeastern perimeter. Luminao Reef extended as a barrier reef from Cabras Island westward for approximately 1.5 miles, giving way to Calalan Bank, a submergent barrier reef further westward. Following World War II, the Glass Breakwater was built on the top of Luminao Reef and Calalan Bank, completely enclosed Apra Harbor along its northern perimeter. Construction of the Glass breakwater reduced water interchange between the harbor and the ocean considerably, restricting circulation in and out of the harbor to the western harbor mouth.

Despite these major anthropogenic alterations Apra Harbor is home to a vibrant and thriving marine community, including well-developed reefs with some of the highest coral cover on Guam, and a diverse biota of algae, invertebrates and fish.

The immediate coastal waters to the west of Cabras Island and the waters extending from the eastern portion to the middle of the Glass Breakwater are home to important coral reef communities that provide physical habitat that supports a wide variety of ecological functions. From a biological perspective, these functions include the provision of forage, shelter, resting, nesting, and recruitment space for diverse assemblages of species, including two federally listed animals, the threatened green sea turtle (Chelonia mydas) and the endangered hawksbill sea turtle (Eretmochelys imbricata). Sea turtles are discussed in further detail in Section 3.13.

Sixty species of macrosponges, 72 species of echmoderms, and 39 species of ascidians have been recorded in Apra Harbor. In comparison 98 species of sponges, 195 species of echinoderms and 70 species of ascidians are currently known on Guam as a whole. Thus 63% of the sponges, 37% of the echinoderms and 56% of the ascidians currently known on Guam are known to occur within Apra Harbor (UOG, 1977a).

The marine environment of Apra Harbor that comprise the Proposed Project site and its immediate vicinity can be divided into three general areas. The first area comprises the western half of the Glass Breakwater and corresponds to the original back reef of Clalalan Bank. This area is under the greatest open ocean influence. This area is characterized by a steep artificial shore of limestone boulders (Glass Breakwater) that extends to a depth of approximately 15 to 20 feet. The boulders rest on solid reef pavement, interrupted by occasional sand pockets, extending as a flat to undulating shelf. This shelf breaks into a slope at a depth of 30 to 50 feet, and continues as a reef slope to depths greater than 100 feet.

The second area comprises the eastern portion of the Glass Breakwater (including the Proposed Project site) corresponds to the original backreef of Luminao Reef. This area is bounded by the artificial fill of the Glass Breakwater (boulders or beach, depending on location), a shallow fringing reef (inner remnant of Luminao Reef), and a reef slope extending toward the harbor bottom to varying depths.

The third and final area is located to the east of the site and comprises northeastern inner area of Apra Harbor. This area includes the commercial port, the dredged Piti channel, and associated sand flats and patch reefs. Much of this area has been substantially altered by human activity. The area is characterized by the prominent port facilities such as wharf walls and pier structures. Interestingly, this area contains a single well-developed patch reef which lies just south of the entrance to the Piti Channel into the harbor. This patch reef has a diverse coral community despite the overheated waters it receives, originating from the Cabras power plants and discharged through the Piti Channel. This patch reef is significant in that it holds the only known population of the coral *Pavona frondifera* on Guam. Another unique occurrence in this area is the sponge *Spirastrella dendyi,* which is common in the Piti Channel and is also found on the patch reef at the mouth of the channel (UOG, 1977b).

In general, submerged lands within the project area is comprised of four broad habitat types or zones which closely follow near-shore bathymetric contours, and can be delineated by depth throughout most of the area. The four habitat types comprising the marine environment within the project area can be categorized as 1) shallow reef flat, 2) reef crest, 3) reef slope, and 4) deep sand. The extent of these four habitat types within the project area are depicted in Figure 3-11 and are described in further detail below:

- Shallow Reef Flat - The shallow reef flat zone, is characterized by a sand bottom with algae covered rubble, sea grass, and scattered coral colonies, and generally has depths of less than 5 feet.

- Reef Crest - The reef crest occurs at a depth of about 15 feet throughout the survey area and represents a distinct transitional zone between shallow consolidated reef and reef slope. It is characterized by boulders and debris (historical fill from the creation of Glass Breakwater) on a calcareous reef matrix, with ample macro-algal cover and low to moderate amounts of live coral.

- Reef Slope - The reef slope is characterized by sand with scattered coral rubble, small boulders, fill, and natural calcareous reef material on a sloping surface. This zone is also characterized by ample algal coverage and generally high but variable live coral coverage.

- Deep Sand - The deep sand zone comprises areas greater than 40 feet and extending to the lagoon floor. It is characterized by large expanses of flat or gently sloping sand and silt, with widely scattered outcrops of live and dead coral, and with some rubble/boulder areas at depths greater than 40 feet.

The coral reef community that occurs in the shallow marine environment (reef flat, reef crest, and reef slope) is the primary habitat of concern at the Proposed Project site. This shallow marine environment functions to provide nursery areas for juvenile reef fish such as wrasses, parrotfish, surgeonfish and others; reef crest habitat, which is

characterized by boulders, rubble and sand on a calcareous reef matrix, with ample macro-algae cover and low to moderate amounts of live coral.

The deep sand habitat within the project area contains burrowing infauna (i.e., worms, crustaceans, other invertebrate groups) that supports a large forage base for selective and generalist predators (eg, goatfish [Mullidae]), which diurnally occupy the reef crest/reef slope areas and nocturnally move to adjacent deep sand habitats to forage over sand (USFWS, 2006).

Within the project area, the reef slope and deep sand zones are littered with solid waste (e.g., metallic debris, discarded batteries, cables, commercial fishing line, and other material). The reef flat areas are primarily confined to embayments situated between the filled wharf, pier, and parking areas.

Biological surveys of the project area revealed biological distribution patterns characteristic of these four zones, with each area having distinct, representative biota. A total of 256 taxa were recorded during the marine biological surveys and included a variety of algae, plant, macro-invertebrate, coral, and fish species.

Marine plant species were least abundant being represented by a single clump of seagrass *Enhalus acoroides* approximately 1 foot in diameter within the reef flat of the proposed Reclamation Site 2 project site. Coral and fish species were present in high abundance and are addressed separately in further detail in Sections 3.12.3.3 and 3.12.3.4, respectively.

A total of 16 algae species were surveyed, however the brown alga, *Padina* was the most dominant being found throughout much of the survey area. Algae species were least abundant in the reef flat zone and most abundant in the reef crest and reef slope zones. The latter two zones contained twice as many algae species than found in the reef flat zone. Table 3-21 summarizes the algae species found within the project area and identifies the habitat types in which they occur.

Table 3-21
Algae Species
Observed Within Project Area

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Cyanophyta				
Schizothrix sp.		X	X	-
Lyngbya sp.		X	X	-
Chlorophyta				
Caulerpa filicoides			X	-
Codium edulis		X	X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Halimeda opuntia		X	X	-
Halimeda sp.			X	-
Halimeda sp., cf. H. macroloba	X			-
Phaeophyta				
Dictyota bartayresii			X	-
Dictyota sp.	X		X	-
Lobophora variegata	X	X	X	-
Padina boryana & P. jonesii	X	X	X	-
Hydroclathrus clathratus	X			-
Turbinaria ornate		X		-
Rhodophyta				
Galaxaura fasciculatus		X		-
Tricleocarpa cylindrica		X		-
Gracillaria salicornia		X		-
Total Species Identified	**5**	**10**	**10**	**-**

Source: USFWS, 2006

A total of 84 non-coral, macro-invertebrate species were identified with the most abundant species belonging to the family Ascidea. Macro-invertebrates were least abundant in the reef flat zone and most abundant in the reef crest and reef slope zones. The latter two zones contained approximately three times as many algae species than found in the reef flat zone. Table 3-22, summarizes macro-invertebrate species found within the project area, and identifies the habitat type(s) in which they occur.

Table 3-22
Macro-Invertebrate Species
Observed Within Project Area

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
DARWINELLIDAE				
Chelonaplysilla sp (purple)	X	X	X	-
Chelonaplysilla sp (orange/red)			X	-
DRUINELLIDAE				
Aplysinella strongylata			X	-
CHALINIDAE				
Adocia sp		X	X	-
Haliclona osiris		X	X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
AXINELLIDAE				
Acanthella cavernosa		X		-
Acanthella sp		X	X	-
Stylissa sp		X	X	-
DICTYONELLIDAE				
Liosina granularis	X	X	X	-
NIPHATIDAE				-
Amphimedon sp			X	-
PLANCTOMYCETACEAE				
Stomatospongia micronesica			X	-
HALICHONDRIIDAE				
Axinyssa sp	X	X	X	-
Haliclona sp		X	X	-
Stylotella aurantium		X	X	-
Stylinos sp	X	X	X	-
CALLYSPONGIIDAE				
Callyspongia sp	X	X	X	-
PLAKINIDAE				
Plakina sp		X	X	-
MICROCIONIDAE				
Xestospongia exigua			X	-
Clathria eurypa		X	X	-
Clathria sp	X	X	X	-
PHLOEODICTYIDAE				
Aka sp		X	X	-
MYXILLIDAE				
Iotrochota baculilfera		X	X	-
RASPAILIIDAE				
Ceratopsion sp		X	X	-
SPONGIIDAE				
Hyrtios altum		X	X	-
Hytrios sp		X	X	-
Pellina sp		X		-
DYSIDEIDAE				
Dysidea granulosa		X	X	-
Dysidea sp		X	X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
TETILLIDAE				
Cinachyra sp		X	X	-
STICHODACTYLIDAE				
Heteractis sp		X	X	-
SERPULIDAE				
Spirobranchus giganteus			X	-
SABELLIDAE				
Sabellid sp		X	X	-
TROCHIDAE				
Trochus niloticus		X		-
TURBINIDAE				
Astrea (Astralium) rhodostoma				-
Turbo argyrostoma		X	X	-
CERITHIIDAE				
Cerithium sp		X	X	-
Rhinoclavis sinensis		X		-
VERMITIDAE				
Serpulorbis sp	X	X	X	-
STROMBIDAE				
Lambis lambis		X	X	-
L. truncata			X	-
Strombus luhuanus	X	X	X	-
S. mutabilis			X	-
MURICIDAE				
Chicoreus torrefactus		X		-
THAIDIDAE				
Morula uva			X	-
MITRIDAE				
Mitra ustulata			X	-
COSTELLARIIDAE				
Vexillum sp			X	-
CONIDAE				
Conus flavidus		X		-
CHROMODORIDIDAE				
Hypselodoris sp			X	-
AGLAJIDAE				

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Philinopsis gardineri			X	-
MYTILIDAE				
Lithophaga sp		X	X	-
PTERIOMORPHIA				
Arca sp		X	X	-
CARDIIDAE				
Fulvia australis			X	-
ISOGNOMONIDAE				
Isognomon perna		X	X	-
PECTINIDAE				
Chlamys sp			X	-
SPONDYLIDAE				
Spondylus sp		X	X	-
CHAMIDAE				
Chama pacifica		X	X	-
Chama sp		X	X	-
OCTOPODIDAE				
Octopus cyanea		X		-
Octopus sp	X	X	X	-
GONODACTYLOIDEA				
Gonodactylus sp	X		X	-
DIADEMATIDAE				
Diadema savignyi	X			-
Echinothrix calamaris	X			-
TOXOPNEUSTIDAE				
Mespilia globulus		X		-
ECHINOMETRIDAE				
Echinometra mathaei		X		-
E. oblonga	X	X	X	-
Echinostrephus acciculatus			X	-
HOTHURIIDAE				
Bohadschia argus	X	X	X	-
B. vitiensis		X	X	-
B. paradoxa	X	X		-
SYNAPTIDAE				
Euapta godeffroyi		X	X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Polyplectana sp	X	X		-
DIDEMNIDAE				
Didemnum molle		X	X	-
D. moseleyi			X	-
D. nigrum		X		-
Didemnum sp		X	X	-
CIONIDAE				
Rhopalaea circula	X	X	X	-
R. crassa		X	X	-
Rhopalaea sp	X	X		-
ASCIDIIDAE				
Ascidium sp		X	X	-
Phallusia julinea	X	X	X	-
STYELIDAE				
Polycarpa sp	X	X	X	-
P. argentata	X	X	X	-
P. cryptocarpa		X	X	-
P. papillata	X	X	X	-
Total Species Identified	**22**	**63**	**68**	**0**

Source: USFWS, 2006

Ongoing *Maristentor dinoferous* Studies at Outhouse Beach

The USFWS noted in their draft FWCA Report that the shallow marine waters of Apra Harbor near Outhouse Beach is a significant resource area for the recently discovered symbiotic association between a ciliate protozoan (*Maristentor dinoferus*) and its zooxanthellae (*Symbiodinium* – the symbiotic algae that grows in corals).

Outhouse Beach is the "type locality" for the genus, i.e., the place from which the species was first collected for description in the scientific literature and from where the official museum specimen came. The site has been studied by University of Guam researchers since 1999, in collaboration with scientists worldwide who have contributed expertise in describing the organism and studying its biochemistry and ecology.

While *Maristentor* occurs at other sites, it is uniquely abundant at Outhouse Beach, which has easy access in contrast to other sides that are offshore. The access and abundance has made possible chemical studies that would not otherwise have been possible, including determining that the pigment in the cells is structural similar to hypericin (the medicinal ingredient in St. John's Wort). A new species of the ciliate *Euplotes* (*E. uncinatus*), also with symbiotic zooxanthellae, has also been discovered at

this site; these are the only two known ciliates with zooxanthellae in the world (USFWS, 2006).

At Outhouse Beach, *Maristentor* occurs and an epiphyste on marine algae from about 5 to 20 feet depths, along the entire stretch of beach between the two capstans, and is most abundant in summer months. Individual cells cluster and appear as black spots on the seaweed and other surfaces. Although these spots may suggest disease to a casual observer, there is no reason to think that the organisms are harmful. Indeed, the black spots may serve as a visual warning to fish not to eat the organism and seaweed it is on.

A study is currently underway to determine growth and persistence of the patches of *Maristentor* and the behavioral basis for persistence versus dispersal. Semi-permanent survey markers have been placed to identify patches and these research sites are under study on short- and long-time scales (Ibid).

3.12.3.2 Coral Reefs

Healthy coral reefs provide other well-recognized ecological and natural services, such as buffering island shorelines from erosion by currents and waves. This protection typically helps support upland areas for human inhabitants and a wide variety of native terrestrial organisms, including ecosystems and species of special concern such as coastal vegetation, sea turtles and other reptiles, seabirds, shorebirds, bats, land snails and other invertebrates.

Other ecological functions provided by healthy coral reefs at Guam include the maintenance of intact near-shore marine communities that interact with pelagic or terrestrial species through complex predator, prey, or symbiotic relationships common in tropical ecosystems. For many years, coral reef resources have provided enormous benefits to the residents of Guam by supporting human activities such as subsistence harvest/fishing, cultural practices, recreational activities, and tourism. The coral reef at the Proposed Project site provides all of these ecological services to varying degrees while serving as the physical base upon which Apra Commercial Wharf operations are supported.

A total of 24 coral species were identified within the project area and immediate vicinity during the biological field surveys. The percentage of live coral colony coverage within the project area and surrounding reef varied from 0% (uncolonized) to areas approaching 100%.

In general, waters within the project area did not have a high percentage of live coral coverage. The sites proposed for construction are comprised mainly of sparsely colonized reef flat areas with scattered coral colonies of *Porites lutea* with coverage generally less than 10% of the bottom. By contrast, reefs adjacent to, but outside of the Proposed Project areas had a higher percentage of coral coverage. The areas to the west (off Dog Leg Pier) and south (off Southwest Point) appear to be the most

biologically diverse containing the highest percentage of coral coverage (AECOS, 2006).

In the area extending off of Southwest Point coral coverage was between 75 and 100%. Coral species identified in this area include *Porites rus, Lobophyllia* sp., *Sinularia* sp, *Chaetodon auriga, and Chlororus sordidus.* Coral species composition in this area may be somewhat similar to that found at the nearby Jade Shoals (located approximately 1,500 feet to the south).

A 1977 study of Jade Shoals, Sasa Bay, and Piti Channel reported that Jade Shoals was the most species diverse of the three areas studied with nearly 100 coral species documented (UOG 1977a). The other area of high coral cover identified during the surveys was also located outside of the Proposed Project area. This area is located to the west of Dog Leg Pier, on a reef finger that runs roughly parallel to the nearby shoreline of Family Beach. The coral cover at this site was more variable than at Southwest Point with coverage of about 75% in certain areas of the reef.

The shallow reef community in proposed Reclamation Site 2 is characterized primarily by both soft and hard coral colonies on sand with a water depth of approximately 5 feet. A similar assemblage was recorded in the shallows of proposed Reclamation Site 3 and is likely to be found in the other locations within the project area with similar physiography.

Corals found in Reclamation Site 2 are dominated by massive Porites sp. (most likely *Porites lutea*), *Porites rus*, and numerous soft corals of the genus, *Sinularia*. A *Astreopora sp.* colony approximately 1.5 feet in diameter was observed in this area as well. Yellow finger coral (*Porites antennuata)*, and the blue coral (*Heliopora coerulea*) were also common at this site. The shallows of proposed Reclamation Sites 1 and 3 revealed many small *Porites* colonies; in addition Reclamation Site 3 also has many large *Porites* colonies, up to approximately 3 feet in diameter (AECOS, 2006).

Actual numbers of observed coral species showed that the number of species were least abundant in the reef flat zone and most abundant in the reef crest and reef slope zones. The reef crest and reef slope zones contained approximately two times and four times the number of species ad the reef flat zone, respectively. In addition to the greater number of coral species found in the reef crest and slope zones relative to the shallow reef flat, the variation in number of individual coral colonies found in these different habitat types is notable.

A total of five coral reef colonies were observed within the shallow reef zone. In contrast, a total of 366 colonies and 1,251 colonies were observed in the reef crest and reef slope zones, respectively. Table 3-23, summarizes different coral species and the number of coral colonies found in the different habitat types within the project area.

Table 3-23
Number of Coral Colonies
Identified Within Project Area

Coral Species	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Astreopora myriophthalma	-	3	24	-
Echinophyllia cf aspera	-	-	1	-
Gardineroseris planulata	-	-	1	-
Heliopora coerulea	-	1	-	-
Herpolitha limax	-		2	-
Leptastrea purpurea	-	27	25	-
Lobophyllia corymbosa	-	-	3	-
Lobophyllia cf. hataii	-	-	1	-
Lobophyllia hemprichii	-	-	5	-
Lobophyllia cf. robusta	-	-	2	-
Montipora cf. tuberculosa	-	-	1	-
Montipora sp.	-	3	-	-
Pavona decussate	-	3	2	-
Pavona varans	-	-	1	-
Pocillopora damicornis	-	20	1	-
Porites cylindrical	-	1	43	-
Porites lobata	4	82	306	-
Porites lutea	1	113	140	-
Porites. Rus	-	30	577	-
Porites sp.	-	-	17	-
Psammocora haimeana	-	-	1	-
Sinularia sp.	-	76	43	-
Stereonephotaya sp.	-	5	-	-
Stylocoeniella armata	-	2	55	-
Total Colonies	**5**	**366**	**1,251**	**0**

Source: USFWS, 2006

During the marine biological assessment a total of eleven survey stations were established throughout the project area. One station was established within the reef flat zone, and five survey stations were established in both the reef crest and reef slope zones. Overall, coral species diversity was low relative to the number of coral colony assemblages.

As shown in Table 3-23 above, species diversity ranged from a low of only 2 species in the reef flat zone, to a high of 21 different species observed in the reef slope zone. However, the relative abundance of coral colony assemblages had a greater range of only 5 colonies in the reef flat zone to 1,251 colonies in the reef slope zone.

Table 3-24 below summarizes relative abundance of coral species and coral colonies for each habitat type within the project area. Figures 3-12 and 3-13 provide a graphical representation of coral species and colony abundance within the project area, respectively.

Table 3-24
Coral Species and Colony Abundance
Within Project Area

Survey Station #	Habitat Type	Number of Species	Number of Colonies
1	Reef Slope	12	163
2	Reef Crest	6	44
3	Reef Slope	9	167
4	Reef Crest	7	21
5	Reef Slope	14	287
6	Reef Flat	2	5
7	Reef Slope	17	489
8	Reef Slope	14	158
9	Reef Crest	8	85
10	Reef Crest	8	111
11	Reef Crest	7	105
TOTAL	**All**	**104**	**1,635**

Source: USFWS, 2006

3.12.3.3 Reef Fish

Within the project area the shallow reef flat zone is not especially rich in fishes. Several small, reef-dwelling species were recorded, including the banded goby (*Amblygobius phalaena*), white tail dascyllus or humbug fish and the oval butterfly fish (*Chaetadon trifasciatus).* A total of 33 fish species occur within the reef flat habitat type. By comparison, 104 different fish species occur in both the reef crest and slope habitats. Fish observed throughout the reef crest and slope habitat types in the project area were numerous and included species such as rabbitfish *(Siganidae*) that are culturally important, and fish such as jacks (*Carangidae*) that are recreationally and commercially important (USFWS, 2006).

The most commonly seen, identifiable reef fishes observed were the Pacific double-saddle butterflyfish (*Chaetodon ulietensis*) and the bullet head parrot fish (*Chlororus sordidus*). Numerous schools of small unidentified clupeid-like fish were also observed

throughout the surveyed area. Planktivores become most common west of Hotel Wharf and include humbug fish *(Dascyllus aruanus)*, schooling clupeid-like fishes, scissortail sergeant (*Abudefduf saxfasciatus*), and blue-streak fusilier (*Pterocaesio tile*). The most diverse genus if fish represented were the butterflyfishes with at least six species observed. The area of greatest fish diversity appears to be the inlet between Hotel Wharf and Dog Leg Pier (AECOS, 2006).

A total of 131 fish species were recorded during the field surveys. Reef crest and slope areas represent the habitat types that attract the greatest numbers, highest biomass, and most diverse fish community. The reef crest and reef slope zones each contained 104 different species of fish. By comparison, the shallow reef zone contained only 33 different species of fish. Table 3-25, summarizes macro-invertebrate species found within the project area, and identifies the habitat type(s) in which they occur.

Table 3-25
Reef Fish Species
Observed Within Project Area

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
CHAETODONTIDAE				
Chaetodon auriga	X	X	X	-
C. bennetti		X		-
C. citrinellus		X		-
C. ephippium	X	X	X	-
C. kleinii	X			-
C. lunula		X		-
C. lunulatus		X	X	-
C. ulietensis	X	X	X	-
Heniochus accuminatus	X	X	X	-
H. chrysostomus			X	-
H. monoceros		X	X	
POMACANTHIDAE				
Pomacanthus imperator		X	X	-
POMACENTRIDAE				
Abudefduf sexfasciatus		X	X	-
A. sordidus		X	X	-
Amblylglyphidodon curacao		X	X	-
Amphiprion melanopus			X	-
A. clarkii			X	-
Chromis atripectoralis			X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
C.viridis		X	X	-
C. xanthura		X	X	-
Chrysiptera brownriggii		X	X	-
C. traceyi		X	X	-
Dascyllus aruanus	X	X	X	-
D. trimaculatus		X	X	-
Plectroglyphidodon lacrymatus		X	X	-
Pomacentrus philippinus	X	X	X	-
P. vaiuli	X	X	X	-
Stegastes nigricans		X	X	-
LABRIDAE				
Anampses ceureuleopunctatus			X	-
Cheilinus chlorurus		X	X	-
C. fasciatus		X	X	-
C. trilobatus		X	X	-
C. undulatus		X	X	-
Cheilio inermis		X	X	-
Epibulus insidiator		X	X	-
Halichoeres biocellatus	X	X		-
H. hortulanus		X		-
H. margaritaceus		X		-
H. marginatus		X		-
H. trimaculatus		X	X	-
Hemigymnus fasciatus	X	X	X	-
H. melapterus		X	X	-
Labroides dimidiatus	X	X	X	-
Oxycheilinus unifasciatus			X	-
Stethojulis bandanensis		X	X	-
S. strigiventor		X	X	-
Thalassoma hardwicki		X	X	-
T. quinquevittatum		X	X	-
SCARIDAE				
C. sordidus	X	X	X	-
Hipposcarus longiceps		X	X	-
Scarus altipinnis		X	X	-
S. forsteni			X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
S. globiceps		X	X	-
S. psittacus	X	X	X	-
S. schlegeli		X	X	-
Scarus sp.		X	X	-
BLENNIDAE				
Ecsenius bicolor		X		-
Exalis brevis		X	X	-
Meiacanthus atrodorsalis		X	X	-
Salarias fasciatus	X			-
GOBIIDAE				
Amblygobius phalaena	X	X	X	-
Ctenogobiops sp.	X	X	X	-
Eviota sp.		X	X	-
Fusigobius sp.		X		-
Gnatholepis sp.		X		-
MICRODESMIDAE				
Ptereleotris microlepis	X			-
SIGANIDAE				
Siganus spinus	X	X		-
ZANCLIDAE				
Zanclus cornutus		X	X	-
ACANTHURIDAE				
Acanthurus nigricauda	X	X	X	-
A. nigrofuscus		X	X	-
A. pyroferus		X	X	-
A. thompsoni		X		-
A. triostegus		X	X	-
A. xanthopterus		X	X	-
Ctenochaetus binotatus	X	X	X	-
C. striatus	X	X	X	-
Naso annulatus	X	X	X	-
N. brevirostris		X	X	-
N. lituratus		X	X	-
N. unicornis		X	X	-
N. vlamingii		X		-
Zebrasoma flavescens		X	X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Z. veliferum		X	X	-
BOTHIDAE				
Bothus mancus		X		-
BALISTIDAE				
Balistapus undulatus		X		-
Balistoides viridescens	X	X	X	-
Rhinecanthus aculeatus	X	X		-
Sufflamen chrysoptera		X	X	-
OSTRACIIDAE				
Ostracion cubicus		X	X	-
TETRADONTIDAE				
Arothron nigropunctatus		X	X	-
Canthigaster solandri		X	X	-
C. valentini		X	X	-
MURAENIDAE				
Gymnothorax javanicus			X	-
SYNODONTIDAE				
Saurida gracilis		X	X	-
Synodus varieagatus			X	-
MUGLIDAE				
Liza vaigiensis	X			-
Valamugil seheli			X	-
ATHERINIDAE				
Atherinomorus lacunosus		X		-
HOLOCENTRIDAE				
Myripristis. berndti		X	X	-
M. violacea		X	X	-
Neoniphon sammara		X	X	-
Sargocentron caudimaculatum			X	-
S. diadema			X	-
S. microstoma			X	-
S. spiniferum		X	X	-
AULOSTOMIDAE				
Aulostomus chinensis		X	X	-
FISTULARIIDAE				
Fistularia commersonii	X		X	-

FAMILY *Genus species*	Habitat Type			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
SERRANIDAE				
Cephalopholis argus			X	-
Epinephelus merra			X	-
CIRRHITIDAE				
Amblycirrhitus bimacula	X			-
APOGONIDAE				
Apogon angustatus		X	X	-
Cheilidipterus artus		X		-
C. quinquelineata	X	X	X	-
MALACANTHIDAE				
Malacanthus latovittatus		X		-
CARANGIDAE				
Gnathanodon speciosus	X			-
Scomberoides lysan	X			-
LUTJANIDAE				
Lutjanus fulvus		X	X	-
L. gibbus		X	X	-
CAESIONIDAE				
Pterocaesio tile			X	-
GERREIDAE				
Gerres acinaces			X	-
LETHRINIDAE				
Lethrinus harak	X	X	X	-
Lethrinus obsoletus		X	X	-
Lethrinus olivaceous		X		-
Monotaxis grandoculus			X	-
NEMIPTERIDAE				
Scolopsis lineata	X	X	X	-
Pentapodus caninus			X	-
MULLIDAE				
Mulloidichthys flavolineatus		X	X	-
Parupeneus barberinus		X	X	-
P. ciliatus		X	X	-
P. cyclostomus		X	X	-
P. multifasciatus	X	X	X	-
Total Species Identified	**33**	**104**	**104**	**0**

Source: USFWS, 2006

As previously mentioned, a total of eleven survey stations were established throughout the different habitat types within the project area during the marine biological survey. Relative to corals, there was a greater diversity of fish species within the project area. The number of fish species observed ranged from the mid-30's (in the reef flat and areas of the reef slope) to the upper-50's and 60 (in the reef crest and slope zones)

Table 3-26 and Figure 3-14, respectively, summarize and depict the abundance of reef fish species observed in the habitat types throughout the project area.

Table 3-26
Reef Fish Species Abundance
Within Project Area

Survey Station #	Habitat Type	Number of Species
1	Reef Slope	55
2	Reef Crest	51
3	Reef Slope	34
4	Reef Crest	52
5	Reef Slope	51
6	Reef Flat	35
7	Reef Slope	59
8	Reef Slope	58
9	Reef Crest	56
10	Reef Crest	60
11	Reef Crest	58
TOTAL	**All**	**569**

Source: USFWS, 2006

In addition to the reef fish observed during the biological surveys, the Guam Department of Aquatic and Wildlife Resources (DAWR) provided unpublished data from fisherman catch surveys for Apra Harbor. The DAWR provided fish catch data for two survey areas within Outer Apra Harbor. For the purposes of this EIS these areas are designated: DAWR-1 and DAWR-2. Most of the fish species caught in these two areas are small abundant planktivores like the anchovy and sardine.

Area DAWR-1 refers to the area west of Family Beach out to Spanish Rocks (the western most end of the Glass Breakwater). Table 3-27 below shows top ten fisheries species caught, as an average number, between the years 1990 – 2004 in areas DAWR-1.

Table 3-27
Top ten fisheries species caught between 1990 through 2004
in area DAWR-1 (area west of Proposed Project improvements)

Species Name	Common Name	Feeding Preference	Number (Avg.)
Stolephorus indicus	Indian anchovy	herbivore/omnivore	4500
Abudefduf sexfasciatus	scissortail sergeant (*fomho*)	herbivore	63
Naso lituratus	oranges-spine unicornfish (*hangun*)	herbivore	50
Cheilinus trilobatus	tripletail wrasse (*a'aga*)	carnivore	20
Siganus spinus	scribbled rabbitfish (*hiteng* or *sesyon*)	herbivore	13
Mulloidichthys flavolineatus	yellowstripe goatfish (*satmoneten pento*)	carnivore	11
Chlorurus sordidus	multicolored parrotfish (*lagua or palakse'*)	herbivore	11
Epinephelus merra	honeycomb grouper (*gadao*)	carnivore	10
Acanthurus triostegus	convict surgeonfish (*kichu*)	herbivore	9
Abudefduf septemfasciatus	banded sergeant (*fomho*)	herbivore	7
TOTAL			**131**

Source: AECOS, 2006, DAWR, 2004

Area DAWR-2 refers to the waters that comprise the general area of the Proposed Project improvements (i.e., from the west end of Family Beach out to west end of Cabras Island). Table 3-28 below shows top ten fisheries species caught, as an average number, between the years 1990 – 2004 in areas DAWR-2.

Table 3-28
Top ten fisheries species caught between 1990 through 2004
in area DAWR-2 (general area of Proposed Project improvements)

Species Name	Common Name	Feeding Preference	Number (Avg.)
Atherinomorus lacunosus	hardyhead silverside	herbivore/omnivore	8500
Spratelloides delicatulus	delicate round herring	herbivore/omnivore	3425
Dussumieria sp. B	sardine	herbivore/omnivore	2500
Encrasicholina punctifer	buccaneer anchovy	herbivore/omnivore	2250
Encrasicholina heterolobus	shorthead anchovy	herbivore/omnivore	300
Decapterus	shortfin scad	carnivore	244

Species Name	Common Name	Feeding Preference	Number (Avg.)
macrosoma			
Nerita polita (mollusca)	polite nerite	carnivore	200
Caranx i`e (sexfasciatus?)	(*Ee*)	carnivore	123
Selar crumenophthalmus	bigeye scad (*atulai*)	carnivore	117
Lethrinus harak	blackspot emperor (*mafute'*)	carnivore	85
TOTAL			**17,744**

The data presented in the above tables are not actual numbers of fishes living in Apra Harbor. However, the data does represent useful information about fishery resources within the project area and surrounding vicinity. The data presented in Tables 3-27 and 3-28 show that approximately 4.8 times as many fish are caught within the general project area (DAWR-2), than are caught in the area immediately to the west, between Family Beach and Spanish Rocks (DAWR-1). If considered by weight, the catch is on average five and a half times higher within area DAWR-2 (366 lbs.) than in area DAWR-1 (66 lbs.).

The fish catch data also demonstrate the interesting result that within the Area DAWR-2, one half of the top ten species are carnivores, whereas the catch within DAWR-1 is dominated by herbivores and omnivores with only three carnivores making the top ten list.

Based upon DAWR fish catch data it appears that the Proposed Project area yields greater fisherman catches by numbers and biomass than the nearby waters to the west. This data suggests the area is an important area for fisherman as compared to the nearby waters to the west. However, these numbers could simply reflect the fact that a greater number of fishermen utilize the area rather than more fishes being present (AECOS, 2006).

3.12.3.4 Essential Fish Habitat (EFH)

As mentioned in Section 3.12.1, the WPFMC is responsible for the creation of FMPs for fishery resources in Federal waters off the coasts of American Samoa, Guam, Hawaii, the Northern Mariana Islands and other US Pacific islands.

Through their management efforts the WPFMC has established federally-approved thresholds to determine for overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. Based upon these established thresholds there are currently, no fisheries in Guam that have been determined by NMFS to be experiencing overfishing or to be overfished (NMFS, 2005).

EFH can consist of both the water column and the underlying surface (e.g. seafloor) of a particular area. Areas designated as EFH contain habitat essential to the long-term survival and health of our nation's fisheries. Certain properties of the water column such as temperature, nutrients, or salinity are essential to various species. Some species may require certain bottom types such as sandy or rocky bottoms, vegetation such as seagrasses or kelp, or structurally complex coral reefs.

EFH includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding, and protection functions. EFH encompasses those habitats necessary to ensure healthy fisheries now and in the future.

Habitat Area of Particular Concern (HAPC) are discrete subsets of EFH that provide important ecological functions or are especially vulnerable to degradation. Specific habitat areas may be designated as HAPC based on one or more of the following reasons:

- Importance of the ecological function provided by the habitat
- Extent to which the habitat is sensitive to human-induced environmental degradation
- Whether, and to what extent, development activities are, or will be, stressing the habitat type
- Rarity of the habitat type

The HAPC designation does not confer additional protection or restrictions upon an area, but can help prioritize conservation efforts. Healthy populations of fish require not only the relatively small habitats identified as HAPCs, but also other areas that provide suitable habitat functions. HAPCs alone will not suffice in supporting the larger numbers of fish needed to maintain sustainable fisheries and a healthy ecosystem.

The FMPs developed by the WPFMC are for: Western Pacific crustaceans; Western Pacific precious corals; bottomfish and seamount groundfish; Western Pacific pelagics; and coral reef ecosystems. The *FMP for Coral Reef Ecosystems of the Western Pacific Region* (approved in February 2004) designated Outer Apra Harbor as Essential Fish Habitat and a Habitat Area of Particular Concern.

Potential impacts to EFH would be addressed through consultation and coordination efforts with the NMFS. The Magnuson Stevens Act specifies that the NMFS must coordinate with other federal agencies to conserve and enhance EFH, and federal agencies must consult with NMFS on all actions or Proposed Projects authorized, funded, or undertaken by the agency that may adversely affect EFH. In turn NMFS must provide recommendations to federal and state agencies on such activities to conserve EFH. These recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or Proposed Projects authorized, funded, or undertaken by that agency.

3.12.4 Significance Criteria

Terrestrial Biota

For the purposes of this EIS impacts to terrestrial biological resources would be considered significant if the Proposed Project

- Results in the permanent loss of functional wetland habitat
- Causes potential for movement or migration of wildlife to be impeded;
- Would have a long-term adverse effect on federally protected wetlands, as defined by Section 404 of the CWA, through direct removal, filling, hydrological interruption, or other means
- Disturbs a substantial part of a vegetation type within the local region to the point where natural or enhanced regeneration would not restore the resource to pre-disturbance conditions for an extended period of time
- Adversely affects a species, natural community, or habitat that is recognized specifically as biologically significant in local, State, or Federal policies, statutes, or regulations
- Conflicts with provisions of an ongoing wetland restoration project; adopted Habitat Conservation Plan; Natural Community Conservation Plan; or other approved local, regional, or State habitat conservation plan or biological resource preservation policy

Marine Biota

For the purposes of this EIS impacts to marine biological resources would be considered significant if the Proposed Project:

- Substantially adversely affects, either directly or through habitat modifications, any species identified as a listed, candidate, sensitive, or special status species in local or regional plans, policies, or regulations.
- Degrades the quality of the environment, substantially reduces the habitat of marine biota species, causes marine biota species to drop below self-sustaining levels, threatens to eliminate an animal (fish) community, or reduces the range of a rare or endangered species.
- Alters or destroys habitat that prevents re-establishment of marine biological communities that inhabited the area prior to construction of the Proposed Project

- Results in long-term impacts caused by habitat disturbance (e.g., construction activities) or habitat reduction (e.g., damage to coral reef structures during construction activities).

- Exposes marine life to contaminants that could cause acute toxicity or bioaccumulation.

- Reduces quality and/or quantity of EFH as defined by the Magnuson Stevens Act. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of or injury to benthic organisms, prey species and their habitat, and other ecosystem components, that may reduce the quality and/or quantity of EFH.

- Interferes substantially with the movement of any resident fish or impedes the use of estuary or fish nursery sites.

- Conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat plan.

3.12.5 Environmental Consequences

3.12.5.1 Terrestrial Environment

No Action Alternative

Any other type of future development, such as industrial and commercial facilities, could potentially result in effects to upland biotic communities from construction and/or operation. Such effects could result in less than significant as well significant, as well as short-term or long-term adverse impacts. However, for the purposes of impacts analysis it is assumed that under the No Action Alternative the proposed wharf improvements and land reclamation would not occur and existing conditions would prevail at the Proposed Project site. Therefore under the No Action Alternative there would be less than significant impacts to the terrestrial biological resources in the project area.

Preferred Alternative

The Proposed Project areas are highly disturbed with sparse vegetation dominated by salt-tolerant, fast-growing species including ironwoods (*Casaurina equisetifolia*), coconut palms (*Cocos nucifera*), Indian fleabane (Pluchea indica), beach morning glory or alahai tasi (Ipomoea pes-caprae subsp. brasiliensis), tangan tangan (Leucaena leucocephala), and nanaso (*Scaevola sericea*).

Under the Preferred Alternative vegetation between Hotel Wharf and Outhouse beach would be lost due to the construction of the deep-draft wharf. Loss of this upland

habitat can be considered a less than significant, long-term impact. Impacts are considered less than significant because habitat quality is generally low and limited due to the highly disturbed nature of the site.

In summary, the Preferred Alternative would result in less than significant impacts to terrestrial biological resources in the project area.

Alternative 2

The impacts to terrestrial flora and fauna associated with Alternative 2 would be same as under the Preferred Alternative, resulting in less than significant impacts to terrestrial biological resources.

Alternative 3

The impacts to terrestrial flora and fauna associated with Alternative 3 would be the same as those under the Preferred Alternative and Alternative 2. However, the only exception would be that under Alternative 3 terrestrial flora and fauna to the west of Outhouse Beach would not be impacted. In summary, the Alternative 3 would result in less than significant impacts to terrestrial biological resources in the project area.

3.12.5.2 Marine Environment

Relative to the sparse terrestrial biota, the marine biota at the project site is far more diverse and abundant. The waters within and in the vicinity of the project site contain complex benthic communities, including diverse coral reef and fish communities that would be impacted by Proposed Project construction and operational activities

No Action Alternative

Under the No Action Alternative there would be no impact to the benthic habitats and coral reef communities within and adjacent to the Proposed Project area. However, increasing traffic at the existing commercial dock would contribute to increased vessel congestion and create an environment where the risk direct coral reef damage from vessel collisions and groundings may increase. Vessel collisions or groundings on coral reefs may result in the release of petroleum products into the harbor, posing a serious contamination threat. The extended residence time for released petroleum products within Apra Harbor would contribute to an elevated risk of potential significant adverse impacts to coral reefs and other marine resources.

Therefore, the No Action Alternative would, for the most part, result in less than significant impacts to marine biological resources, with the potential for a significant adverse impact resulting from an increased risk of vessel collisions and or groundings due to increased vessel congestion.

Preferred Alternative

Under the preferred alternative an estimated 28.83 total acres of coral reef would be permanently lost. Approximately, 12.18 acres would be lost as a result of the proposed deep draft wharf construction, and an additional 16.65 acres of coral reef would be lost due to filling of proposed reclamation sites 1, 2, and 3. In addition to the permanent loss of benthic habitat non-permanent indirect impacts to marine resources would also occur.

Indirect impacts to marine resources adjacent to the project site are anticipated to occur as a result of construction-related disturbance of the marine environment. These impacts would result primarily from suspension of particulates in the water column during dredge and fill operations, including disturbance of the substrate from the temporary placement of anchors and mooring lines for dredges, barges and other equipment.

The proposed dredge and fill activities would suspend sediment that is highly transitory with water currents and could settle out of the water column and smother corals and other benthic invertebrates over down-stream areas. Coral polyps and larvae are particularly vulnerable to suspended sediment. Suspended sediment in the water column can abrade and lacerate coral larvae and can reduce the viability of larvae through chemical reactions if the larvae come into contact with contaminants carried into surface waters by the sediment. Once particulates settle to the benthos, coral polyps are at risk to similar sub-lethal and lethal impacts. In addition, this mobilized sediment could adversely impact fish and other marine fauna resources through ingestion or contact if the sediment is contaminated (USFWS, 2006).

Anticipated indirect impacts were estimated based on calculations associated with typical dredge/fill operation logistics (e.g., mooring line requirements, temporary anchor placement, and sediment suspension/re-suspension). An estimated 102.9 acres of marine habitat would be impacted as a result of sediment suspension and resuspension during construction activities. Approximately 20.58 acres would be impacted as a result of sediment deposition, and 3.3 acres are anticipated to be impacted due to temporary placement of anchors and mooring lines for dredges, barges and other equipment (Ibid).

Based upon the coastal engineering study it is estimated that the suspended sediment plume near the sea surface and its associated indirect impacts will extend over 3,000 feet to the west of the Proposed Project site, and suggest that the plume may be up to 656 feet in width (Sea Engineering, 2005). Figure 3-15 depicts the estimated extent of the area that would be impacted due to sediment suspension and resuspension during and after construction activities.

Based on the benthic habitat classifications established by the USFWS during their marine biological survey efforts (see Figure 3-11) the benthic habitat types and approximate areas impacted under the Preferred Alternative are summarized and depicted in Table 3-29 and Figure 3-16, respectively.

Table 3-29
Benthic Habitat Areas Impacted
(Preferred Alternative)

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
Wharf Construction, Dredge, and Fill	Deep Draft Wharf	Reef Flat	1.39	Permanent
		Reef Crest	1.38	Permanent
		Reef Slope	2.91	Permanent
		Deep Sand	6.50	Permanent
Embayment Fill	Reclamation Sites 1,2, and 3	Reef Flat	11.64	Permanent
		Reef Crest	3.04	Permanent
		Reef Slope	1.97	Permanent
Sediment Suspension & Resuspension[2]	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	55.7	3 Years
		Reef Crest	14.6	3 Years
		Reef Slope	7.1	3 Years
		Deep Sand	25.5	3 Years
Sediment Deposition	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	11.14	10 Years
		Reef Crest	2.92	10 Years
		Reef Slope	1.42	10 Years
		Deep Sand	5.1	1 Year
Anchoring & Mooring Lines	Deep Draft Wharf	Deep Sand	3.3	1 Year[1]

(1) Estimated time to recovery for infauna to recolonize benthic habitat
(2) Lethal and sub-lethal reproduction and recruitment impairment during construction period

Source: USFWS, 2006

As shown in Table 3-29 above under the Preferred Alternative the largest loss would be to the shallow reef flat habitat. Approximately 13.03 acres of reef flat would be permanently lost due to wharf construction and the filling of Reclamation Sites 1,2, and 3. The main impact of this reef flat loss would be the loss of nursery habitat that is currently utilized by juvenile fish, and the loss of vegetated shallows that support a variety of macro-algae and seagrass that may be used by sea turtles.

The loss of reef crest and reef slope habitat were smaller than reef flat areas that would be lost. The area of reef crest and reef slope habitat that would be lost are estimated to be 4.42 acres, and 4.88 acres, respectively. Although the areas of reef crest and reef slope are almost one third the area of reef flat that would be lost, they would still be considered significant considering that these areas support some areas with very high live coral cover and high fish diversity and biomass (USFWS, 2006).

As discussed in the previous section, as a result of existing water currents within Apra Harbor, suspended sediment is modeled to rapidly disperse to background levels upon the cessation of the dredging activity. The time series plots of the dredge plume concentrations show that during both average and worst case loading scenarios, the

dredge plumes dissipate rapidly, usually within 2 to 3 hours after the dredging has stopped (Sea Engineering, 2005).

Although water quality parameters may disperse to background levels within a few hours, the overall sediment-related (i.e., suspension, resuspension, deposition) impact duration times would be longer when taking into consideration shipping operations at the proposed deep-draft wharf after its construction.

Once shipping operations at the new wharf begin, the recovery of resources would be slowed or prevented as a result of repeated turbulent water motion due to large propeller wash and stormwater runoff from newly paved surfaces. These events would resuspend harbor bottom sediment, which will continuously cover and abrade coral polyps and other fragile sessile life forms and reduce photosynthesis due to shading. Propeller wash will resuspend harbor bottom contaminants and stormwater runoff will introduce wharf-based sources of contaminants into surface waters which can chemically alter and reduce the viability of coral and other larvae.

The estimated duration times shown in Table 3-29 were based upon lethal and sub-lethal reproduction and recruitment impairment during the construction period and sediment deposition and associated suppression of reproductive functions in some marine organisms (USFWS, 2006).

In summary, the Preferred Alternative would result in significant adverse impacts by permanently eliminating marine resources occurring in several marine habitat types. The benthic habitat type that would be most impacted is the reef flat habitat. In addition, to direct construction impacts indirect construction-related impacts would also occur. It is assumed that most marine resources subjected to temporary construction-related impacts would recover over time.

As previously discussed, the coral reef community that occurs in the shallow marine environment (reef flat, reef crest, and reef slope) is the primary habitat of concern at the Proposed Project site. The shallow marine environment functions to provide nursery areas for juvenile reef fish species such as wrasses, parrotfish, surgeonfish and others. The deep sand habitat which contains burrowing infauna (i.e., worms, crustaceans, other invertebrate groups) that supports a large forage base for selective and generalist predators would also be impacted as a result of project construction activities.

All of the existing ecological functions and values associated with the marine resources (including the recently discovered *Maristentor dinoferus* - *Symbiodinium* symbiotic association) within the proposed deep-draft wharf footprint would be permanently lost as a direct impact of construction. A small amount of dredged deep sand habitat immediately fronting the wharf would remain and is anticipated to recover, but only limited replacement of ecological functions is anticipated in this area because of ongoing impacts due to wharf operations and vessel traffic (stormwater run-off, re-suspension of sediment etc).

Indirect impacts to marine communities in the down-current areas adjacent to the Proposed Project site would occur as a result of sediment transport. However, these communities are expected to fully or mostly recover over time.

Due to the permanent loss of coral reef ecosystems, the Preferred Alternative would result in significant adverse impacts to marine biological resources. However, it should be noted that, though not a beneficial impact, under the Preferred Alternative, that over time marine life would begin to reestablish itself within the pilings beneath the wharf structure. The pier pilings are estimated to eventually provide approximately 3.47 acres of replacement habitat for fish, coral and other invertebrate communities to reestablish themselves.

Alternative 2

Under Alternative 2 the anticipated direct and indirect impacts to marine resources would be the same as the Preferred Alternative. As under the Preferred Alternative an estimated 28.83 total acres of coral reef would also be permanently lost under Alternative 2. Approximately, 12.18 acres would be lost as a result of the proposed deep draft wharf construction, and an additional 16.65 acres of coral reef would be lost due to filling of proposed reclamation sites 1, 2, and 3.

In addition to the permanent loss of benthic habitat non-permanent indirect impacts to marine resources similar to those discussed under the Preferred Alternative would also occur. Based on the benthic habitat classifications established by the USFWS during their marine biological survey efforts (see Figure 3-11) the benthic habitat types that would be impacted in the Proposed Project area under Alternative 2 are summarized in Table 3-30 below.

Table 3-30
Benthic Habitat Areas Impacted
(Alternative 2)

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
Wharf Construction, Dredge, and Fill	Deep Draft Wharf	Reef Flat	1.39	Permanent
		Reef Crest	1.38	Permanent
		Reef Slope	2.91	Permanent
		Deep Sand	6.50	Permanent
Embayment Fill	Reclamation Sites 1,2, and 3	Reef Flat	11.64	Permanent
		Reef Crest	3.04	Permanent
		Reef Slope	1.97	Permanent
Sediment Suspension & Resuspension[2]	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	55.7	3 Years
		Reef Crest	14.6	3 Years
		Reef Slope	7.1	3 Years
		Deep Sand	25.5	3 Years

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
Sediment Deposition	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	11.14	10 Years
		Reef Crest	2.92	10 Years
		Reef Slope	1.42	10 Years
		Deep Sand	5.1	1 Year
Anchoring & Mooring Lines	Deep Draft Wharf	Deep Sand	3.3	1 Year[1]

(1) Estimated time to recovery for infauna to recolonize
(2) Lethal and sub-lethal reproduction and recruitment impairment during construction period

Source: USFWS, 2006

The quantity and proportion of benthic habitat types that would be permanently lost as a result of construction under Alternative 2 would be the same as those anticipated under the Preferred Alternative. Similarly, the type, magnitude, and duration of indirect impacts are the same as the Preferred Alternative. The approximate area impacted under Alternative 2 is shown in Figure 3-16.

In summary, the Alternative 2 would result in significant adverse impacts by permanently eliminating marine resources occurring in several marine habitat types. Similar to the Preferred Alternative, the benthic habitat type that would be most impacted is the reef flat habitat.

Under this alternative, all of the existing ecological functions and values associated with the marine resources within the proposed deep-draft wharf footprint would be permanently lost as a direct impact of construction. Similarly, a small amount of dredged deep sand habitat immediately fronting the wharf would remain and is anticipated to recover, but only limited replacement of ecological functions is anticipated in this area because of ongoing impacts due to wharf operations and vessel traffic (stormwater run-off, re-suspension of sediment etc).

In addition, to direct construction impacts indirect construction-related impacts would also occur in the immediate project area. It is assumed that most marine resources subjected to temporary construction-related impacts would recover over time. Similarly, indirect impacts to marine communities in the down-current areas adjacent to the Proposed Project site will occur as a result of sediment transport. However, these communities are also expected to fully or mostly recover over time.

Similar to the Preferred Alternative, Alternative 2 would result in significant adverse impacts to marine biological resources due to the permanent loss of coral reef ecosystems. An important distinction between the Preferred Alternative and Alternative 2 is that under latter alternative the cellular sheet pile design would be able to function as a FAD. In contrast to the submerged pilings extending under the pier structure, under Alternative 2 fill material would extend from the shoreline to the cellular sheet pile bulkhead wall along the seaward face of the wharf. As a result, the 3.47 acres of replacement benthic habitat which would be provided under the Preferred Alternative

design would not be available under Alternative 2 for fish, coral and other invertebrate communities to reestablish themselves.

Alternative 3

As described in Section 2.4.4, Alternative 3 is markedly from the Preferred Alternative and Alternative 2 in that it encompasses a significantly different spatial footprint. Under Alternative 3, a fixed pier and backland areas would be created by the placement of approximately 900,000 cubic yards of fill between Golf Pier and Southwest Point to accommodate a fixed pier with contiguous operational backland areas.

This Alternative would also result in significant adverse impacts due to the permanent loss of approximately 40 acres of reef flat, reef crest, and reef slope habitat in the project area. However, relative to the Preferred Alternative and Alternative 2 the loss of reef flat, crest and slope habitat under this alternative is far more significant.

The volume of fill required to create fast land required for the deep-draft wharf and backland facilities would be more than 4 times and almost 3 times greater than the volume of fill required under the Preferred Alternative and Alternative 2, respectively. Additionally, the construction period for this alternative is anticipated to be longer than that of the other alternatives.

The area of indirect impact is estimated to be similar to the other alternatives, however, due to the physical size of the wharf structure under Alternative 3 and the associated need for an increased construction period, the duration of the of impacts is projected to be longer. The recovery times for each habitat type is projected to be similar to the other alternatives (USFWS, 2006).

Similar to the Preferred Alternative and Alternative 2, the coral reef community that occurs in the shallow marine environment is the primary habitat of concern for this alternative. The dominant organisms, functional groups, ecological services and natural resource values associated with the other alternatives also apply to Alternative 3. Based on the benthic habitat classifications established by the USFWS during their marine biological survey efforts (see Figure 3-11) the benthic habitat types and approximate areas impacted under the Alternative 3 are summarized and depicted in Table 3-31 and Figure 3-17, respectively.

Table 3-31
Benthic Habitat Areas Impacted
(Alternative 3)

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
Fixed Pier Construction & Embayment Fill	Golf Pier/Southwest Point	Reef Flat	13.01	Permanent
		Reef Crest	5.58	Permanent
		Reef Slope	8.46	Permanent

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
		Deep Sand	15.56	Permanent
Sediment Suspension & Resuspension[1]	Golf Pier/Southwest Point	Reef Flat	55.7	3 Years
		Reef Crest	14.6	3 Years
		Reef Slope	7.1	3 Years
		Deep Sand	25.5	3 Years
Sediment Deposition	Golf Pier/Southwest Point	Reef Flat	11.14	10 Years
		Reef Crest	2.92	10 Years
		Reef Slope	1.42	10 Years
		Deep Sand	5.1	1 Year

(1) Estimated time to recovery for infauna to recolonize

Source: USFWS, 2006

It should be noted that under Alternative 3, the total area of reef flat habitat that would be lost as a result of direct construction-related impacts would be equivalent (approximately 13 acres) to the area reef flat lost under the Preferred Alternative and Alternative 2. However, a larger total amount of reef crest, reef slope, and deep sand habitat would be lost under Alternative 3. Compared to the Preferred Alternative and Alternative 2, an additional 1.16 acres of reef crest, 3.58 acres of reef slope, and 9.06 acres of deep sand habitat would be lost under Alternative 3.

Construction activities would result in the direct loss of coral reef habitat and all of the environmental and ecological functions and values associated with this area of habitat. However, limited replacement of lost ecological services and values of the marine resources in the immediate area of the wharf is anticipated due to the effects of ongoing wharf operations and vessel traffic. Indirect impacts to marine communities in the down-current areas adjacent to the Proposed Project site would also occur, but these communities are expected to recover fully or mostly over time.

In summary, Alternative 3 would result in significant adverse impacts to marine biological resources due to the permanent loss of coral reef ecosystems,

3.12.6 Proposed and Potential Mitigation Measures

Implementation of the proposed harbor improvements would result in the permanent loss of coral reef community within the project area. Additionally, ecological functions associated with coral reefs in adjacent areas would either be temporarily or permanently degraded during construction activities.

It is not likely that any single mitigation measure could adequately avoid, minimize, or compensate for the degradation and loss of coral reefs and associated their ecological functions that would result from implementation of the Proposed Project. However, the combined effects of multiple measures implemented in a coordinated manner at appropriate geographic and time scales could adequately mitigate these losses

Therefore, as a result of these anticipated adverse impacts to the coral reefs in the project area a key mitigation measure would be the development of a comprehensive mitigation plan to holistically address project-related impacts to the marine biological environment. Development and implementation of such a mitigation plan as a mitigation measure is further discussed in the remainder of this section.

3.12.6.1 Compensatory Mitigation

Regulatory Framework

In accordance with Section 404(b)(1) of the Clean Water Act, the FWCA 2(b) report and EO 13089, the proposed action will avoid and minimize impacts to coral reefs and waters of the U.S. to the full extent practicable. Where impacts are unavoidable, compensatory mitigation will be provided to compensate for the functions and values lost.

The Guidelines policy and procedures are set forth in the "Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines," (Mitigation MOA) dated February 7, 1990. The Mitigation MOA establishes the framework for compensatory mitigation in terms of loss of ecological functions and values, prescribing a minimum of one-to-one functional replacement with an adequate margin of safety to reflect the uncertainty and risk of expected success. The Mitigation MOA bases mitigation measures on the development of assessments and methodologies performed by qualified professionals and tailored to each site, as ecological characteristics of individual aquatic system are unique (USACE, 2005).

Existing guidelines, policies, and procedures developed by the USACE and USEPA under section 404 of the CWA would provide a structured compensatory mitigation planning process to guide compensatory mitigation actions to effectively replace marine resources that would be permanently lost due project-related impacts. Additionally, national technical guidance for mitigation is supported by regionally developed mitigation guidance that considers aquatic and marine resources that are of regional importance, including coral reefs (USACE, 2005; USACE, 2002).

3.12.6.2 Compensatory Mitigation Plan Development

During the FWCA consultation process with the USFWS, heavy emphasis was placed on the importance of developing a compensatory mitigation plan to address anticipated adverse impacts that would result from the construction of the Proposed Project. In consideration of USFWS recommendations, a comprehensive mitigation plan would be developed in close coordination with the USFWS, NMFS, USEPA, DAWR, the USACE Regulatory Branch, Guam EPA, Guam CZM Program, and other parties.

The main purpose of the mitigation plan would be to develop a mitigation strategy that would effectively compensate for the project-related losses of marine resources. An

acceptable strategy in developing such a plan could include the following six components (Bentivoglio, 2003).

1. Documentation of anticipated area of impact
2. Assessment of resources anticipated to be impacted
3. Correlation of anticipated impacts and compensatory mitigation
4. Scientific monitoring of compensatory mitigation
5. Establishment of performance standards and evaluation criteria
6. Determination of the effectiveness of implemented compensatory mitigation

The first two components of this strategy, "documentation of anticipated area of impact" and "assessment of resources anticipated to be impacted" were addressed in the USFWS draft FWCA Report (Appendix I). However, the USWFS report notes that additional oceanographic modeling may be required to better define the actual area of indirect impacts once construction methods and the sequence of construction activities are finalized (USFWS, 2006).

For the third component of plan development the USFWS recommends that mitigation planning for the Proposed Project consider permanent resource losses in certain reef areas as well as temporary resource losses in areas that will recover over time. It is important to consider that some coral reef community characteristics have a longer period of recovery that others (e.g., impacts due to sedimentation on a biologically diverse coral reef flat may take much longer to recover than a deep sand bottom). Both the area of impacted resources and the time-to-recovery should be accounted for in mitigation planning (USFWS, 2006).

An established quantitative methodology, recommended by the USFW, to model area-time recovery of the various habitat types and provide a means to quantify and define the scale of off-site mitigation plans is Habitat Equivalency Analysis (HEA).

HEA is a methodology used to determine compensation for natural resources that have been damaged or permanently lost. The principal concept underlying the HEA method is that compensation can be made for past losses of habitat resources through habitat replacement projects providing additional resources of the same type. HEA has been employed for vessel groundings, spills and hazardous waste sites. Habitats involved in these analyses include tidal wetlands, estuarine soft-bottom sediments, seagrasses, and coral reefs (NOAA, 2006).

In addition to maintaining continuity of the reach and extent of U.S. waters, a basic premise of compensatory mitigation in the CWA is that aquatic resource functions and values lost or degraded due to project-related activities are appropriately and verifiably replaced. Periodic monitoring would be required to verify the performance and effectiveness of the measures proposed in the compensatory mitigation plan.

The USACE has developed guidance for minimum monitoring requirements for compensatory mitigation projects. Based on this guidance monitoring guidelines for compensatory mitigation measures would typically include the following key components (USACE, 2006):

1) Performance Standards – Performance standards as defined in 33 CFR 332.2 must be consistent with the objectives of the compensatory mitigation measure. The goal of the performance standards is to ensure that the mitigation measure can be objectively evaluated to determine if it is developing into the desired resource type and providing the expected functions. Additionally, special conditions of Department of the Army permits must clearly state performance standards specific to the type and function of the ecosystem in relation to the objectives of the compensatory mitigation project. Alternatively, the special conditions can refer to the performance standards documented in the Corps approved mitigation plan.

2) Monitoring Timeframe - The monitoring period must be sufficient to demonstrate that the compensatory mitigation project has met performance standards, but not less than five years. Special conditions of Department of the Army permits must support the five-year monitoring usually needed for mitigation sites that take longer to develop and reach a level of stability.

3) Monitoring Reports - Monitoring reports are required for all compensatory mitigation projects unless it has been determined that monitoring is not practicable for that compensatory mitigation project.

Monitoring reports are the main documentation that provides information to determine if a compensatory mitigation measure/project site is successfully meeting its performance standards. Remedial actions for correcting deficiencies in mitigation outcomes would be based on information provided in the monitoring reports and subsequent site inspections.

The format and content of a typical monitoring report would follow the standard format outlined in the USACE compensatory mitigation monitoring guidance. Standard monitoring report format and content requirements for assessing mitigation measures would be adhered to as outlined in USACE Regulatory Guidance Number 06-03 (USACE, 2006).

In addition to the above described monitoring guidance. Post-construction assessments and monitoring efforts could be developed to incorporate recommendations made by the USFWS in their draft FWCA Report. USFWS recommended elements to be considered include but may not be limited to:

- Post Construction Assessment - A post-construction assessment of the marine environment in the vicinity of the completed project should be conducted. The marine assessment should evaluate the coral reef community throughout all

adjacent areas where indirect impacts actually occurred. The assessment should validate the extent of project-related damage and should be timed to periodically confirm recovery times of the various habitat types are progressing as projected.

- Timing of Monitoring Efforts - Valid scientific methods should be used to monitor compensatory mitigation actions and their ultimate effectiveness. It is critical that the project sponsor commit to periodic monitoring commensurate with the ecological timescales that may be needed to ensure success of the mitigation plan, a timeframe that may extend over several decades. Data from before-and-after resource surveys at mitigation sites must indicate that a balanced community of indigenous coral reef species has been created, restored or preserved; and that it is scientifically defensible to conclude that any mitigation area(s) will support appropriate ecological functions in perpetuity.

3.12.6.3 Potential Compensatory Mitigation Measures

Fish Aggregating Device (FAD)

As discussed briefly in the previous section, inherent in the Preferred Alternative pier on pile design is the benefit that the waters beneath the wharf platform would eventually develop into a functioning benthic habitat over time. The benthic habitat beneath the wharf would have the potential to support a variety of marine species.

The ecological development of the pier piling area into benthic habitat would be particularly beneficial for fish populations in the project area. The reason for this is that pelagic fish species are often attracted to floating objects such as coconuts, logs, seaweed, and plastic bottles. These are often found at current boundaries and up-wellings, which are areas of the ocean that are usually very productive and therefore good places for pelagic fish species to search for food.

Fish aggregating devices (FADs) are floating objects that are designed and located to attract ocean going pelagic fish species, and therefore allow fishers to find them more easily. FADs are man-made objects and usually consist of buoys or floats tethered to the ocean floor with concrete blocks. FADs are widely used in the Western Pacific purse seine fisheries and are commonly comprised of a large anchor, a heavy-duty mooring chain and mooring rope, with about 50 purse-seine floats strung at the surface. The ropes and chain are joined using various shackles, rope connectors, splices and thimbles (WIOMSA, 2006).

It is not clearly understood exactly why fish are attracted to FADs, but the ropes, floats and the other materials used presumably mimic the build-up of driftwood and seaweed found naturally in the sea. It is suspected that fish congregate around them for navigational purposes. Fish tend to move around the FADs in orbits of differing

dimensions, as opposed to remaining stationary underneath the buoys. They are deployed for use by both recreational and commercial fisheries and there are two types; surface FADs and midwater or subsurface FADs. Subsurface FADs last longer due to less wear and tear from surface tension, but have the disadvantage of being harder to locate (SPC, 2005).

Over time the pier pilings themselves could naturally begin to function as FADs. However, as a mitigation measure the piling structures could be enhanced to better function as FADs. For example, attaching floating objects such as logs, coconuts, rope, or plastic bottles to the pilings could increase their attractiveness to fish species and enhance their function as a FAD.

Therefore, based upon the FAD potential of the Preferred Alternative's pier on pile design, loss of benthic habitat and fishing grounds in the project area would be somewhat mitigated. Should the pier pilings overtime function as efficient FADs they could potentially enhance some fish stocks locally.

Coral Transplantation

Transplanting of coral and the creation of marine protected areas (MPAs) are established methods of compensation for unavoidable coral reef habitat losses. Coral transplanting is a potential mitigation method that could be included within a broader mitigation plan (Bentivoglio, 2003).

The best available methods for transplanting corals should be determined and a suitable site to receive the corals, appropriate coral species, and time of year to transplant. The receiving site should have similar environmental conditions (depth, water clarity, temperature, and salinity) as the existing conditions within Outer Apra Harbor, and be protected from high energy waves that could break off newly transplanted corals. A 1996 Kawaihae, Hawaii transplant project lost the majority of transplanted corals within six months due to storm waves alone (Jokiel, et al., 1999). Of the corals present in the project area, lobate *Porites* species would be good candidates for transplanting. In a study conducted in nearby Tepungan Channel, Piti, Guam, Kolinski (2002) reports successful transplantation and low mortality rates for *Porites lutea* a year after transplanting, but poor results for *Pocillopora damicornis.*

Post-transplant surveys are often not conducted long enough after transplantation, resulting in reports of far better survival than is eventually the case. Coral transplants have been found to have high survival rates within the first several months of transplanting and, in some cases, survival decreases drastically after the first year of transplanting (Bentivoglio, 2003).

Initial monitoring should be undertaken within the first month after transplantation to ascertain effects of the transplanting methodology. Follow-up monitoring should be undertaken annually for up to 5 years after transplantation to determine if the transplanted corals survive the new location for an ecologically meaningful period of time.

The efficacy of coral transplanting is not only dependent on the methodology employed, but also on naturally occurring environmental conditions such as water quality, storm waves, and factors like competition with and predation by other reef inhabitants (Duenas and Associates, 1994). All of these naturally occurring factors can decrease the effectiveness of this form of coral reef mitigation and their negative impact on transplanted coral survival must be factored in when designing a mitigation plan.

Possible transplant receiving sites are the submerged lands to the west of the project area and Dog Leg Reef. These areas have similar depths, water flow, and exhibit existing healthy coral populations.

Best Management Practices

In addition to technology-based mitigation measures, best management practices could also be incorporated into mitigation plan development as a means to further minimize project-related impacts. The mitigation plan could in general terms describe BMPs which would need to be adhered to, and would be described in detail in the project construction management plan. For example, to minimize impacts to coral larvae and recruitment-related processes, project-related construction activities that may result in the mobilization of suspended sediment would not be conducted ten days before and ten days after the primary coral spawning period in Guam, which follows a lunar periodicity and usually takes place in June or July.

3.13 PROTECTED SPECIES

3.13.1 Introduction

Regulatory Framework

Since 1973, the Endangered Species Act (ESA) has regulated a wide range of activities affecting flora and fauna classified as endangered or threatened. Reauthorized in 1988, the provisions of the ESA apply only to species listed in the Federal Register as endangered or threatened. Under the provisions of the ESA, all Federal agencies are required to undertake programs for the conservation of threatened and endangered species and are prohibited from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or alter their critical habitat.

Specifically, the ESA prohibits acts such as:

- The importation and exportation of endangered species from the U.S.;
- Taking (killing, capturing, collecting, harming, harassing, pursuing, hunting, trapping) within the U.S. and territorial waters;
- Possessing, selling, delivering, carrying, transporting, or shipping any such species unlawfully taken within the U.S. or on the high seas;
- Delivering, receiving, carrying, transporting, or shipping any such species unlawfully taken within the U.S. or on the high seas; and
- Selling or offering for sale any such species in interstate or foreign commerce.

The ESA also provides for the protection of habitat critical to the survival and recovery of the species and the creation of a recovery plan for each listed species.

A species may be classified as "endangered" when it is in danger of extinction within the foreseeable future in all or a significant portion of its range. A "threatened" classification is assigned to a species likely to become endangered within the foreseeable future in all or a significant portion of its range.

A "species" includes any species or subspecies of fish; wildlife, or plant. It also includes any variety of plant or any distinct population segment of any vertebrate species that interbreeds when mature. Additionally, actions affecting species proposed for listing would require the same coordination with state and Federal agencies as those actions affecting listed species.

The USFWS and the NMFS share responsibility for administration of the ESA. In general, the USFWS is responsible for terrestrial and freshwater species and migratory birds, while the NMFS regulates and protects marine species. Under Section 7 of the Act, the responsible federal agency must consult with these agencies when a proposed action may impact upon listed or candidate species under their jurisdiction.

The USACE has initiated consultation with the USFWS and NMFS in accordance with coordination requirements under Section 7 of the ESA. Prior to construction, consultation in accordance with Section 7 of the ESA will be completed as appropriate with USFWS and NMFS to ensure that the proposed action does not jeopardize any federally listed species. ESA Section 7 consultation correspondence is attached as Appendix J.

All marine mammals are protected under the Marine Mammals Protection Act (MMPA) of 1972. The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

The MMPA was passed by Congress based on the following findings and policies:

- Some marine mammal species or stocks may be in danger of extinction or depletion as a result of human activities;
- These species or stocks must not be permitted to fall below their optimum sustainable population level ("depleted");
- Measures should be taken to replenish these species or stocks;
- There is inadequate knowledge of the ecology and population dynamics; and
- Marine mammals have proven to be resources of great international significance.

The MMPA was amended substantially in 1994 to provide for:

- Certain exceptions to the take prohibitions, such as for Alaska Native subsistence and permits and authorizations for scientific research;
- A program to authorize and control the taking of marine mammals incidental to commercial fishing operations;
- Preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; and
- Studies of pinniped-fishery interactions.

The Migratory Bird Treaty Act (MBTA), is the domestic law that affirms, or implements, the United States' commitment to four international conventions with Canada, Japan, Mexico and Russia for the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11). Section 704 of the MBTA states that the Secretary of the Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. The Secretary in adopting regulations is to consider such factors as distribution and abundance to ensure that take is compatible with the protection of the species.

3.13.2 Affected Environment

Terrestrial Species

Over the past 40 years it has become well documented that Guam's native forest birds have been almost totally eliminated because of the brown tree snake predation. Over-hunting and perhaps brown tree snake predation have also caused the nearly complete loss of Marianas Fruit Bats (*Pteropus mariannus*) from Guam's forests.

Guam has eleven terrestrial bird and mammal species and one plant species that are Federally listed as endangered. Guam's endangered terrestrial species include the Marianas fruit bat (*Pteropus mariannus*), Little Marianas fruit bat (*Pteropus tokudae*), Mariana crow (*Corvus kubaryi*), Guam broadbill (*Myiagra freycineti*), Guam Micronesian kingfisher (*Halcyon cinnamomina cinnamomina*), Micronesian Mallard (*Anas*

platyrhynchos), Mariana Moorhen (*Gallinula chloropus guami*), Guam rail (*Rallus owstoni*), Mariana Gray Swiftlet (*Aerodramus vanikorenis bartschi*), Micronesian Starling (*Aplonis opaca*), Nightingale reed-warbler (*Acrocephalus luscinia*), and Guam bridled white-eye (*Zosterops conspicillata conspicillata*), The single endangered plant species is the Hayun lagu (*Serianthes nelsonii*) (USFWS, 2006).

Of the federally listed endangered terrestrial species on Guam only the Mariana crow, Mariana moorhen, Mariana Gray Swiftlet, Micronesian Starling, and the Marianas fruit bat are known to still occur in the wild. Other species such as the Guam rail and the Micronesian kingfisher, are being captively bred in zoos in the hope that they can eventually be released back into the wild.

None of the federally listed endangered terrestrial species are known to occur in the project area, and as previously noted in Section 3.14.2.1 there were no endangered terrestrial flora or fauna identified within the project area during the biological survey. Many of the listed species are upland species with native forest habitats. Additionally, past disturbance of harbor lands and ongoing industrial and commercial operations within the harbor area do not provide a conducive habitat for established populations of these endangered species.

Marine Mammals

Humpback whales *(Megaptera novaeangliae*), Risso's dolphins (*Grampus griseus*), Cuvier's beaked whales *(Xiphias cavirostris)*, pygmy sperm whales *(Kogia breviceps)*, pilot whales *(Globicephala melaena)*, striped dolphins *(Stenella coeruleoalba)*, and the pantropic whitebelly spinner dolphin *(Stenella longirostris longirostris)* have been sighted around Guam. No endangered marine mammals are known to occur within the project site or the immediate surrounding harbor waters

Seabirds

The following seabirds are believed to be residents of Guam; wedge-tailed shearwater (*Puffinus pacificus)*, white-tailed tropicbird (*Phaethon lepturus)*, red-tailed tropicbird *(Phaethon lepturus)*, masked booby *(sula dactylatra)* and brown booby *(Sula leucogaster)*. Other species believed to be visitors to Guam include; streaked shearwater *(Calonectris leucomelas*), short-tailed shearwater *(Puffinus tenuirostris)*, Christmas shearwater *(Puffinus nativitatis)*, Newell's shearwater *(Puffinus auricularis)*, Audobon's shearwater (*Puffinus iherminieri*), Leach's storm-petral (*Oceanodroma leucorhoa*), Matsudaira's storm-petral (*Oceanodroma matsudairae*), and the red-footed booby (*Sula sula*). It is possible that some species of migratory birds could occasionally utilize the project area (NMFS, 2005).

Sea Turtles

Both hawksbill and green sea turtles are known to nest on Guam as a whole, and there have been occasional sightings of leatherback turtles as well. Nesting surveys for green

sea turtles have been done on Guam since 1973 with the most consistent data collected since 1990. There have been up to 60 nesting females observed annually, with a generally increasing trend over the past 12 years Aerial surveys done in 1999-2000 also found an increase in green sea turtle sightings around Guam. (Cummings, 2002).

Areas within Apra Harbor have long been used by sea turtles for foraging and resting. The Federally listed threatened green sea turtle (*Chelonia mydas*) has been observed within both Outer and Inner Apra Harbor but mostly outside of the immediate project area. Based upon data provided by the Guam DAWR, an average of 31 green sea turtles per year were observed for the entirety of Apra Harbor between the years 1995 and 2004. Of these sightings the average number of sea turtles observed within the Proposed Project area averaged about 3 turtles per year (AECOS, 2006)

Green sea turtle nesting activity has been observed on a beach near Orote peninsula, and (Tibbatts 2001). In addition, to the green sea turtle, the endangered hawksbill turtle (*Eretmochelys imbricata*) has been reported to nest in Sumay Cove, which is outside of the project area and to the west of the former SRF (USDN, 2003).

On July 19th 2006 The Guam DAWR discovered a green sea turtle nest located approximately 400 feet to the west of the Sea Plane Ramp parking area. The nest was situated on a narrow sandy shore approximately 50 feet south of Route 11 and had been vacated at the time of discovery. The location of the green sea turtle nest in relation to the proposed project is shown in Figure 3-18. The Guam DAWR memorandum documenting the green sea turtle nest finding has been included in Appendix J.

Green sea turtle may also utilize the waters within the project area because, at least three species of algae and a blue green alga identified as green sea turtle forage were identified at the Proposed Project site. Seagrass at the site may also be utilized by sea turtles. Various invertebrate and algal taxa observed in the Proposed Project area, including sponges, coelenterates, bryozoans, mollusks, urochodates, algae such as Codium, and seagrass, have been documented as hawksbill forage (USFWS, 2006).

3.13.3 Significance Criteria

For the purposes of this EIS, impacts specific to protected species would be considered significant if the Proposed Project:

- Adversely affects a population of a threatened, endangered, regulated, or other sensitive species by reducing its numbers; altering behavior, reproduction, or survival; or causing loss or disturbance of habitat

- Would have a substantial adverse effect, either directly or indirectly, on any listed, proposed, or candidate endangered or threatened species listed under Federal ESA. Effects could include reducing the number or restricting the range

of a threatened or endangered plant or animal

- Directly impacts nesting migratory birds protected under the MBTA;
- Causes injury or mortality or results in an action that could be considered a Level A take under the Marine Mammal Protection Act (MMPA) (defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild).
- Causes a Level B take of a listed or candidate species or a Level B take of significant numbers (more than 10) of marine mammals (defined as harassment having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering).
- Causes substantial deviations (more than 1 NM [1.15 miles or 1.9 km]) of migration routes for significant numbers (more than 10) of marine mammals.
- Causes injuries or mortalities to substantial numbers (more than 10) of non-listed 5 sea birds.
- Causes substantial deviations (more than 1 NM [1.15 miles or 1.9 km]) of 7 migration routes for significant numbers (more than 10) of sea birds.

3.13.4 Environmental Consequences

Under the No Action Alternative, proposed wharf and backland facilities would not be constructed. Consequently, there would be no adverse impacts on marine and terrestrial habitats in the project area that may be utilized by protected species.

Preferred Alternative

The Preferred Alternative is not anticipated to result in any impacts to protected marine mammal species since they do not occur within the Proposed Project area and the immediate surrounding waters of Outer Apra Harbor.

It is also not anticipated that there will be and significant adverse impact to protected sea turtle or sea bird species as a result of the Preferred Alternative. However, since there is a possibility for the presence of sea turtles and/or sea birds utilizing and/or occasionally nesting within the project area potential less than significant impacts could occur.

As previously noted, sea turtles may frequent waters in the vicinity of the project sites, and it is possible that without proper precautions sea turtles could be harmed as a result of proposed construction and dredging activities. High noise-producing construction activities such as pile driving could result in the disruption of sea turtle use of the waters

in the project area. However, these noise-related impacts to sea turtles and other marine life would be short-term and temporary and limited only to the times such construction activities were taking place.

In addition to potential direct construction-related activities, green sea turtles could be indirectly impacted by the loss of seagrass foraging grounds within the project area. However, due to the fact that turtles have never actually been observed foraging within the project areas, and the availability of numerous other foraging grounds in the Apra Harbor area these impacts are anticipated to be less than significant.

Should a CDF be constructed to manage contaminated sediments, there is a potential risk of sea bird exposure to possible contaminated sediment through dermal contact or ingestion of water or invertebrates that may be contained within the sediment.

In summary, the Preferred Alternative with appropriate mitigation measures (i.e., through ESA consultation with USFWS, NMFS, and Territorial agencies) would result in less than significant impacts to protected species.

Alternative 2

Under Alternative 2 potential impacts to protected species would be the same as under the Preferred Alternative, resulting in less than significant impacts (with appropriate mitigation measures) to protected species.

Alternative 3

Under Alternative 3 potential impacts to protected species would be similar as those under the Preferred Alternative and Alternative 2, resulting in less than significant impacts (with appropriate mitigation measures) to protected species.. However, under Alternative 3 the magnitude and potential for direct construction-related and indirect habitat loss impacts would be increased due to the larger area of impact under this alternative.

3.13.5 Proposed and Potential Mitigation Measures

The USFWS shares jurisdiction with the NMFS over federally listed threatened green sea turtles and endangered hawksbill sea turtles. The USFWS has sole jurisdiction over these species when they are on shore, and the NMFS has sole jurisdiction over these species when they are in the ocean. Consultation in accordance with Section 7 of the ESA will be conducted as appropriate prior to construction. All conservation measures identified through consultation and agreed to by USFWS and NMFS to ensure the proposed action will not jeopardize the listed species will be implemented in their entirety.

Since the possibility of sea turtles to be adversely affected during project construction activities exists, the PAG would maintain close coordination and consultation with the NMFS during project planning, design, and in water construction activities. NMFS

recommendations for the protection and conservation of sea turtles in the waters of Apra Harbor would be incorporated into the construction phase of the project.

The following procedures may be implemented during pier construction activities to minimize adverse impacts to sea turtles. If sea turtles are observed entering waters in the vicinity of an active construction site, all in-water construction activities will cease and resume only after the animal(s) have voluntarily departed from the area. Additionally, the NMFS Protective Species Program would be notified of each such incident.

Temporary short-term water quality impacts to protected species would be mitigated by employing measures previously discussed in Section 3.11.5. Specifically, water quality impacts to sea turtles from dredging and pier construction activities would be mitigated through the implementation of BMPs. An example of a BMP that would mitigate sediment-related water quality impacts would be the use of siltation curtains. This flexible fabric curtain would create a physical barrier from construction areas, preventing the turtles from entering an area of potential harm.

Should a CDF be constructed to manage contaminated sediments, it would be netted to prevent migratory bird exposure to possible contaminated sediment through dermal contact or ingestion of water or invertebrates that may be contained within the sediment.

3.14 NONINDIGENOUS INVASIVE SPECIES

3.14.1 Introduction

Nonindigenous species refer to terrestrial and aquatic plants, animals, and microorganisms transported or established outside of their natural range due to the activities of humans, whether done so intentionally or not. An "invasive species" is defined as a species that is: 1) nonindigenous to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm, and/or harm to human health (NISC, 2001).

Oceanic islands throughout the world are especially vulnerable to biological invasions. Island ecosystems experience long periods of evolution in isolation from environmental forces faced routinely by plants and animals on continents. Guam's fragile island ecosystem makes the introduction of nonindigenous invasive species (NIS) a paramount environmental concern.

As previously noted in Section 3.15.2, the brown tree snake is the most prominent example of a NIS which has adversely impacted Guam's fragile island ecosystem. However, in addition to terrestrial NIS aquatic habitats are also susceptible to NIS invasion.

For example, a number of introduced vertebrates have become established in Guam's wetlands. Alien fishes include tilapia (*O. mossambicus* and *Tilapia zilli*), catfish (*Clarius*

macrocephalus), tucunare (*Cichla ocellaris*), mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*) and guppies (*Poecilia reticulatus*). Several other species are believed to have escaped from aquaculture ponds and started populations in the Ajayan and Agfayan Rivers. Two species of amphibians, the Marine Toad (*Bufo marinus*) and Dwarf Tree Frog (*Litoria fallax*), breed at many sites, while two types of turtles, the Red-eared Slider (*Trachemys scripta*) and a soft-shelled turtle (*Pelodiscus* sp.), now appear to be reproducing at several locations. The skink *Carlia fusca* is abundant throughout the island, and is found in many wetlands with seasonally dry substrates (Wiles and Ritter, 2006).

Regulatory Framework

The Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) was passed on November 29, 1990, and subsequently was amended by the National Invasive Species Act of 1996 (NISA). Subsequently, Presidential Executive Order No. 13112 titled "Invasive Species was published on February 3, 1999. The purpose of these acts and executive orders are to:

- Prevent unintentional introduction and dispersal of nonindigenous species into waters of the U.S. through ballast water management and other requirements;
- Coordinate Federally conducted, funded or authorized research, prevention control, information dissemination, and other activities regarding the aquatic nuisance species
- Develop and carry out environmentally sound control methods to prevent, monitor and control unintentional introductions of nonindigenous species from pathways other than ballast water exchange
- Understand and minimize economic and ecological impacts of nonindigenous aquatic nuisance species that become established

The NISA reauthorized and broadened the NANPCA. The new focus of the NANPCA turned its attention to ballast tanks of ships. U.S. Coast Guard (USCG) regulatory powers were expanded by giving the agency jurisdiction over any vessel with a ballast tank. Previous to the NISA, the USCG could only regulate ships with pumpable ballast tanks. Recreational boats that do not have pumpable ballast tanks but are capable of carrying water are now under USCG jurisdiction for ballast water management.

The NISA guidelines for ballast water management are voluntary in all areas of the United States except the Great Lakes at this time. The NISA guidelines are as follows:

- All vessels entering U.S. waters after having operated outside of the U.S. are requested to conduct a mid-ocean ballast water exchange prior to entering U.S. waters. These same vessels are required to submit a ballast water management report to the USCG

- In addition, all vessels operating in U.S. waters are asked to take a number of voluntary operational precautions to minimize the uptake and release of aquatic species. These include avoiding ballasting at night, in shallow or turbid waters, and areas with phytoplankton blooms or known infestations of harmful organisms or pathogens. These are measures that are available to those vessels on domestic voyages and those that do not transit waters of sufficient depth to allow for conducting a ballast water exchange (Swanson, 2000).

In 1997, the National Ballast Information Clearinghouse (NBIC) was developed in conjunction with the Smithsonian Environmental Research Center (SERC) as the national repository for ballast water management data collected under this voluntary program. The NBIC submitted their first biennial report to the USCG in November 2001. The report summarizes the data collected by the NBIC from vessels reporting ballast water discharges as part of the U.S. voluntary ballast water management guidelines enacted under the NISA. The report indicated a nationwide 30.4 percent compliance level for reporting of ballast water management activities for vessels entering the U.S. Exclusive Economic Zone (EEZ).

As required by NISA, the Secretary of Transportation submitted a report to Congress (June 2002) assessing the compliance by vessels with the reporting requirement and voluntary guidelines. Using criteria developed by the, Aquatic Nuisance Species (ANS) Task Force as a starting point, this report assessed the adequacy and effectiveness of the guidelines and regulations in preventing the introduction and spread of nonindigenous species in U.S. waters. The report concluded that the consistently low rate of vessel reporting made it impossible to accurately assess compliance with the voluntary Ballast Water Management (BWM) guidelines. This finding, coupled with broad support for a mandatory national BWM program and the direction provided by NISA, served as a catalyst for the development of a mandatory ballast water management program.

On November 1, 2004 the United States Coast Guard's (USCG) newly developed Mandatory Ballast Water Management (MBWM) Program took effect. This final ruling revises 33 CFR part 151 to implement the requirements of the National Invasive Species Act (NISA). . Specifically, subpart D of 33 CFR part 151 has been revised to require a MBWM program for all vessels equipped with ballast water tanks entering U.S. waters.

The United Nations has a regulatory board called the International Maritime Organization (IMO) whose duties include helping countries set up regulations to prevent biological disasters. In 1991, the IMO set up guidelines for handling ballast water in "International Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ship's Ballast Water." The IMO is a body of the United Nations, in which the USCG represents the U.S. The current IMO guidelines have no direct connection with U.S. Federal or state regulations.

In November 1997, the IMO formally adopted guidelines for ballast water management

[Resolution A.868(20)], as part of the Marine Pollution (MARPOL) Annex. The MARPOL Annex contains nine important points regarding the present and future management of the ballast water issues:

- Changes the emphasis from prevention to minimizing the risk of introducing exotic species by ballast water;
- Emphasizes `target species' known to occur in water at the port of origin and known to have been taken up during the ballasting process;
- Recommends that if such target species are still found in the ballast water at the end of the journey then "the receiving port state authority may invoke management measures accordingly";
- Encourages port states to carry out biological baseline surveys in their ports and to disseminate the results of their investigations;
- Recommends a "fair, uniform and nationally consistent manner" for sampling tanks at all ports within the port state;
- Recommends that port states undertake compliance monitoring by taking and analyzing ballast water and sediment samples, and testing the samples for viability of the species they contain;
- Recognizes that operational measures such as mid-ocean exchange are only short term solutions;
- Advocates that member states undertake research on ballast water treatment; and
- Urges research on the implications of such exchanges on ships' safety (Dames & Moore, 1998).

The MARPOL Annex proposes that its regulations provide the overall BWM framework with the following components:

- A requirement for member countries to promote measures to minimize transfers of marine organisms in ballast water;
- A definition of "Harmful Aquatic Organisms and Pathogens" as those which, "if introduced may create hazards to human health, ha" living resources and aquatic life, damage amenities, or interfere with other legitimate uses of the sea;"
- An application to all vessels which carry ballast water, except those exempted by a receiving port state or where the safety of the ship, human life, and safety and similar factors prevent application of the regulations;
- A requirement for the uptake, management, treatment and discharge of ballast by ships to be undertaken in accordance with the guidelines to the Annex;

- An explicit recognition that ship safety would have the highest priority
- An explicit recognition for the need to minimize costs and undue shipping delays due to ballast management measures (Dames & Moore, 1998).
- Each ship would have its own "BWM Plan," including a standard of record keeping and reporting requirements to meet MARPOL Annex requirements; and
- Ships would adopt and implement relevant BWM measures from the following operational procedures:

  - minimize the uptake of organisms and sediments at the source port;
  - remove sediment from ballast tanks on a timely basis;
  - exchange ballast water at sea;
  - discharge into port reception/treatment facilities, where such exist; and
  - adopt other appropriate procedures as new technology becomes proven and accepted, including treatments enabling biological sterilization (Dames & Moore, 1998).

The U.S. Department of Agriculture also has a number of authorizations controlling introduction of potentially harmful plant species. These include the Organic Act, the Federal Plant Pest Act, the Federal Seed Act, and the Federal Noxious Weed These authorizations are designed to prevent the introduction of noxious weeds from other countries into or through the U.S. and to detect, eradicate, suppress, control, prevent or retard the spread of plant pests in the U.S.

Through an agriculture quarantine inspection program conducted at 178 U.S. ports of entry, the Animal and Plant Health Inspection Service (APHIS) conducts pre-clearance activities, permit decisions, treatment efforts, detection surveys, and eradication efforts to prevent the introduction of specific foreign pests that would threaten U.S. agricultural production and natural ecosystems.

Significant foreign pests include insects, plant and animal diseases, mollusks, mites, and invasive plants. Domestically, APHIS cooperates with Federal and state agencies as well as non-governmental organizations to detect, contain, and eradicate infections of selected foreign pests before they become well-established and spread. APHIS may use integrated management approaches including biological control to address widespread insects, diseases, and selected weeds that cannot otherwise be eradicated.

APHIS' National Wildlife Research Center (NWRC), is the world's only research facility devoted entirely to developing methods for managing wildlife damage due to non-native invasive species. The NWRC has an integrated, multidisciplinary research program that is uniquely suited to provide scientific information and solutions to wildlife

damage problems. Fining ways to control the brown tree snake on Guam is one of the NWRC's ongoing projects.

3.14.2 Affected Environment

Marine Environment

As previously discussed, Apra Harbor is the only deep lagoon in the entire Mariana Islands, and it is also the largest and busiest port in the archipelago. The harbor's unique environment provides habitat for many marine species that are found nowhere else on Guam. At the same time, Apra Harbor is also the main entry point of marine species that are introduced by shipping traffic.

Apra Harbor, like other port facilities, has the potential to introduce NIS into the native environment. There are six primary mechanisms of potential NIS introduction into marine environments. For marine nonnative introductions, the mechanism that is focused on to the greatest extent both in Hawaii and elsewhere, is the international and domestic shipping industry. In the past, research activities and stocking programs were also key mechanisms for marine introductions into Hawaii. Examples of additional potential mechanisms for introduction and transport include fisheries activities, aquaculture, and the water garden and aquarium industries (DLNR, 2003).

Table 3-32 below summarizes potential pathways of NIS introduction and post-introduction dispersal in marine environments.

Table 3-32
NIS Introduction and Dispersal Pathways
in Marine Environments

Mechanism	Introduction Pathways	Dispersal Pathways
Large Commercial Shipping and Passenger Vessels (cargo vessels, fishing boats towed platforms, cruise ships and ferries)	A) Ballast water and sediments -Planktonic organisms and larvae -Adult organisms B) Vessel hulls, seachests and pipe systems -Fouling organisms - algae, adult fish and invertebrates and larvae released by adult organisms C) Live holding and bait wells -Release of baitfish/invertebrates -Release of sediments -Release of symbiots and pathogens D) Fisheries gear and debris -Fouling organisms on nets and floats	A) Ballast water and sediments -Planktonic organisms -Adult organisms B) Vessel hulls, seachests and pipe systems - Fouling organisms - Release of larvae C) Fishing gear and debris -Fouling and sediments on nets and floats
Recreational Boating	A) Hull fouling and bio fouling on structures besides the hull (e.g., outboard motors) -see above with	A) Hull fouling and bio fouling on structures besides the hull (e.g., outboard motors)

Mechanism	Introduction Pathways	Dispersal Pathways
	commercial shipping B) Other factors-livewells, waterlines	B) Other factors -livewells, waterlines
Aquaculture, Aquarium, Water Garden and Other Industries, from Producer to Consumer	A) Accidental release of target organisms from culture/grow-out facilities B) Accidental release of non-target organisms -Epiphytic organisms -Pathogens C) Unauthorized, intentional release of organisms (largely a result of consumers or hobbyists)	A) Interisland transport of stock B) Unauthorized, intentional release of organisms (largely a result of consumers or hobbyists) C) Unintentional escape
Government Programs and Research	A) Authorized release -Bio-control -Stocking programs B) Un-authorized or unintentional release -Accidental release of experimental target organisms -Release of associated pathogens and symbiots	A) Authorized release of target species -Stocking programs -Bio-control B) Inadvertent release through interisland transport -Including research activities
Private Sector	A) Live seafood shipments B) Aquarium release C) Release for cultural practices D) Illegal and/or accidental imports -Foreign Cargo, Domestic Cargo -Foreign Passengers, Domestic Passengers -Mail -Private Aircraft and Vessels	A) Live seafood shipments B) Interisland transport of aquarium pets C) Recreational boating (also referred to in recreational Boating above) D) Diving and snorkeling activities
Marine Debris	A) Fouling organisms on abandoned nets and floats	A) Fouling organisms on abandoned nets and floats
Natural Dispersal	Not Applicable	A) Natural Dispersal (passive and active) -once established, many AIS can disperse naturally without the assistance of human activities

Source: DLNR, 2003

Of the above described mechanisms, introduction of NIS as a result of operations associated with commercial port activities at Apra Harbor could occur via the following pathways:

- Presence in transported cargo shipments
- Release during ballast water discharge from ships
- Attachment to the bottom of ships' hulls (i.e. "hull-growth")

The potential of each of these pathways as they relate to Apra Harbor operations is briefly discussed below.

Cargo Operations - Overseas and international cargo is offloaded and

inspected at Apra Harbor. Thus, cargo entering and being offloaded at Apra Harbor has the potential to be carrying stowaway alien species.

Ballast Water Discharge - Ballast water is necessary to increase a ship's manageability and safety and for maximum sailing efficiency and stability. A ship carrying little or no cargo rides high in the water, having less draft than a loaded ship. Ballast water intake allows a ship to ride lower in the water, thus increasing stability and making the vessel less vulnerable to waves and winds, less vulnerable to the bow being slammed when riding over high waves, and less potential for the propeller to raise out of the water. Ballast water is also loaded or discharged to adjust a ship's trim, improve maneuverability, increase propulsion efficiency, reduce hull stress, raise the ship to pass over shallow areas (reduce draft), and lower the ship to get under bridges or cranes (lower air draft).

Ballast water enters a ship through intakes located below the waterline. Depending on the level of the tank relative to the water surface, water may be taken in or discharged either by pumping or by gravitational flow. Ballast water is generally carried in several different compartments on board ships, often in tanks dedicated to that purpose (referred to as "segregated ballast water"). Some tankers carry ballast water in their cargo holds which is referred to as "nonsegregated ballast water," since it is mixed with the contaminants or remnants of the material that was last in that cargo hold.

Ballast capacity can range from several cubic meters in small fishing boats to hundreds of thousands of cubic meters in large cargo carriers. Large tankers can carry an excess of 200,000 m^3 of ballast water and have ballasting discharge rates as high as 15,000 to 20,000 m^3/hour. Discharged ballast water often contains marine organisms and sediment which has accumulated in ballast tanks (NISC, 2001).

Ballast sediment occurs when water containing large amounts of particulate matter (plankton, organic and inorganic detritus) mixed in the water column is pumped into the ballast tanks. These particulates enter the ballast tanks and over time settle to the bottom of the tanks. Ballast sediment is difficult to dispose of Disposal may be done in mid-ocean, but normally is done only when the vessel is in port or dry dock. Sediment in the ballast tanks gets stirred up every time the tanks are refilled and the organisms in the sediment get re-suspended and may be discharged when ballast tanks are emptied.

Hull-Growth - Hull growth or fouling is the attachment of organisms to the hull of ships, barges, floating dry docks, and other floating or submerged surfaces. Organisms found growing on the hulls of ships include microscopic invertebrates, barnacles, algae, mollusks and crustaceans. Hull-growth tends to occur when ships stay at anchor or in harbors for extended periods of time, giving organisms a chance to establish themselves. Alien species may need little time to transfer from host vessels to other vessels and spread to other harbors. However, the

amount of time needed for transfer of organisms is a point of conjecture, even among the experts on this subject.

Hull fouling organisms increase drag, resulting in slower speeds and higher fuel consumption. Therefore, it is in the best interest of vessels to keep bio-fouling such as hull-growth to a minimum, as it creates friction which increases fuel cost. Hull-growth on cruise ships is discouraged because the cost of building and maintaining cruise ships prompts owners to keep them in service as much as possible. Also, the expectation of cruise passengers to move frequently from port to port decreases the amount of time in any one harbor where hull-growth might have a chance to occur.

At the present time, the total number of nonnative aquatic species in Guam is not known. Additional work is needed to more formally and objectively assess the presence, distribution, life history traits, status, and threat of many nonnative aquatic species in Guam before all suspected aquatic invasive species can be identified.

While the number of nonnative aquatic species in Guam is still being assessed, research of nonindigenous species is ongoing which could contribute to the indentification of potential NIS organisms that could directly impact marine environments. Recent studies have shown that many invertebrates in Apra Harbor are nonnative introduced species. For example, among marine invertebrates Apra Harbor contains 16 introduced and 11 cryptogenic (likely, but not certainly introduced by humans) species of ascidians, one introduced and 16 cryptogenic species of sponges, and two cryptogenic species of echinoderms (UOG, 1997a).

It is of interest to note that although numerous non-indigenous species have invaded the marine waters of Apra Harbor, most of these have made little impact and remain restricted to artificial substrata. From the perspective of biotic invasion, Apra Harbors habitats can be divided into three categories. 1) Patch reefs and fringing reefs which are dominated by indigenous species. 2) Wharf walls and other concrete revetments which have a mixed biota that includes numerous non-indigenous as well as indigenous species, and 3) Buoys which are dominated by non-indigenous species, but also have numerous indigenous species (UOG, 2005).

Terrestrial Environment

Beginning in the mid 1906's, the brown Treesnake decimated Guam's native avifauna. The birds of Guam evolved in the absence of snake predators. They had no experience with such a predator and lacked protective behaviors against the brown Treesnake. Consequently, they were easy prey for these efficient, nocturnal predators. As the snakes spread across the island, the number of snakes began to grow exponentially and bird populations declined. Nine of the 11 species of native forest-dwelling birds have been extirpated from Guam. Five of these were endemic at the species or subspecies level and are now extinct on Guam. Two of these species, the Guam rail and the Micronesian kingfisher, are being captively bred in zoos in the hope that they

can eventually be released back into the wild. Several other native species exist in precariously small numbers, and their future on Guam is perilous.

The history of this decline starts shortly after the introduction of the brown Treesnake, although appreciable losses were not evident until the 1960s. By 1963, several formerly abundant species of native birds had disappeared from the central part of the island where snakes were most populous. By the late 1960s, birds had begun to decline in the central and southern parts of the island and remained abundant only in isolated patches of forest on the northern end of the island. Snakes began affecting the birds in the north-central and extreme northern parts of the island in the 1970s and 1980s, respectively. Most native forest species were virtually extinct when they were listed as threatened or endangered by the U.S. Fish and Wildlife Service in 1984.

3.14.3 Significance Criteria

For the purposes of this EIS, impacts related to nonindigenous invasive species would be considered significant if the Proposed Project:

- Introduces new, or leads to the expanded range of existing, non-native invasive species, so that they interfere with successful reproduction and/or revegetation of native fauna and/or flora

- Introduces invasive wildlife species into native terrestrial or aquatic habitat areas where native species could become displaced or the genetic integrity of the native ecosystem could be degraded

- Substantially interferes with the movement of any native resident or migratory terrestrial or aquatic species, or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites.

3.14.4 Environmental Consequences

Shipping operations throughout the Apra Harbor area currently result in ballast water discharges within the vicinity of the Bay. No direct effects or "no impacts" with regard to introductions of NIS are expected to occur from the No Action Alternative.

Under the three remaining reasonable alternatives potential NIS-related impacts would in large part be similar regardless of project location and/or design. Therefore, analysis of potential impacts from NIS were not differentiated by alternative but rather addressed collectively for the proposed improvements.

Cargo Operations

Proposed improvements to Apra Commercial Harbor to accommodate increased commodities traffic and cargo transshipment would increase chances that invasive

species would inadvertently be carried to Guam or be shipped away from Guam to other locations. Invasive species are a growing threat to business, agriculture and the ecological integrity of the region. For example, the brown tree snake is responsible for the near-extirpation of native land birds and fruit bats on Guam, and poses an enormous risk to the bird and bat fauna of nearby islands such as Saipan and Rota. This threat also extends to islands in the Freely Associated States of Micronesia and Hawaii, especially Oahu, which are connected to Guam by commercial, shipping and military ties. Other biological agents such as avian influenza pose a risk associated with unauthorized shipments of poultry and other bird stocks.

Ballast Water Discharge

As discussed in the previous section, A ships' ballast water functions to increase the vessel's manageability and safety and to control its draft, trim (for maximum sailing efficiency), and stability. Ballast water is taken in and discharged by vessels at varying rates and volumes depending on external (weather and sea conditions) and internal (cargo type, vessel design, and load quantity) conditions under which a vessel is sailing. Ships exchanging water from other areas may introduce NIS that can invade and potentially adversely impact marine ecosystems.

The potential diversity of marine biota which can be transported in ballast water is vast. The maximum size range of organisms capable of being taken into a ship depends upon the method of ballasting and the size of the intake screens. Virtually all organisms less than 1 cm in size that are adjacent to the vessel – either swimming naturally, stirred up from bottom sediments, or rubbed off harbor pilings – could be ballasted into the vessel. Such organisms include viruses, bacteria, protozoa, fungi, algae, plants, zooplankton, and fish.

Guam like many other island economies is a net importer of bulk cargo and manufactured goods, and therefore receives less ballast water than regions that are net exporters of these items. The reason for this is because ballast water is taken on in the loading rather than unloading phase of port operations. Cargo vessels entering Apra Harbor would be arriving with full loads and would not be carrying ballast water for discharge in or near the harbor. Conversely, cargo vessels would be taking in sea water from the Apra Harbor area in preparation for their exit voyages with a relatively lighter empty vessel.

Hull-Growth

Hull fouling may be the most underestimated pathway for nonnative introductions. Fouling organisms are divided into two categories: micro- and macro-sessile. Micro-sessile organisms include diatoms, algae, and bacteria. Macro-sessile organisms include mollusks, sea squirts, sponges, sea anemones, bryozoans, tubeworms, polychaetes, and barnacles. Both these categories of organisms can live on the hulls, and distribute propagules to wherever the vessel goes.

The loosening and release of hull-growth into receiving waters can occur from natural ocean currents, draft of the vessel, or from rubbing against harbor pilings. Additionally, if a vessel that is fouled with nonnative species runs aground, then it is likely that many of these species will be distributed at the grounding site.

Relative to ballast water discharge, hull-growth is not considered to be as large of a potential threat of NIS introduction because the amount of organisms present in hull-growth is not as numerous, and as discussed in the previous section, most vessels adhere to regularly scheduled hull cleaning activities as a part of their preventive maintenance program.

In summary, all of the considered alternatives with appropriate mitigation measures would result in less than significant impacts relating to the introduction of nonindigenous invasive species.

3.14.5 Proposed and Potential Mitigation Measures

The release of NIS, whether from ballast water discharge or hull-growth, into a new coastal environment does not necessarily constitute their successful introduction. An alien species must have the ability to form established populations to complete a successful introduction. Limiting the volumes of ballast water discharge into coastal waters, and in turn the number of potential NIS, would reduce the chances of the successful establishment of reproducing populations in the receiving waters.

As a general mitigation policy, PAG's port operations would seek to control and reduce the risk of introduction of marine invasive species by ensuring vessel compliance with the most current ballast water management guidelines. The PAG would operate the proposed expanded wharf facility with ongoing program(s) of compliance with national and international efforts to control the spread of marine invasive species. These programs include the ballast water exchange practices recommended by the IMO and the U.S. Coast Guard, which is implementing federal legislation consistent with IMO Guidelines, and the recommendations of the national ANS Task Force, which has developed directives for state and territorial jurisdictions as identified by ANS Regional Panels. Potential mitigation measures are discussed in further detail below.

Cargo Operations

To be effective in successfully containing these threats, we recommend that project planning incorporate strong controls to interdict accidental transportation of brown tree snakes and other NIS species. An example of such a control would be the installation of dedicated facilities throughout the new wharf facilities that house a permanent, on-site staff of invasive species specialists (representing United States Department of Agriculture – Wildlife Services and other programs) and equipment (vehicles, dogs etc).

The PAG will consistently sustain an adequate inspection rate of all cargo, vehicles, munitions, household goods and other items departing from the Port of Guam or other sites where materials, goods, vehicles, and cargo are staged for departure from Guam.

Support at the proposed wharf expansion site for brown tree snake quarantine efforts would need to accommodate the staff levels and operational infrastructure required to maintain programmatic integrity during all periods and phases of cargo and vehicle movement off Guam.

Establishing a long-term adequate and consistent office and kennel facilities for brown tree snake interdiction efforts at the proposed expanded wharf would be an important mitigation measure. The PAG would continue to support sustained brown tree snake trapping, capture, and toxicant use by the USDA APHIS Wildlife Services directly in the vicinity of sites where cargo, vehicles, and other items are staged, stored, or packed prior to departing Guam. PAG would also work cooperatively with the USDA APHIS Wildlife Services to develop joint operating procedures that would ensure a continued brown tree snake interdiction effort at appropriate levels.

In addition to the above measures, the USDA will continue to inspect agricultural products coming in on vessels, including items passengers may have on board. As needed, they will confiscate illegal agricultural items that could contain alien species. When a foreign cruise ship comes in, the USDA will continue to inspect the ship's stores (food), including agricultural products in the kitchen. If prohibited items are found, they will be sealed in refrigerators.

Ballast Water Discharge and Hull Growth

Regulatory Measures

PAG would also seek to control and reduce the risk of introduction of marine invasive species by ensuring vessel compliance with the most current ballast water management guidelines. Until recently, there had been no enforceable laws at either the federal or local level regulating ballast water management (BWM). However, on November 1, 2004 the USCG newly developed MBWM Program took effect.

This final ruling revises 33 CFR part 151 to implement the requirements of the NISA. . Specifically, subpart D of 33 CFR part 151 has been revised to require a MBWM program for all vessels equipped with ballast water tanks entering U.S. waters.

The MBWM program requires all vessels equipped with ballast water tanks entering U.S. waters after operating beyond the Exclusive Economic Zone (the area encompassing waters extending up to 200 miles from the shoreline a.k.a, the EEZ) to employ at least one of the following ballast water management practices:

- Prior to discharging ballast water in U.S. waters, perform complete ballast water exchange in an area no less than 2,000 nautical miles from any shore.
- Retain ballast water onboard the vessel.
- Prior to the vessel entering U.S. waters, use an alternative environmentally sound method of ballast water management that has been approved by the USCG.

Although, the national mandatory BWM program provides vessels with the option of using one of three BWM practices, ballast water exchange is likely to be the most used practice. This is due to:

- Some vessels engaged in trade are unlikely to hold their ballast after arriving from outside the EEZ, as this would mean they would not be able to load their cargo
- Alternative environmentally sound methods of ballast water management are still being developed, and would likely be of limited availability in the near future

Therefore, under this rule, the BWM practice of conducting mid-ocean ballast water exchange prior to discharging ballast in U.S. waters would be the practice most used by the majority of vessels.

Mid-ocean ballast water exchange is currently the most practicable method to help prevent the introductions of NIS into U.S. waters. Water in the open ocean contains certain physical, chemical, and biological conditions contained in ballast water that is exchanged in mid-ocean will not, or are unlikely to survive in an open ocean system. Likewise organisms that are contained in ballast water after a mid-ocean exchange is conducted will not, or are unlikely to survive if introduced into a freshwater or coastal system.

Under the new MBWM program regulations (33 CFR part 151 subpart D), subject vessels will be required to develop and maintain a BWM plan. The BWM plan shall be specific to each vessel and shall fulfill two purposes: (1) Show that there is a BWM strategy for the vessel; and (2) allow any master, or other ship's officer as appropriate, serving on that vessel to understand and follow the BWM strategy for the vessel.

The USCG currently recognizes two feasible methods of conducting ballast water exchange:

1. An empty/refill exchange. The tank (or pair of tanks) is pumped down to the point where the pumps lose suction, and then the tank is pumped back up to the original level, and;
2. A flow-through exchange. Mid-ocean water is pumped into a full tank while the existing coastal or fresh water is pumped or pushed out through another opening. As defined by the Coast Guard, a volume of water equal to three times the ballast tank capacity must be pumped for a flow-through exchange.

Failure to employ at least one of these BWM practices outlined above would result in monetary penalties, unless the vessel is exempt due to safety or voyage

Technological Measures

Once ballast water has been loaded on board, the ideal mechanism for preventing

subsequent introductions of nonindigenous aquatic species is to kill or remove the organisms prior to discharging ballast water overboard. This could be achieved by utilizing onboard chemical, physical, biological, or mechanical treatment technologies. There are numerous promising treatment technologies emerging, a few of which are listed below (IMO, 1996):

- Filtration Systems
- Oxidizing and nonoxidizing biocides
- Thermal techniques
- Electric pulse and pulse plasma techniques
- Ultra violet treatment
- Acoustic systems
- Magnetic Fields
- Deoxygenation
- Biological techniques

Each of the above technologies, whether utilized individually or in combination, would achieve the goal of neutralizing potentially harmful alien species in an environmentally safe manner before they are discharged into receiving waters.

Regulatory Oversight of NIS in Guam

In addition to the measures discussed above, control of NIS introduction into Guam would continue to be addressed by existing and future cooperative interagency efforts. PAG would operate the proposed expanded wharf facility with an ongoing program of compliance with national and international efforts to control the spread of marine invasive species. For example, the PAG would continue to cooperate with and follow the recommendations of the National ANS Task Force, which has developed directives for state and territorial jurisdictions as identified by ANS Regional Panels, and committees such a the Western Micronesian Regional Invasive Species Committee (WMRISC), and the Guam Invasive Species Advisory Committee (GISAC) to monitor and resolve the potential introduction of NIS species. The PAG would remain committed to cooperating with other regulatory agencies that have jurisdiction and authority on the prevention and control of NIS introductions into Guam.

Table 3-33 provides an overview of the main governmental agencies with responsibilities for control of potential NIS introductions.

Table 3-33
Regulatory Oversight of NIS Control and Introduction

Agency	Overview of Responsibility
United States Department of Agriculture	Inspection and clearance of agricultural items (plant materials and pests) on foreign arriving vessels. Refers some plant pest dispositions to Hawaii Department of Agriculture.

Agency	Overview of Responsibility
United States Department of the Treasury U.S. Customs Service	Boarding and clearance of foreign arriving vessels, passengers, crew and cargo. Refers plant materials to U.S. Department of Agriculture and refers animals or animal parts to U.S. Fish and Wildlife Service.
United States Coast Guard*	Jurisdiction over all maritime vessels (commercial, private, foreign, U.S. flag ships). Oversees hazardous materials in transit and assists or refers contraband to other federal or state agencies for disposition. Enforces mandatory ballast water guidelines
United States Department of the Interior Fish and Wildlife Service	Inspection and clearance of wildlife (animals and parts) including alien species and protected, threatened or endangered species on foreign arriving vessels.

*Note: As of March 1, 2003, the U.S. Coast Guard (USCG) became a component of the Department of Homeland Security. As a result the Secretary of Department of Homeland Security assumed all duties once bestowed on the Secretary of Transportation with respect to security measures at U.S. commercial ports.

3.15 NOISE AND VIBRATION

3.15.1 Introduction

This section describes the existing noise, ground-borne vibration, and noise-induced vibration environment in and around the study areas surrounding each alternative project location and how that environment may be affected by the proposed facilities included in the proposed harbor improvements. Potential impacts focused mainly on noise sensitive human receptors within the project vicinity. Receptors that may be affected by noise and vibration are identified, as well as the criteria that evaluate the compatibility of noise and vibration at those receptors. In addition this section describes the fundamentals of acoustics and vibration, sound level and vibration measurements, and acoustical calculations.

Noise

The impacts of sound on the environment are determined by several factors including, sound level (loudness), the duration of exposure to the noise, the frequencies involved, and the variation or fluctuations in noise levels during exposure. Loudness is measured in units called decibels (dB). Since the human ear is unable to perceive all sound frequencies equally, noise levels are adjusted to correspond to human hearing. This adjusted unit is known as the A-weighted decibel, or dBA.

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL). This descriptor incorporates a 24-hour average of instantaneous dBA levels as read on a standard Sound Level Meter. By definition, the minimum averaging period for the DNL descriptor is 24 hours. Sound levels which occur during the nighttime hours of 10:00 p.m. and 7:00 a.m. are increased by 10 dB prior to computing the 24-hour average by the DNL descriptor.

A value of 65 DNL or lower is considered to be an acceptable exterior noise level for residential receptors. This standard is applied nationally including Guam. Where naturally ventilated dwellings are used, relatively low exterior-to-interior sound attenuation result from these naturally ventilated structures, and an exterior noise level of 65 DNL does not eliminate all risks of noise impacts. Because of these factors a lower level of 55 DNL is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 DNL, many government agencies have selected 65 DNL as a more appropriate regulatory standard.

For commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL. The Apra Harbor and its immediately adjacent land areas include existing land uses and activities which fall within the commercial and industrial categories. These land uses and activities are not considered to be noise sensitive.

Table 3-24 presents current federal noise standards and acceptability criteria for residential land uses that are present within the general environs of the Apra Harbor area and that may be affected by noise from harbor activities.

Table 3-34
Exterior Noise Exposure Classification
(Residential Land Use)

Noise Exposure Class	Day-Night Sound Level	Equivalent Sound Level	Federal [1] Standard
Minimal Exposure	Not Exceeding 55DNL	Not Exceeding 55Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But not above 65DNL	Above 55 DNL But not above 65Leq	Acceptable [2]
Significant Exposure	Above 65 DNL But not above 75DNL	Above 65 Leq But not above 65DNL	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

(1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.
(2) Federal Highways Administration (FHWA) uses the Leq instead of the DNL descriptor. For planning purposes, both are equivalent if: a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.

Vibration

Vibration consists of waves transmitted through solid material. There are several types of wave motion in solids, unlike in air, including compressional, shear, torsional, and bending. The solid medium can be excited by forces, moments, or

pressure fields. This leads to the terminology "air-borne" (pressure fields) or "structure-borne/ground-borne" (forces and moments) vibration.

Ground-borne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be comprised of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hz. Most environmental vibrations consist of a composite, or "spectrum" of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most ground-borne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz. Ambient and source vibration information for this study has been measured in terms of the peak particle velocity (PPV) in inches per second (in/sec) that correlates best with human perception.

Vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. High frequency vibrations reduce much more rapidly than low frequencies, so that in the far-field from a source the low frequencies tend to dominate. Soil properties also affect the propagation of vibration. When ground-borne vibration interacts with a building there is usually a ground-to-foundation coupling loss but the vibration can also be amplified by the structural resonances of the walls and floors. Vibration in buildings is typically perceived as rattling of windows or items on shelves or the motion of building surfaces. The vibration of building surfaces can also be radiated as sound and heard as a low-frequency rumbling noise, known as ground-borne noise.

Ground-borne vibration is generally limited to areas within a few hundred feet of railway systems, certain types of industrial operations, and construction activities, especially pile driving. Road vehicles rarely create enough ground-borne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps. If traffic, typically heavy trucks, does induce perceptible vibration in buildings such as window rattling or shaking of small loose items, then it is most likely an effect of low-frequency air-borne noise or ground characteristics.

Construction activities can also produce varying degrees of ground vibration, depending on the equipment and methods employed. The construction activities that typically generate the highest levels of vibration are blasting and impact pile driving.

Ground vibrations generated during pile driving operations are generally described in terms of peak particle (or ground) velocity (PPV) in units of inches/second. The human being is very sensitive to ground vibrations, which are perceptible at relatively low particle velocities of 0.01 to 0.04 inches/second. Damage to structures, however, occur at even higher levels of vibration. A summary of building damage criteria is shown in Table 3-35.

Table 3-35
Summary of Building Damage Criteria

Peak Particle Velocity (inches/second)	Peak Particle Velocity (milimeters/second)	Comment
7.6	193.04	Major damage to buildings
5.4	137.72	Minor damage to buildings
4.0	101.16	"Engineer structures" safe from Damage
2.0	50.6	Safe from damage (probability of damage <5%)
No Structural Damage		
1.3	33.02	Risk threshold for "architectural" damage to houses
1.0	25.4	No data showing damage to structures for PPV <1.0 inches/second
0.6	15.24	No risk of architectural damage to normal buildings
0.4	10.16	Threshold of damage to older homes
0.2	5.08	Statistically significant percentage of structures may experience minor damage
No Architectural Damage		
0.5 to 0.15	3.81	Upper limits for ruins and ancient monuments
0.04	1.0	Vertical vibration clearly perceptible to humans
0.01	0.32	Vertical vibration just perceptible to humans

Source: U.S. Department of Transportation, 1993

The most commonly used damage criteria for structures is the 2.0 inches/second limit derived from work by the U.S. Bureau of Mines. A more conservative limit of 0.2 inches/second is also used for project planning purposes. For the purposes of impact analysis in this EIS the latter limit was used because of the repetitive nature of pile driving operations which could increase risks of damage due to fatiguing, and particularly if structures are adjacent to pile driving activities.

3.15.2 Affected Environment

In the vicinity of the project areas, ambient sound levels are influenced primarily by vehicular traffic from nearby Route 1. Noise related to harbor operations include on-site motor vehicles, fixed mechanical equipment, and ocean vessels activities. The noise generated from harbor operations are for the most part not radiated beyond the harbor property boundaries.

The existing traffic noise levels in the Apra Harbor vicinity are in the "Significant Exposure, Normally Unacceptable" category for noise sensitive activities at the lots which front Route 1. For commercial and industrial uses, existing traffic noise levels along Route 1 are in the "Compatible" and "Marginally Compatible" categories. Along Route 11, where existing uses are primarily commercial and industrial, existing traffic noise levels are also in the "Compatible" and "Marginally Compatible" categories.

Average traffic noise levels in the project area typically remain relatively steady during the daylight hours from 6:00 am and through the evening hours until 6:00 pm. After 6:00 pm, average traffic noise levels decline to their lowest levels at about 3:00 am the next morning. The background noise level during the daytime hours typically ranges between 64 to 68 dB at 100 feet from the roadway centerline, and declines to a value between 52 and 54 dB during the quietest hour near 3:00 am. Traffic noise levels along the Right-of-Way of a roadway generally represent the worst-case (or highest) noise levels due to the proximity of the Right-of-Way to the noise sources.

In the Piti residential area east of Apra Harbor existing background noise levels are controlled by local traffic, distant highway traffic, and roosters, with average noise levels ranging between 50 to 60 Leq. For existing residences beyond 250 feet from Route 1, existing background noise levels are estimated to be between 55 to 65 DNL.

An acoustical study was conducted in March 2005 in support of this EIS to evaluate potential noise and vibration impacts associated with the proposed harbor improvements (attached as Appendix J). Existing traffic and background ambient noise levels were measured at nine locations in the vicinity of Apra Harbor to establish a baseline for existing noise levels and for developing the project's traffic noise contributions along the public roadways which would service the proposed harbor project. The measurement locations and a summary of the ambient background noise measurements are presented in Figure 3-18 and Table 3-36, respectively.

Table 3-36
Traffic and Background Noise Measurements in the Apra Harbor Vicinity

Measurement Location	Time of Day	Average Speed (in MPH)	Hourly Traffic Volume & Vehicle Mix			Measured Leq (dB)
			Automobile	Medium Truck	Heavy Truck	
A	1000	N/A	N/A	N/A	N/A	N/A
B	1100	40	231	19	49	66.1
C	1200	N/A	N/A	N/A	N/A	N/A
D1	1500	50	1,601	20	68	73,6
D2	1500	50	1,601	20	68	65.5
D1	1600	48	2,282	26	47	74.8
D2	1600	48	2,282	26	47	66.4
D1	0700	50	2,084	12	16	73.2
D2	0700	50	2,084	12	16	65.3
E1	1600	50	2,068	27	20	73.1
E2	1600	50	2,068	27	20	65.3
E1	0700	50	1,956	13	23	73.8

Measurement Location	Time of Day	Average Speed (in MPH)	Hourly Traffic Volume & Vehicle Mix			Measured Leq (dB)
			Automobile	Medium Truck	Heavy Truck	
E2	0700	50	1,956	13	23	65.6
F	0800	N/A	N/A	N/A	N/A	N/A
G	0900	N/A	N/A	N/A	N/A	N/A

Notes: N/A = Not Applicable Source: Ebisu, 2006

It should be noted, due to the unavailability of applicable Guam noise regulations the Hawaii State Department of Health (HDOH) noise regulations (State of Hawaii, 1996) were used as an appropriate reference for regulation of noise during construction activities and for the regulation of noise from fixed mechanical equipment. The noise from ships and small water craft are not regulated by the DOH. Hawaii State DOH noise regulations concerning stationary mechanical equipment are expressed in maximum allowable property line noise limits rather than DNL. For agricultural or industrial lands, the allowable limits are 70 dBA for daytime and nighttime periods along the property boundaries.

The daytime period is defined to be from 7:00 am to 10:00 pm, and the nighttime period is considered to be the remaining hours by the DOH rules. For properties zoned for apartment, hotel, or business uses, the applicable DOH property line noise limits are 60 and 50 dBA during the daytime and nighttime periods, respectively. For single family residences, public and open spaces, and preservation zoned lands, the daytime and nighttime DOH limits are 55 and 45 dBA, respectively. Although they are not directly comparable to noise criteria expressed in DNL, Hawaii State DOH noise limits for residential, commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively. In general, the lower noise limits would only apply to harbor lands that are zoned for activities other than industrial or agricultural uses.

3.15.3 Significance Criteria

In general, noise-related impacts could be considered significant if any of the following apply:

- Project construction or operation noise levels exceed the local noise ordinance or any applicable noise regulations promulgated on the Federal, State, or Territorial level at locations such as residences, schools, parks, places of worship, or hospitals
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- A substantial temporary or periodic increase, greater than 10 dBA, in ambient noise levels in the project vicinity above levels existing without the project.

3.15.4 Environmental Consequences

No Action Alternative

Under the no action alternative the proposed deep-draft wharf project and land reclamation would not occur. Therefore, this alternative would result in a less than significant impact. Predicted noise levels under this alternative would be equivalent to future 2025 conditions without the Proposed Project. Noise conditions under this alternative take into consideration Guam's projected future traffic growth as discussed in Section 3.4. However, 2025 noise conditions under the No Action Alternative are not presented in this subsection. Rather, they are presented under the Preferred Alternative subsection below, as they provide a more useful comparative future baseline against which the Preferred Alternative can be measured.

Preferred Alternative

Traffic-Related Impacts

As discussed in Section 3.4, over the coming 20 years traffic volume in the Apra Harbor area is expected to increase with or without implementation of the Preferred Alternative. Similarly, traffic noise levels in the Apra Harborarea are expected to increase as well.

Future traffic noise level impacts resulting from the Preferred Alternative were analyzed for key roadway locations in the project vicinity. The hourly Equivalent Sound Level (Leq) is expected to increase an average of 1.4 dB and at key roadway locations. A comparison of existing traffic noise levels and projected traffic noise levels after implementation of the Preferred Alternative are shown in Table 3-37.

Table 3-37
Existing and Future Traffic Noise Levels
Along Roadways in the Apra Harbor Project Area[a]

Location	Hourly Equivalent Sound Level (Leq)	
	Existing (2005)	Future 2025 (w/Preferred Alternative)
Route 1 (north of Route 11 intersection)	67.1	68.6
Route 1 (south of Route 11 intersection)	67.1	68.4
Route 11 (west of Route 1 intersection)	64.8	65.7
Route 11 (at entrance gate to Apra Harbor)	60.1	61.7

(a) During the PM peak hour and at 100 ft. setback distance from roadway centerline. Source: Ebisu, 2006

Traffic noise levels along Route 1 were predicted to increase by 1.4 to 1.6 dB between the years 2005 and 2025 primarily as a result of non-project-related traffic volume increases. Traffic noise levels along Route 11 were predicted to increase by 1.0 to 1.6 dB between this same 20 year period primarily as a result of traffic volume increases associated with the Preferred Alternative. Without the Preferred Alternative, future

traffic volumes along Route 11 were assumed to be identical to base year (2005) values. Therefore, all future increases in traffic noise along Route 11 would be attributable to the Preferred Alternative. Table 3-38 presents the predicted increases in future traffic noise levels resulting from both the Preferred Alternative and non-project related traffic increases.

Table 3-38
Future (2025) Project and Non-Project
Traffic Noise Contributions[a]

Location	Noise Level Increase in dB	
	Non-Project Traffic	Preferred Alternative - Related Traffic
Route 1 (north of Route 11 intersection)	1.5	0.1
Route 1 (south of Route 11 intersection)	1.3	0.1
Route 11 (west of Route 1 intersection)	0.0	1.0
Route 11 (at entrance gate to Apra Harbor)	0.0	1.6

Source: Ebisu, 2006

In summary, traffic noise levels in the immediate vicinity of the Apra Harbor are predicted to increase by 1.5 dB or less between the years 2005 and 2025 as a result of non-project traffic volume increases. The largest increases in future traffic noise levels would occur at the entrance gate to Apra Harbor, which is not a residential area. At the harbor entrance gate traffic noise levels would increase by 1.6 dB as a result of the Preferred Alternative. The projected traffic noise level increases described above considered negligible, and would be difficult to perceive over the 20-year forecast period.

Construction-Related Impacts

Unavoidable but temporary noise impacts may occur during the construction of the proposed harbor improvement projects. The quality of the acoustic environment may be degraded to unacceptable levels during periods of construction because noise from construction activities are predicted to be audible at adjoining properties. Construction-related noise would be generated by both on-site equipment (e.g., pumps, generators, compressors, jack hammers, rock drills, demolition equipment, and power tools) and vehicles (e.g., trucks, front loaders, backhoes, tractors, graders, pavers, concrete mixers, etc.). Pile driving would be necessary to implant piles at the site of the proposed deep-draft wharf.

The impulsive noise levels of impact pile drivers range from approximately 75 dB to 115 dB at distances of 1,000 feet to 10 feet, respectively, from the pile driving equipment. Figure 3-19 depicts the predicted range of noise levels outdoors within the areas surrounding Apra Harbor during pile driving activities at the proposed deep-draft wharf site. Indoors, typical levels of pile driving noise within naturally ventilated and air conditioned structures would be approximately 10 and 22 dB less, respectively, than the outdoor levels shown in Figure 3-19.

In summary, noise impacts are not anticipated during construction activities at existing residential areas east and south of Apra Harbor. Maximum noise levels during pile driving activities are expected to remain below 50 dB at the closest residential areas of Piti to the east and at the U.S. Naval Base to the south. Noise levels from other construction operations (i.e., dredging, pier construction, paving, etc.) are predicted to be 15 dB lower than those shown in Figure 3-19.

Family Beach is predicted to experience impulsive noise levels of approximately 72 dB during pile driving activities. However, these construction noise levels are predicted to be less than 70 DNL and in the "Marginally Compatible" category for water sports/recreational activity areas.

The noise receptor expected to experience the highest levels is Hotel Wharf. At Hotel wharf noise levels resulting from pile driving activities is expected to range between 72 to 102 dB.

In addition to noise generated by pile driving activities, pile driving induces ground vibrations which have the potential to cause structural and architectural damage to existing structures. As previously discussed, pile driving ground vibrations are measured in peak particle (or ground) velocity (PPV) in units of inches/second. The criteria most commonly used in measuring structural damage induced by pile driving activities is a 2.0 inches/second limit derived from work from the U.S. Bureau of Mines. A more conservative limit of 0.2 inches/second was used for the Proposed Project because of the repetitive nature of pile driving activities which could increase the risks of damage to adjacent structures due to fatiguing (Ebisu, 2006).

The intensity of vibration of pile driving activities can be expressed in units known as scaled energy distance factor (SEDF). The SEDF can be converted to measurable distances between the pile driver tip and a receptor to determine PPV levels. SEDF and PPV levels for pile driving activities vary depending upon substrate type and the size of the pile driver used. For wet sand soil conditions, the 0.2 inches/second vibration damage criteria would be exceeded at a SEDF of approximately 0.7.

In addition to substrate type, actual PPV levels at the receptor are dependent upon both the distance from the pile driver and the size of the pile driver. For a 30,000 foot-pound pile driver, a SEDF of 0.7 equates to a separation distance of 247 feet. Under clay soil conditions, and a shorter separation distance of 115 feet would be required to not exceed the 0.2 inches/second criteria.

Under the preferred alternative, pile driving activities would occur in coral layers. When pile driving operations must penetrate through coral layers, vibration levels at a receptor (adjacent structure) may exceed the 0.2 inches/second vibration damage criteria, particularly if the receptor is supported by the common coral layer.

The nearest structure to the proposed pile driving site would be a small single-story concrete building located at Hotel Wharf. This concrete structure is in a state of disrepair, is unoccupied, and is used mainly for equipment storage. During construction of the west end of the proposed deep-draft wharf, the concrete building may fall within the 247 to 30 feet critical distances to pile driving activities. Should this be the case, the structure could potentially be adversely impacted by pile driving-induced vibrations.

The next-nearest structures would be the Mobile and SPPC fuel tanks which are located a considerable distance away, situated approximately 2,200 feet west of the proposed deep-draft wharf site. At this distance the fuel tanks are well beyond the 0.2 inches/second vibration contour associated with possible damage from ground vibrations during pile driving with 30,000 foot-pound pile drivers. The Piti residential area which is located more than 2 miles from the proposed deep-draft wharf site would experience imperceptible ground vibration levels. Therefore, risks of adverse impacts from ground vibrations during pile driving operations are considered to be very low, and special mitigation measures should not be required (Ebisu, 2006).

Operational Impacts

Harbor vehicles such as heavy trucks, forklifts, sweepers, buses, and ships which will conduct maintenance activities and transport materials and personnel to and from harbor projects are potential sources of noise. Mechanical equipment such as emergency electrical generators, air conditioning cooling towers, air-conditioning compressors, exhaust fans, and other ventilation systems will be the primary fixed on-site noise sources expected to be located at the harbor project sites.

Typical noise levels of mobile harbor equipment are between 65 to 85 dB at 100 feet distance. The noise levels from these yard activities and mobile harbor equipment are not expected to change significantly because major modifications to the cargo receiving and handling areas are not anticipated (Ebisu, 2006).

The loudest noise sources associated with harbor activities are boat whistles and horns. Whistles and horns of typical excursion vessels are approximately 90 dB at 250 feet distance. The horns of typical large cruise ships are approximately 85 dB at 1,000 feet distance. The horns are intermittent, and are typically sounded prior to sailing or during safety drills. Because of their low frequency characteristics, the horns of the large ships do not interfere with speech communication, but may startle nearby residents. Adverse noise impacts from cruise ship horns at the proposed deep draft wharf are not anticipated due to the relatively large distances to the nearest residential structures.

In summary, the Preferred Alternative with appropriate mitigation measures would result in less than significant noise-related impacts.

Alternative 2

Under Alternative 2 potential noise and vibration related impacts would be similar to those under the Preferred Alternative, resulting in less than significant noise-related impacts with appropriate mitigation measures. Under this alternative sheet piles would be driven into the ground rather than pier pilings. This may result in slightly differing noise and vibration intensities. However, the general construction site locations would be identical to those under the Preferred Alternative.

Alternative 3

Under Alternative 3 the Proposed Project area is substantially larger than under the Preferred Alternative and Alternative 2, resulting in less than significant noise-related impacts with appropriate mitigation measures.. Due to the larger size of the proposed facility and its closer proximity to the residential areas of Piti, adverse noise and vibration impacts under Alternative 3 could be anticipated to be greater in both intensity and duration than those under the first two Alternatives.

3.15.5 Proposed and Potential Mitigation Measures

Traffic-Related Impacts

As previously mentioned, Apra Harbor and its immediately adjacent land areas include existing land uses and activities which fall within the commercial and industrial categories. These land uses and activities are not considered to be noise sensitive. Therefore, risks of adverse noise impacts as a result of the proposed improvements within the harbor and its immediately adjacent areas are considered to be minimal and traffic noise mitigation measures should not be required.

Construction-Related Impacts

Mitigation of construction noise to inaudible levels may not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), due to the relatively low background ambient noise levels in the surrounding communities, and due to the exterior nature of the work (pile driving, jack hammering, earth moving, dredging, trenching, concrete pouring, hammering, etc.). The added noise during construction may result in the temporary degradation of the acoustical environments of the surrounding communities. Therefore, the following noise mitigation measures should be implemented if determined to be feasible:

- The use of properly muffled construction equipment should be required on the job site.
- Reduction of pile driving noise may be possible, if soil conditions allow, through the use of vibratory pile driving equipment rather than impact pile drivers.
- The incorporation of construction noise limits and curfew times during the construction phases of this project is another noise mitigation measure commonly used. Hawaii State DOH construction curfews are between the hours

of 7:00 A.M. and 6:00 P.M. on weekdays, and between 9:00 A.M. and 6:00 P.M. on Saturdays (State of Hawaii, 1996).

As previously discussed, the receptor expected to experience the highest levels of pile driver-related noise is Hotel Wharf. At Hotel wharf noise levels resulting from pile driving activities is expected to range between 72 to 102 dB. Due to these elevated noise levels scheduling of pile driving activities during cruise activity periods should be avoided.

As previously noted, Hotel Wharf contains a single story concrete building. During construction of the west end of the proposed deep-draft wharf, the concrete building may fall within the 247 to 30 feet critical distances to pile driving activities. If so, and if considered necessary, vibration monitoring at the structure could be conducted during close-in pile driving operations as a mitigation measure. However, it should be noted that if the building is at a distance greater than 25 feet from the pile driving activity, the probability of damage is relatively low (less than 5 percent) with vibration levels being less than 2.0 inches per second (Ebisu, 2006).

4.0 SUMMARY OF UNAVOIDABLE IMPACTS, COMMITMENT OF RESOURCES AND CUMULATIVE IMPACTS

4.1 UNAVOIDABLE ADVERSE IMPACTS OF THE PROPOSED PROJECT

This section provides a list of unavoidable adverse impacts of the Proposed Project. For detailed explanations of the impacts, refer to Section 3 of the EIS.

- The Proposed Project would require public expenditures for public infrastructure investments, as well as for operational maintenance dredging

- Unavoidable noise impacts resulting mainly from construction of the Proposed Project have been identified. A detailed discussion of the project-related construction and operational noise impacts (and the proposed noise mitigation measures) can be found in Section 3.15

- The construction and operation of the Proposed Project would negligibly alter the general visual character, viewsheds, and lighting of the area. Changes to localized nighttime ambient light levels would be minimized through the incorporation of appropriate project design elements.

- There are unavoidable adverse air quality impacts that would be associated with construction and operational activities of the Proposed Project. Regardless of proposed mitigation efforts to be undertaken, some additional pollutants would still be emitted.

- The Proposed Project would result in unavoidable adverse impacts on hydrology, drainage, and flooding. These impacts would include changes in land use and drainage patterns from undeveloped to developed conditions in an area of about 24 acres, with about 16.6 acres of upland backland area created and about 7.4 acres for deep-draft wharf facilities.

- Unavoidable adverse impacts to water quality from the Proposed Project would include alterations in the pattern, and increase in the quantity, of stormwater discharges. The stormwater runoff would be mostly from newly paved areas discharged through manmade outfalls. The stormwater entering surface water bodies may contain oil and grease, traces of petroleum products, and washings/runoff from vehicles and paved areas. However, the water quality of stormwater discharges would be controlled by NPDES permit regulations. There would be increased turbidity in adjacent coastal waters where dredging activities would be conducted, as well as during times of ship movements during future wharf operations.

- The Proposed Project would result in new deepwater areas within Outer Apra Harbor. Construction and operational activities would result in the short-term, temporary disruption of bottom sediments in areas immediately adjacent to the proposed deep-draft wharf.

- The Proposed Project would result in the permanent fill and loss of approximately 16.67 acres of submerged lands in three shallow man-made embayments.

- Construction of the Proposed Project would result in the permanent loss of approximately 1,500 feet of recreational area consisting of the Outhouse Beach facilities and the adjacent coastal waters extending westward up to (but not including) Hotel Wharf. This area is utilized primarily for instructional SCUBA diving activities which would eventually be relocated to another suitable coastal area.

- Construction of the Proposed Project would result in the permanent loss of approximately 22.33 acres of coral reef habitat consisting of approximately 13.03 acres of reef flat, 4.42 acres of reef crest, and 4.88 acres of reef slope habitats. Appropriate compensatory mitigation measures would be required and would developed in cooperation with applicable federal and Territorial agencies.

4.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES FROM THE PROPOSED PROJECT

This section discusses natural, social, and economic resources, which would be permanently committed as a result of the Proposed Project. These resources would be expended in a way that could not be recovered once committed to the Proposed Project. Therefore, their loss of availability for other uses would be irreversible.

- Construction of the Proposed Project would cost approximately $67.5 million, which would be an irreversible and irretrievable commitment of financial resources. There would be an additional commitment of public financial resources for operational costs of the new facilities.

- Labor would be required for construction, planning, engineering design, landscaping, purchasing, and services. Once used, the labor is irretrievable. However, labor effort is also monetarily compensated, thereby supporting the Guam's economy.

- Constructing the Proposed Project would result in the permanent loss of approximately 22.33 total acres of coral reef habitat. Loss of this habitat would be addressed through compensatory mitigation measures. However, loss of the existing habitat in its present location would be irreversible and irretrievable.

- Development of the Proposed Project would result in the loss of approximately 16.67 acres of submerged lands to fill activity and the transformation of about 24 acres of undeveloped fast and submerged lands to wharf and backland facilities.

- Development of the Proposed Project would result in the permanent fill or excavation of approximately 146.0 acres of freshwater wetlands, of which approximately 19.3 acres are jurisdictional under current USACE regulations. Although these losses would be mitigated and replaced as stated in Section 4.2, these specific aquatic resources would be permanently committed to the Proposed Project.

- During the construction phase of the proposed improvements, an undetermined amount of resources such as fossil fuels and construction materials such as concrete, steel, asphalt, wood, and rock would be irrevocably committed.

4.3 RELATIONSHIP OF SHORT-TERM USES OF MAN'S ENVIRONMENT AND LONG-TERM PRODUCTIVITY

This section discusses the short-term adverse impacts caused by development of the proposed project relative to the long-term maintenance and enhancement of productivity. Short-term impacts are primarily those that occur during the period of construction. Long-term productivity relates to the continuous beneficial impacts of the Proposed Project, such as enhanced efficiency and increases in permanent employment opportunities.

In the short-term, the land area of about 24 acres to be occupied by the Proposed Project and access rights of way would remain undeveloped, with continued aesthetic and recreational value, and continued contribution toward ecosystem balance. With continued growth on Guam as wells as in the immediate Apra Harbor area, coastal lands would be required to support commercial port infrastructural development. As a result, the long-term productivity of the commercial port area would be utilized for such developments, and the long-term economic productivity derivable from such developments outweighs the short-term uses of this part of man's environment.

The environment associated with the Proposed Project includes coastal water bodies. The short-term use of these water bodies includes fishing, recreational activities, commercial navigation, and assimilation of storm and sanitary wastewater discharges from adjoining areas. With the development of the Proposed Project, long-term economic productivity would be enhanced by improving navigational activities. Recreation and fishing may be impacted, but these activities could be maintained. In addition, there would be some increased usage of the surface water bodies for dilution and assimilation of storm water discharges.

Some of the long-term ecological functions of approximately 24 acres of existing benthic habitat would be replaced by the economic benefits associated with the Proposed

Project. Similar ecological functions would become re-established through the development of an accepted compensatory mitigation program.

4.4 CUMULATIVE EFFECTS

4.4.1 Introduction

The Council on Environmental Quality's (CEQ) regulations for implementing the NEPA define cumulative effects as:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR part 1508.7)

Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Effects can include both direct effects, which are caused by an action and occur at the same time and place as the action, and indirect effects which are caused by an action and occur later in time and are farther removed in distance, but can still be considered to be reasonably foreseeable. The cumulative impacts of implementing the Proposed Project along with past and reasonably foreseeable future projects proposed were assessed based upon available information.

4.4.2 Cumulative Effects Assessment Methodology

The cumulative effects analysis in this EIS was organized by issue and resource categories. Where possible and/or practical, a quantitative analysis has been used as a basis for determining cumulative effects to the resources addressed in this EIS. Where this was not been possible, the cumulative effects have been presented in qualitative terms. Cumulative effects have also been evaluated considering specific geographic boundaries and time frames, as well as considering magnitude and significance, as discussed in Section 4.4.3 below.

4.4.3 Geographic Boundaries and Timeframes

The resources addressed in the EIS, encompass a range of geographic areas where potential cumulative effects could occur. For the purposes of this EIS the "potential impact zones" for the resources identified above are:

- Roadway traffic – The Apra Commercial Port and the districts of Piti, Agat, Santa Rita, and Hagatna
- Socioeconomic and Environmental Justice considerations – Guam as a whole with a focus on the Apra Harbor area
- Land use, recreational, historic, and cultural resources – The Apra Harbor area

- Water quality, hydrology, wetlands, and ecological issues - The Apra Harbor area.

- Air and noise quality – The Apra Harbor area.

The time frame for the cumulative effects assessment for this EIS was based on the 20-year period between the years 2005 to 2025, consistent with the impact analyses presented in Section 3.0. This time period extends beyond the practical limits of predictability for some topics, such as air quality and acoustical issues, but is used in light of the tentative projected buildout period for the Proposed Project.

4.4.4 Identification of Present and Reasonably Foreseeable Future Actions

The following is a brief description of present and reasonable foreseeable future actions that have been identified which could have a potential cumulative effect when considered along with the Proposed Project being addressed in this EIS.

- **U.S. Navy Construction Dredging of Inner Apra Harbor** – The U.S. Navy proposes to conduct construction dredging activities within the Inner Apra Harbor at Piers A and B. The purpose of these dredging activities is in support of proposed improvement and expansion of existing U.S. Navy facilities at these locations. This project would generate an estimated 600,000 to 700,000 cubic yards of dredge material. As previously discussed in Section 1.3.4, pending additional chemical and physical data on the sediments to be dredged, a portion of this dredge material may be used as fill material for the Proposed Project addressed in this EIS.

- **U.S. Navy Maintenance Dredging of Inner Apra Harbor** – The U.S. Navy proposes to conduct maintenance dredging of Inner Apra Harbor. Maintenance dredging of Inner Apra Harbor is needed to restore depth and allow for safe and unrestricted navigation of U.S. Navy vessels and berthing at Navy wharves. The Inner Apra Harbor would be dredged to average depths of -35 feet MSL. Most dredging would occur adjacent to existing wharves. This project would generate an estimated 150,000 cubic yards of dredge material.

- **U.S. Navy Expansion of Kilo Wharf** – The purpose of this project is to extend Kilo Wharf to provide adequate berthing facilities to accommodate the new T-AKE multi-purpose ship. The length of the existing Kilo Wharf, which is 400 feet, is not adequate to accommodate berthing of the T-AKE. The T-AKE is 689 feet in length, and would require 800 feet for adequate berthing. Other transient ships that utilize Kilo Wharf include certain logistic and surface combatant ships. The proposed extension or replacement of Kilo Wharf will provide for adequate

berthing facilities to support the T-AKE. The increased length would also improve berthing support for transient ships that utilize the wharf.

- **Guam Water and Wastewater Infrastructure Improvements** – Guam's water and sewer infrastructure systems are in a deteriorated state. This situation resulted in the issuance of a notice of violation by the USEPA. Violations had gone uncorrected and the courts have since issued an order for compliance which mandates that GovGuam make over $46 million in improvements to the island-wide water and sewer systems. This includes $3.8 million for renovations and improvements to the Agana Sewage Treatment Plant which would service the proposed facility improvements addressed in this EIS.

- **Guam Marina Development Project** – Guam's existing marina facilities are inadequate and unable to withstand typhoon conditions. The proposed project would consist of constructing a new 150 boat slip marina and shore-line facilities. The construction of a typhoon-proof docks and additional boat slips and services would enable Guam's marine tourism activities and its local boating and fishing industry to expand as well as relive congestion pressures in the Apra Harbor area.

- **Guam Fisherman's Cooperative Marina Building Complex** – The Guam Fishermen's Cooperative Association is a 25 year old non-profit organization whose mission is to market the fish harvested by its members. Established in 1977 with a dozen fishers, the Association has expanded to nearly 200 members in 2003. Insufficient space within the Coop's existing facility, compounded by significant typhoon damage to the facility in 2002, necessitates the need for use by the Coop. The project would consist of the construction of the Coop's 16,000 sq. ft. facility housing its retail outlet, office, fish processing area and ice production area; a seafood restaurant, gift shop, and dive and tackle shop.

- **Marine Drive By Pass (Route 20)** – This project involves the construction of an alternate roadway for Marine Drive within a 120-foot wide roadway corridor that will follow the western boundary of the former U.S. Naval Air Station and continue eastward to the Route 16 underpass. The Marine Drive bypass will reduce congestion on Marine Drive (Route 1) as well as improve access to the Guam International Airport and promote efficient circulation of airport-related vehicular traffic. This project will also entice further development of airport type activities and facilities in the surrounding area.

- **Capitol City of Agana Bridge Construction** – This project proposes improvements to the roadway system of Agana by constructing three new bridges. The proposed bridges are: the Agana River Bridge, O'Brien Bridge, and Santo Papa Bridge. The existing bridges and riverine channels are severely deteriorated and the proposed bridges would improve local traffic and circulation in the area.

4.4.5 Potential Cumulative Effects

4.4.5.1 Land Use and Coastal Zone Management

Future commercial, industrial and residential growth patterns are expected to continue at a similar rate and pattern as that which has occurred on Guam in the recent past. This future growth, is anticipated to encourage direct and induced, or secondary, alterations to existing land use patterns and continue the trend of converting undeveloped land to a variety of other uses. Because of the anticipated continued growth, areas adjacent to, proximate to, or with immediate access to roadways would likely experience more rapid growth and conversion of land use. These areas are likely to provide supporting commercial and business uses for the growing residential areas, and larger vacant tracts are likely to convert to industrial land uses based on proximity to limited access highways. Other large tracts farther from limited access roadways are likely to convert to suburban residential land uses to provide for the housing demand.

Since the Apra Harbor area is mixed use (commercial, industrial, and residential), the cumulative effects of the proposed deep-draft wharf and backland facilities and other past, present, and reasonable future actions on property values would be dynamic. Some areas in the future may see property value decreases due to congestion, and other growth and development related issues. Other nearby areas may see increases in property values as change in use and development occurs.

The construction and operation of the proposed deep-draft wharf and backland facilities would convert currently undeveloped fast and submerged land to commercial/industrial purposes, consistent with projected commercial, industrial and residential growth trends. Construction of these facilities may also contribute to the potential for secondary, or induced, growth effects in the vicinity associated with the development of private sector commercial support industries. The direct and secondary land use changes that would occur at under of the alternatives considered would represent a small contribution to the overall changes in land use that would likely occur in the future.

The GCMP provides flexibility to allow for the use of coastal resources with a goal to minimize adverse effects to coastal resources to the greatest extent practicable. From a cumulative perspective, the following possible development areas could be reviewed by the CZMA process, under the established GCMP policies to guide government decision making that may affect areas in the coastal zone.

- Construction of waterfront facilities such as marinas or fisheries facilities
- Construction, operation, and maintenance of waterfront DOD facilities
- Construction and operation of solid waste treatment, storage, and disposal facilities
- Filling and construction of waterfront structures on submerged lands
- Prevention, response and remediation of oil spills

- Discharge of municipal and industrial wastewater to coastal waters
- Nonpoint-source water pollution
- Development in critical areas
- Dredging and dredged material disposal and placement

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have significant cumulative effects on land use and coastal zone management resources.

4.4.5.2 Socioeconomic Conditions and Environmental Justice

The Apra Harbor area and Guam as a whole would continue to experience population and employment growth over the next 20 years for the No Action Alternative. Port-related growth would be greater if the Proposed Project were built. If the Proposed Project were constructed it could contribute to the overall amount of additional workers, residents, and/or households to the region by 2025.

The majority of project-related growth in direct employment would likely occur in the trucking and maritime services sectors. The majority of the population and employment growth would likely occur in the Apra Harbor/Piti areas as well as along the Island's west coast in general as this region is central to the existing commercial port operations at Apra Harbor. In terms of environmental justice, there would be low potential for disproportionate impacts for minority or low-income households based on the demographic characteristics of the Apra Harbor and Piti areas.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have significant cumulative effects on socioeconomic and Environmental justice conditions.

4.4.5.3 Infrastructure and Utilities

General population growth in the communities surrounding Apra Harbor is expected to continue in the future, putting additional pressure on community infrastructure and municipal services, ultimately requiring continued expansion. From a cumulative perspective the Proposed Project would contribute to these pressures to some degree. Proposed infrastructure improvement projects over the next 20 years should provide for infrastructure and utility improvements capable of accommodating the Proposed Project as well as other proposed developments over this time period.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on infrastructure and utilities.

4.4.5.4 Traffic and Circulation

Section 3.4 provides a detailed discussion of existing baseline conditions for key roadways in the project area. In addition, future traffic background conditions were also

calculated. Background traffic conditions are defined as future traffic volumes without the Proposed Project.

Based on current data, traffic volumes in the Agat, Piti and Santa Rita areas are anticipated to increase 36.3% between 2003 and 2020. This equates to an average annual increase of 1.846% per year. This growth rate was used to establish a background growth factor of 1.44 and determine the background growth levels between 2005 and 2025 (Rowell, 2006).

As discussed in Section 3.4 the future background traffic conditions in the project vicinity would increase by approximately 87.6 % and 89.8% during the AM and PM peak hours, respectively. Cumulatively, the Proposed Project would add an additional 12.4% and 10.2% to future background AM and PM peak hours, respectively (Ibid).

Vehicular movements during the operations phase of the Proposed Project would incrementally add to the future increased vehicular traffic movements in the region. These incremental effects would likely be more noticeable along major roadways and at major intersections in the immediate vicinity of Apra Harbor.

However, the effective implementation of roadway improvement projects identified in Section 4.4.4, along with others that would be identified in future years, would help reduce the cumulative effects associated with the Proposed Project facilities, as well as those associated with the projected growth trends.

Potential traffic safety impacts could result due to increases in truck traffic in the Apra Harbor and surrounding areas from the Proposed Project and other past, present, and reasonably foreseeable future actions. It is plausible that more truck and/or automobile collisions would occur due to the increased volume of trucks. Properly designed and expanded roadways, improved safety standards for trucks and cars, and possible reduced speed limits should mitigate the cumulative effects upon traffic safety of increased truck traffic to some extent.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on traffic and circulation.

4.4.5.5 Historic and Cultural Resources

Industrial growth in the Apra Harbor area would be expected to continue at a rate similar to that experienced in recent years. The Proposed Project would not contribute to the regional disturbance of known, significant cultural resources. Land development without archeological studies could represent a contribution to the disturbance of archaeological resources, depending on the type and nature of preservation or mitigation efforts and location of these resources.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on historic and cultural resources.

4.4.5.6 Aesthetic and Recreational Resources

The continued and incremental growth within Apra Harbor, the demand for waterfront facilities, and industrial development would result in an aesthetic change and localized increases in ambient light levels and nightglow characteristics. The density and type of future development would contribute to the overall change in the visual character, aesthetic resources and viewsheds.

Outer Apra Harbor has been and would continue to be an area of recreational use, both for recreational boaters and adjacent shoreside users/visitors. The construction and operation of the Proposed Project would result in an incremental increase in the amount of projected vessel transits by 2025 within the Outer Apra Harbor. However, this increase would be limited to deep water shipping channels and would not be expected to impede the ability of recreational boat users to pursue their boating interests and enjoyment in Apra Harbor. This is due in part to the fact that recreational boating and other opportunities are typically transient and temporal in nature and do not tend to focus on particular sites or areas within the Outer Harbor, particularly where deep water shipping channels exist.

In addition, from a cumulative perspective, the Proposed Project, as well as the marina-related projects listed in Section 4.4.4, would provide a beneficial impact by reducing congestion and competition with commercial fishing vessels for berthing space at existing port facilities.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on aesthetic and recreational resources.

4.4.5.7 Public Health and Safety

Fire protection, law enforcement, and other public services and infrastructure would continue to expand in response to the projected growth in the Apra Harbor area. In order to provide adequate protection to support this growth, additional staffing of these services would be required to maintain the current levels of service in the vicinity of each alternative project location, whether or not the Proposed Project is constructed. The efficiency of typhoon evacuation routes is dependent on growth and would be affected on a cumulative basis as the region continues to develop, regardless of the Proposed Project. The potential for increased hazardous material spills and truck accidents would continue to increase as additional facilities dealing in the production or transportation of such materials are constructed or expended.

All alternatives considered, including the No Action Alternative, would contribute to an incremental increase in the risk of a terrorist event. Security measures, plans, and programs are continually being taken at existing facilities to increase homeland security levels. These security measures would continue into the future as multiple Federal

agencies are developing an integrated programs to reduce terrorist risks associated with maritime activity.

Commercial non-containerized vessel traffic, shipment of bulk liquid cargo by intermodal means, and activities associated with the storage and transportation of hazardous materials in the Apra Harbor area would likely increase in response to continued industrial growth in the region. This growth would be expected to result in an increase in volume of hazardous material, hazardous waste storage, and transportation of hazardous materials. The Proposed Project facilities would handle mainly containerized cargo and would represent a minimal contribution to the related risk of spills associated with the transport and storage of hazardous materials.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on public health and safety.

4.4.5.8 Air Quality

As Guam and the Apra Harbor area continue to experience economic development, associated emissions impacts to ambient air quality would be expected. Examples possible development project that would result in such impacts include construction of new manufacturing plants and power plants, growth in personal and commercial vehicle milestraveled within the region, and water related activities such as on-going harbor maintenance and additional container terminal facilities.

As stated in Section 3.8.2 the Proposed Project site is located within the USEPA designated non-attainment area around the Piti Power Plant for sulfur dioxide (SO_2). If the associated air emissions were unregulated, future development (including the Proposed Project) could result in adverse SO_2 emissions increases in the area. These emissions increases could prevent the attainment of the SO_2 air quality standard in the region and possibly lead to continued future nonattainment of other air quality standards.

However, the USEPA is mandated to ensure that such growth will not interfere with the attainment of the SO_2 standard or threaten the maintenance of other air quality standards. The USEPA tracks measured air quality levels over a regional monitoring network to identify the potential for ambient air quality levels approach or exceed established standards. These agency also tracks changes in emissions of air pollutants in order to identify relationships between changing emissions and changes in air quality.

If the USEPA determines that an air quality standard is being exceeded, it is responsible for implementing regulations and control strategies that would facilitate attainment of the standard. For example, the USEPA would be required by the CAA to develop a plan that shows how the SO_2 ambient air quality standard will be met by a specified future year while accommodating foreseeable growth.

Although there is a particular focus on attainment of the SO_2 standard in the Apra

Harbor area at present, the USEPA also has regulations in place to regulate emissions of other pollutants even though the air quality standards for those pollutants are being met. These regulations are designed to limit emissions growth in a way that will assure continued maintenance of the standards.

The emissions associated with past, present and future projects and activities that produce air emissions in the Apra Harbor area are addressed through this regulatory system to achieve, maintain, and improve compliance with health and welfare related air quality standards. In addition, industry in the Apra Commercial port, including the PAG, would continue to work cooperatively with regulatory agencies to identify ways to continue to reduce emissions from all man-made emission sources.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not have a significant cumulative effect on air quality resources.

4.4.5.9 Hydrology, Soils, and Drainage

The direct and induced land use pattern changes associated with future growth within the commercial port would represent an incremental encroachment on floodplains and have an effect on the localized hydrology and drainage. The Proposed Project, in conjunction with these reasonably foreseeable projects, would represent a minimal contribution to overall hydrology, drainage, and floodplain modifications. Localized, site-specific hydrology and drainage would be affected in a cumulative manner by the conversion of undeveloped land to pavement or other impervious surfaces typically associated with industrial or commercial development.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not result in cumulative effects on hydrology, soils, and drainage in the project area.

4.4.5.10 Water Quality and Sediments

Potential future projects (including the Proposed Project) within Apra Harbor may contribute to the cumulative impacts on water quality and sediments in the area. Impacts of major proposed developments in Apra Harbor including harbor dredging and facility improvement projects proposed by the U.S. Navy, may be additive to those of the Proposed Project.

The U.S Navy projects listed in Section 4.4.4 involve substantial dredging of existing areas. Associated with these projects is the deepening of the harbor bottom. Deepening of the Inner Apra Harbor and areas of the Outer Apra Harbor adjacent to Kilo Wharf would have water quality and sediment-related impacts similar in many ways to those associated with the Proposed Project.

The affected water quality associated with construction and operation of the Proposed

Project consist mainly of marine surface water bodies. To establish baseline water quality conditions for the affected environment, relevant water quality studies were conducted. Dissolved oxygen may show short-term decreases in areas at and near dredging operations of future US Navy projects and the Proposed Project.

Like any other commercial harbor, the Apra Commercial port undergoes periodic maintenance dredging. The future volume of maintenance dredging would be increased by proposed expansion projects in the harbor. Additional volumes of periodic maintenance dredging would be generated within a portion of the Outer Harbor as a result of the Proposed Project. The potential cumulative effects of ongoing and future maintenance dredging activities would result in increased periods of elevated turbidity in the harbor.

As previously discussed, associated with the proposed US Navy Construction Dredging Project is the possible use of portions of Navy dredge material for the development of three Reclamation Sites under the Proposed Project. Should this dredge material be suitable as fill material for the Proposed Project a CDF would likely need to be constructed. Since the suitability of the future dredge material for use as fill material has not been determined, a potential CDF site has also not been identified. However, based upon proximity and land availability the siting of a CDF would likely be located adjacent to the existing Wharf F-6 facilities.

The runoff and return water from the CDF and project-related stormwater runoff that may contain oil and grease, traces of petroleum products, and washings from equipment and vehicles could result in potential cumulative impacts to water quality of Outer Apra Harbor waters. In addition, future urbanization and industrial development would likely occur in the Apra Harbor resulting in increased stormwater discharges into the harbor.

However, it is expected that future stormwater and potential CDF discharges would be regulated by NPDES permits with specific restrictions on the loading of water quality constituents of concern. The PAG, US Navy, and other potential proponents of future development actions would be required to meet all state and Federal requirements pertaining to stormwater run-off. This would minimize the potential cumulative effects of these discharges.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action could result in cumulative effects on water quality and sediment resources.

4.4.5.11 Biological Resources

Similar to the water quality issues described above, potential future projects (including the Proposed Project) within Apra Harbor may contribute to the cumulative impacts on benthic biotic communities of the area. Impacts of major proposed developments in

Apra Harbor including harbor dredging and facility improvement projects proposed by the U.S. Navy, may be additive to those of the Proposed Project.

The U.S Navy projects listed in Section 4.4.4 involve substantial dredging of existing areas. Associated with these projects is the deepening of the harbor bottom. Deepening of the Inner Apra Harbor and areas of the Outer Apra Harbor adjacent to Kilo Wharf would have impacts similar in many ways to those associated with the Proposed Project.

As discussed in Section 3.5.12.2, an estimated 102.9 acres of marine habitat including reef flat, reef crest, reef slope, and deep sand, would be impacted by the Proposed Project as a result of sediment suspension and resuspension during construction activities. In addition, approximately 20.58 acres would be impacted as a result of sediment deposition, and 3.3 acres are anticipated to be impacted due to temporary placement of anchors and mooring lines for dredges, barges and other equipment.

Marine habitat impacts due to sediment suspension/resuspension and sediment deposition would take an estimated three and ten years to recover, respectively. These projected impact duration times could potentially be extended if combined with the proposed US Navy dredging project impacts.

Increased vessel traffic from combined future projects (including the Proposed Project) could disrupt protected species that utilize areas within the Outer Apra Harbor. However, protected species only infrequently use the areas in the immediate project vicinity and significant cumulative impacts to protected species is not anticipated.

In light of historic, ongoing and reasonably foreseeable future actions, the proposed action could result in cumulative effects on biological resources and coral reefs in particular.

4.4.5.12 Noise Quality

Future increases in ambient noise levels associated with projected industrial development in the Apra Harbor area are anticipated, especially in close proximity to the harbor projects listed in Section 4.4.4. Construction and operation of the Proposed Project, in conjunction with these projects, may contribute to the long-term overall ambient noise levels at sensitive receptors near these sites. It is expected that ambient noise levels at Apra Harbor and the surrounding area in general would increase commensurate with projected industrial growth. The density and type of future development of the region would contribute to cumulative changes in noise levels.
In light of historic, ongoing and reasonably foreseeable future actions, the proposed action would not contribute to cumulative effects on noise quality in the project area.

4.4.6 Summary of Potential Cumulative Effects

This section summarizes the potential cumulative effects associated with the construction and operation of the Proposed Project, taking into consideration reasonably foreseeable future activities that may occur in the Apra Harbor area. As discussed, the Proposed Project, when considered in the context of past, present, and future activities, can be expected to contribute, in a small yet incremental way, to the overall cumulative effects on specific resources.

Some of the potential cumulative effects could be considered beneficial, such as the increase in employment opportunities and increased tax base to Guam. Others could be considered adverse, such as the cumulative impacts to water quality due to an increase in maintenance dredging events result from various proposed harbor improvement projects (including the Proposed Project).

Overall, the construction and operation of the Proposed Project would affect in a cumulative fashion, some in a positive way and some in a negative way, the resources and ecological components addressed in this EIS. Overall, the potential cumulative effects associated with the Proposed Project are not expected to be substantial. However, cumulative affects to the marine environment could potentially be significant when considering the direct and indirect project-related impacts, combined with proposed future construction and/or maintenance projects within Apra Harbor.

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6.0 CONSULTATION AND COORDINATION

6.1 INTRODUCTION

Proactive public and agency involvement are vital to the success of a project that potentially impacts the public. Consultation and coordination ensure that community concerns and technical issues are identified early and addressed in the EIS analyses of project-related actions. Information obtained through public and agency meetings were used to develop and refine the project alternatives considered to ensure they addressed community needs and preferences and to satisfy local and federal environmental requirements.

The USACE and PAG conducted consultation and coordination efforts with the general public and governmental agencies. The process by which the consultation and coordination efforts were undertaken are described in this section. All consultation and coordination materials referenced in this section (i.e., public meeting materials, meeting minutes, informational handouts, presentations, correspondences, etc.) can be found in the Project Scoping Report which is attached herein as Appendix K.

6.2 SCOPING

NEPA requires Federal agencies to carefully consider all environmental effects of their Proposed Projects. If an action is likely to have a significant effect on the quality of the environment, the agency proposing the action is required to prepare an EIS. An EIS is a document that contains many components, some which are: a description of the Proposed Project and alternatives to the Proposed Project; a description of the affected environment in its present and future states; and a description of the environmental consequences of each proposed and alternative action. The EIS also identifies mitigation measures to reduce or eliminate potential impacts, as necessary.

Following the decision that an EIS is required, there are a number of steps that must be followed. The first step is scoping, or the process of determining the scope, focus and content of an EIS.

Scoping in the EIS process helps ensure that a project proponent fully understands and considers the public's interest. Scoping identifies issues and concerns related to the planning process and the scope of issues that should be addressed in the environmental analysis. Typically, scoping occurs at the beginning of the National Environmental Policy Act (NEPA) process.

The scoping process involves the participation of Federal, State, and local agencies, stakeholders, and the general public. The process asks agencies and interested parties to provide input on the proposed alternatives, the proposed topics of evaluation

and potential impacts and mitigation measures to be considered. The most important thing that occurs during the scoping process is the identification of relevant and significant issues that will be analyzed in depth in the EIS.

It should be noted, that the USACE and PAG made an extra effort to initiate interagency participation in the Proposed Project as early as possible. Therefore, prior to the initiation of the formal scoping process the PAG and the USACE initiated an informal early consultation period. On October 4, 2004 an early consultation meeting was held at the PAG boardroom. The meeting was attended by various federal and Government of Guam agencies for the purpose of soliciting agency comments, concerns, and recommendations with regard to the Proposed Project prior to the formal initiation of the EIS process. (A list of early consultation meeting participants and meeting minutes can be found in Appendix J.

6.2.1 The Scoping Process

For the Proposed Project the scoping process began with formal agency notification. On Wednesday, February 2, 2005, the USACE published a Notice of Intent (NOI) in the Federal Register to advise interested agencies and the public that an Environmental Impact Statement (EIS) would be prepared. The PAG and USACE also notified potentially interested organizations and individuals about the public scoping meetings and forthcoming EIS. The public scoping meetings were announced through publication in the February 17, 22, and 23, 2005 issues of the Pacific Daily News. The NOI, and public notice advertisement can be found in Appendix K.

As discussed in the previous section, a NOI was published in the February 2, 2005 issue of the Federal Register. After publication of the NOI the formal scoping process and public comment submission period was initiated. The NOI stated that public comments should be submitted no later than June 1, 2005 in order to be considered in the draft EIS.

The PAG and the USACE conducted a public scoping meeting for interested agencies and the public on February 23, 2005. A total of 18 individuals attended the public scoping meeting. The meeting began as an informal open house format providing attendees the opportunity to review project information display boards and to talk one-on-one with PAG, USACE, and other project personnel.

Following the brief open house period, a formal PowerPoint presentation was given by the PAG and WCP personnel. The presentation provided an overview of the Proposed Project and alternatives, the scoping and the environmental impact statement process, environmental issues, and the project schedule. Following the formal presentation meeting attendees were asked to provide oral and /or written comments on the scope of the EIS. No written comments were submitted at the meeting, however oral comments were made. Additionally, written comments were submitted by mail or email subsequent to the public scoping meeting. All scoping meeting materials and public comments can be found in Appendix K.

In addition to conducting early consultation and public scoping meetings, the USACE and PAG initiated a subsequent comprehensive scoping mail-out to stakeholders and interested parties. The mailing was designed to solicit input from potential interested parties that did not attend either the early consultation or public scoping meetings. A total of 123 user groups, tenants, and other stakeholders were mailed the public scoping meeting handout materials and asked to submit any comments and concerns they might have with regard to issues to be addressed in the forthcoming EIS. The scoping mailing list and written comments received by mail or email can be found in Appendix K.

6.2.2 Summary of Key Issues and Concerns Raised During the Consultation and Coordination Process

Early Consultation

The early consultation meeting was held on October 4, 2004, from 1 to 2:30 p.m. at the PAG Building, Board Conference Room, 1026 Cabras Highway, Piti, Guam. Notice of the meeting was sent to representatives of federal, local agencies and other organizations.

The meeting was attended by representatives of the U.S. Department of the Navy, Guam Bureau of Statistics and Planning, Guam Department of Agriculture – Division of Aquatic Resources, Guam Economic Development Authority, Guam Environmental Protection Agency, Guam Governor's Office, U.S. Army Corps of Engineers, and PAG.

The meeting was opened with a discussion of the purpose and need of the proposed improvements, discussion of the study area, and the purpose of the early consultation meeting. Afterward, the floor was opened to the agency representatives to express their concerns regarding the proposed harbor improvements.

Agency representatives voiced the following issues and concerns regarding the Proposed Project's design, social, cultural, and economic impacts, and environmental impacts.

Design and Operations

- How far proposed deep-draft wharf would extend into Apra Harbor
- Potential contamination of Navy dredge spoils to be used as fill material

Social, Cultural, and Economic Impacts

- Possible presence of cultural and archaeological resources within the project area
- Impacts on recreational use and public access onto the Glass Breakwater

Environmental Impacts

- Loss of coral communities within the harbor and the marine habitat they support
- Investigation of appropriate mitigation measures for coral communities affected (including but not limited to coral colony transplants)
- Impacts of harbor water quality
- Preparation of a marine species inventory within the project area
- Potential radiological hazards with Apra Harbor
- Potential unexploded ordnance within Apra Harbor

Public Scoping Meeting

A Public Scoping Meeting was held on Wednesday, January 23, 2005, from 6 to 8 p.m. at the PAG Building, Board Room, 1026 Cabras Highway, Piti, Guam. The purpose of the meeting was to provide information about the Proposed Project and the EIS process to the general public and to provide an opportunity to gather public input on the proposed harbor improvements.

Eighteen people from the general public and government agencies attended the meeting and a total of eight oral comments were made. A total of five written comments were received by mail or email subsequent to the public scoping meeting. Public scoping meeting transcripts and written comments and responses can be found in Appendix K.

Oral and written comments received expressed concerns regarding the following operational, social, cultural, economic, and environmental impacts.

Design and Operations

- Impacts of strong waves and storm events on proposed harbor improvements
- Design of the proposed improvements to benefit both US Navy and commercial port use.
- Design and use of the proposed wharf (and Apra Harbor in general) with respect to national security concerns and wartime operations.
- Consideration of alternatives to dredging activities
- Utilization of the proposed wharf by larger container vessels
- Suitability of the Proposed Project site for construction of a deep-draft wharf based on natural conditions (i.e., surge, currents, wind, etc.)
- Impact on military training activities conducted in the harbor
- Potential military use of the proposed wharf and its affect on port revenues
- Impact of the proposed wharf's location and activities with respect to the Navy's future requirements, i.e., including but not limited to home porting additional attack submarines; mooring of Military Prepositioned Ships, loading and off-loading of munitions at Kilo Wharf and maintenance of the Glass Breakwater

- Potential savings to the Navy, should use of the proposed wharf allow the Navy to delay construction of its own deep draft wharf
- Safety concerns regarding the types of vessels that will be berthing at the proposed deep draft wharf (i.e., Vessels carrying munitions or explosives)

Social, Cultural, and Economic Impacts

- Impacts on recreational users in the area
- Impacts on public access to the Seaplane Boat Ramp, Outhouse Beach and other recreational areas on the Glass Breakwater
- Loss publicly accessible areas within the harbor and the potential secondary impacts of divers relocating to marine protected areas.
- Impacts to small local scuba diving companies operating in the area
- Identification of alternative dive sites as a mitigation measure
- Support for the Proposed Project due to the fact that it would result in beneficial economic impacts to the Piti community and Guam as a whole.

Environmental Impacts

- Impacts of fill material on marine resources
- Preparation of an assessment of coral and marine resources in the project area
- Impacts of the proposed improvements on coral communities and loss of fish habitat.
- Investigation of appropriate mitigation measures for coral communities affected (including but not limited to coral colony transplants)
- Development of mitigation measures to include the artificial enhancement of areas in which corals are not found in abundance, reef balls or other environmentally sound method of artificial reef structure.
- Impacts on mangrove, coconut crab, and other area wildlife
- Increased surface runoff and waste discharges from the new facilities
- Project consistency with the Federal Coastal Zone Management Act

Scoping Mail Solicitation

Subsequent to the early consultation and public scoping meetings, a comprehensive mail solicitation was undertaken in an effort to solicit additional input from potentially interested parties unable to attend the meetings. One hundred twenty three (123) user groups, tenants, and other stakeholders were mailed project information packets and requested to provide any comments and concerns they might have regarding the proposed improvements or upcoming EIS. Of the 123 recipients a total of six (6) provided written comments. A complete listing of recipients, written comments, and responses can be found in Appendix K.

Design and Operations

- Identification of appropriate wharfage design to mitigate impacts from potential oil spills in the harbor
- Impacts of the Proposed Project on tanker schedules and operations at Golf Pier
- Impacts to tanker mooring activities and equipment in project areas 2A and 2B
- Impacts to use of outfalls in the vicinity of project area 2C
- Safety/hazard concerns related to fuel bunkering and storage facility integrity, and overall operations, Safety/hazard concerns included: tanker maneuverability within Apra Harbor during construction and dredging activities, impacts to handling of highly flammable materials, potential flammable vapors and explosive atmospheres within the vicinity of the Proposed Project areas, increase in vehicular traffic and circulation and related safety impacts, impacts of military vessels containing explosives on fuel bunkering and storage facilities and operations.
- Site access for dive companies
- Establishment of entry and pass procedures
- Beneficial impacts resulting from reduced congestion within Apra Harbor, increased safety and security through the separation of commercial and cargo operations, and increased commercial opportunities.
- Beneficial impacts by enabling Apra Harbor to accommodate the largest U.S. Navy aircraft carriers.

Social, Cultural, and Economic Impacts

- Public access to Seaplane Boat Ramp, the ocean shores and marine resources in the project area
- Impacts to small commercial dive operators and other recreational users in the area
- Impacts on snorkeling and scuba diving activities in the vicinity of Outhouse Beach and possible mitigation measures (i.e., identification of alternative diving areas)
- Site access for dive companies
- Establishment of entry and pass procedures
- Impacts on submerged cultural resources (i.e., shipwreck dive sites and historic resources) within Apra Harbor
- Loss of access to the public to seasonal "atulai" (Selar crumenopthalmus) schools that frequently enter the harbor to feed.
- Beneficial impacts due to the expansion of Guam's cruise ship market and diversification of its tourism base.
- Beneficial impact due to the enhancement of Guam's position as a regional cargo and transshipment hub between Asia and the United States

Environmental Impacts

- Short and long-term effects on coral reef habitat and other marine resources and identification of compensatory mitigation options in the event of loss of these marine resources.
- Impacts to endangered species: Both hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtles forage in the harbor. Green sea turtles have been observed within the Proposed Project area.

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8.0 APPENDICES

Appendix A – Figures

Appendix B – Traffic Impact Assessment Report

Appendix C – Archaeological Investigation Report

Appendix D – National Historic Preservation Act Section 106 Consultation Findings

Appendix E – Coastal Zone Management Consistency Review

Appendix F – Air Quality Impact Report

Appendix G – Coastal Engineering Study

Appendix H – Marine Biological and Water Quality Survey

Appendix I – Fish and Wildlife Coordination Act Report (Draft)

Appendix J – Endangered Species Act Coordination

Appendix K – Acoustical Study

Appendix L – Project Scoping Report

Appendix M – Draft EIS Distribution List

Appendix N – Draft EIS Public Hearing Materials

Appendix O – Draft EIS Comments

APPENDIX A

Figures

APPENDIX B

Traffic Impact Assessment Report

Level-of-Service Concept

Signalized Intersections

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 2. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. ***Level-of-Service D is typically considered acceptable for peak hour conditions in urban areas.***[2]

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Table 2 Level-of-Service Definitions for Signalized Intersections[1]

Level of Service	Interpretation	Volume-to-Capacity Ratio[2]	Stopped Delay (Seconds)
A, B	Uncongested operations; all vehicles clear in a single cycle.	0.000-0.700	<10.0
C	Light congestion; occasional backups on critical approaches.	0.701-0.800	10.1-20.0
D	Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed.	0.801-0.900	20.1-35.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.	0.901-1.000	35.1-80.0
F	Total breakdown with stop-and-go operation.	>1.001	>80.0

Notes
(1) Source: *Highway Capacity Manual*, 2000
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity

[2] Institute of Transportation Engineers, *Traffic Access and Impact Studies for Site Development, A Recommended Practice*, Washington, D.C., 1991, p.39.

Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for level-of-service at an unsignalized intersection is therefore based on delay of each turning movement. Table 3 summarizes the definitions for level-of-service and the corresponding delay.

Table 3 Level-of-Service Definitions for Unsignalized Intersections[1]

Level-of-Service	Expected Delay to Minor Street Traffic	Delay (Seconds)
A	Little or no delay	>10
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	See note (2) below	>50.1

Notes
(1) Source: *Highway Capacity Manual*, 2000
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

All traffic to and from the project will use the intersection of Route 1 at Route 11. This intersection is signalized with separate left turn phasing. Route 11 is a two-lane, two-way road.

The traffic counts of the intersection of Route 1 at Route 11 were performed during April, 2005 and are summarized in Figure 2.

1. The traffic volumes include large trucks, buses and motorcycles.
2. The traffic counts do not include mopeds or bicycles.
3. There were no pedestrians observed during the counts.

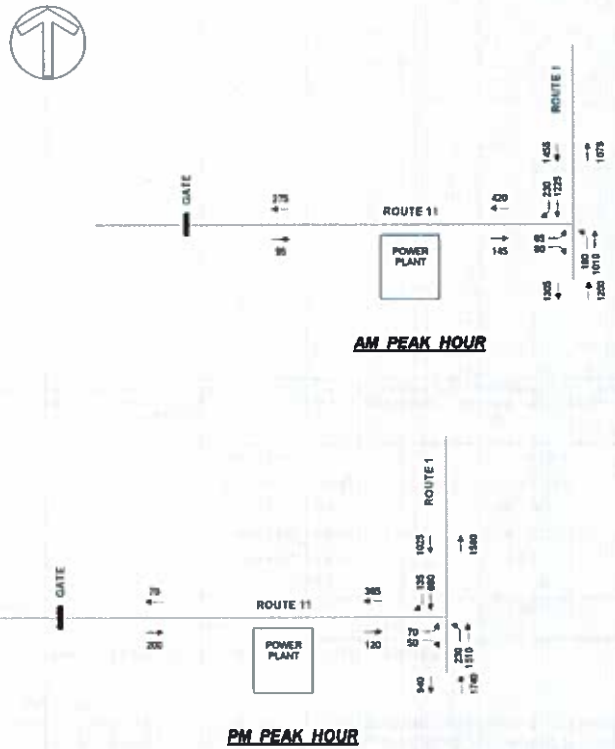


Figure 2
EXISTING (2005) PEAK HOUR TRAFFIC VOLUMES

Study Area

The study area for the project includes Route 11 between Route 1 and the entrance gate to Apra Harbor, including the intersection of Route 1 and Route 11.

Order of Presentation

Chapter 2 describes existing traffic conditions, the Level-of-Service (LOS) concept and the results of the Level-of-Service analysis of existing conditions.

Chapter 3 describes the process used to estimate 2025 background traffic volumes and the resulting background traffic projections. Background conditions are defined as future background traffic conditions without traffic generation by the study project.

Chapter 4 describes the methodology used to estimate the traffic characteristics of the proposed project, including 2025 background plus project traffic projections.

Chapter 5 discusses the results of the traffic impact analysis and identifies potential mitigation measures.

2. EXISTING CONDITIONS

This chapter discusses existing traffic conditions on the roadways adjacent to the proposed project. The level-of-service (LOS) concept and the results of the LOS analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a Chapter 5.

Existing Roadway and Traffic Conditions

Route 1, also known as Marine Drive, is the major arterial highway on the west side of Guam, running north-south for the length of the island. In the vicinity of Route 11, Route 1 is a four-lane highway with a separate northbound to eastbound left turn lane. Southbound deceleration and acceleration lanes are also provided. The posted speed limit is 35 miles per hour.

Route 11 connects Route 1 with the power plant and Apra Harbor. Route 11 is a two-lane, two-way roadway. The posted speed limit is 15 miles per hour.

Methodology

The following is a summary list of the tasks performed:

1. The study area and the scope of work was defined using criteria established by the Institute of Transportation Engineers[1] for small developments. Small developments are projects that generate less than 100 peak hour trips. This was based on the results of a preliminary trip generation analysis that determined the proposed project would generate between 100 and 500 trips during the peak hour. See Table 1.
2. A field reconnaissance was performed to identify existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.
3. Existing traffic volumes were determined from traffic counts performed during April, 2005.
4. Existing levels-of-service at the intersection of Route 11 at Route 1 were determined using the methodology described in the *2000 Highway Capacity Manual*.
5. Future background traffic volumes without traffic generated by the study project were estimated.
6. Peak hour traffic that the proposed project will generate was estimated using trip generation analysis procedures recommended by the Institute of Transportation Engineers.
7. Project generated traffic was assigned to the adjacent roadway network.
8. A level-of-service analysis for future traffic conditions with traffic generated by the study project was performed.
9. The impacts of traffic generated by the proposed project were quantified and summarized.
10. A report documenting the conclusions of the analyses performed and recommendations was prepared.

[1] Institute of Transportation Engineers, *Transportation and Land Development, Second Edition*, Washington, D.C., 2002, pages 3-1 thru 3-16.

Table 1 Suggested Requirements for Various Types of Traffic Impact Analyses[2]

	Trip Generation Threshold			
Traffic Study Description	Access Location & Design Review	Small Development: Traffic Impact Assessment	Medium Development: Traffic Impact Statement	Large Development: Regional Traffic Analysis
Estimated Trips Generated By Project	T ≤ 100 Peak Hour Trips	100 < T ≤ 500 Peak Hour Trips	500 < T ≤ 1000 Peak Hour Trips	T > 1000 Peak Hour Trips
Pre-application meeting or discussion	✔	✔	✔	✔
Analysis of Roadway Issues				
Existing condition analysis within study area	✔	✔	✔	✔
Sight distance evaluation	✔	✔	✔	✔
Nearby driveway locations	?	✔	✔	✔
Existing traffic conditions at nearby intersections and driveways		✔	✔	✔
Future road improvements		?	✔	✔
Crash experience in proximity to site	?	✔	✔	✔
Trip generation of adjacent development		?	✔	✔
Trip distribution analysis		✔	✔	✔
Background traffic growth		?	✔	✔
Future conditions analysis at nearby intersections		?	✔	✔
Mitigation identification and evaluation		?	?	✔
Site Issues				
Traffic generation	✔	✔	✔	✔
Traffic distribution	?	✔	✔	✔
Evaluate number, location & spacing of access points	?	✔	✔	✔
Evaluate access design, queuing, etc.	✔	✔	✔	✔
Evaluate site circulation	✔	✔	✔	✔
Other Analyses				
Gap analysis for unsignalized locations		?	?	✔
TSM/TDM Mitigation measures (car- or van-pooling, transit, etc.) - transit agency participation			?	✔
Effect on traffic signal progression, analysis of proposed signal locations			?	✔

Notes:
(1) Key: ✔ = required, ? = may be appropriate on a case-by-case basis
(2) TSM/TDM = Transportation System Management/Transportation Demand Management
(3) A traffic signal should not be permitted

1. INTRODUCTION

Project Location and Description

The project is located at Apra Harbor which is located on the west side of Guam approximately 7.0 miles south the Tumon Bay. See Figure 1. Apra Harbor is accessed by Route 11, which connects with Route 1, which is the main north-south roadway on the west side of the island. In addition to serving Apra Harbor, Route 11 provides access and egress to the power plant located in the southwest quadrant of the intersection of Route 1 at Route 11.

The project consists of the construction of a new wharf and mechanized cargo container handling equipment. Approximately 18 acres of area will be created to accommodate this new facility. The new wharf and equipment will be used as a storage area for containers.

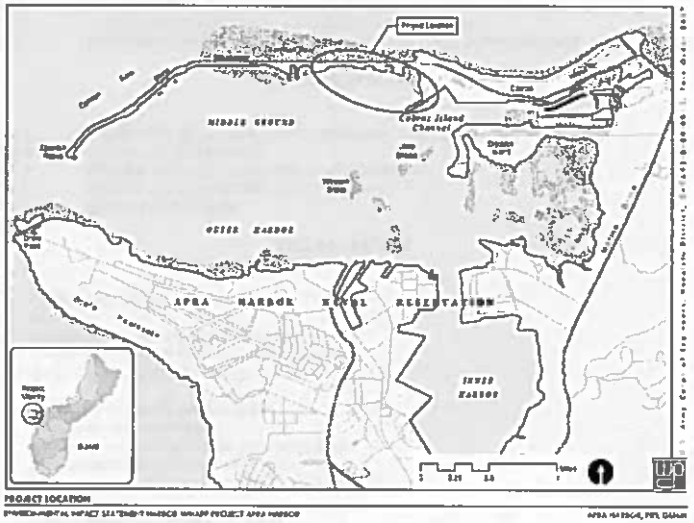


Figure 1
PROJECT LOCATION MAP

TRAFFIC IMPACT ASSESSMENT REPORT FOR

APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION PROJECT

IN PITI, GUAM

FINAL REPORT

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TABLE OF CONTENTS

1. INTRODUCTION 1
Project Location and Description 1
Methodology 3
Study Area 5
Order of Presentation 5

2. EXISTING CONDITIONS 6
Existing Roadway and Traffic Conditions 6
Existing (2005) Levels-of-Service 11

3. PROJECT BACKGROUND TRAFFIC CONDITIONS 12
Design Year for Traffic Forecasts 12
Background Traffic Growth 13
2025 Background Traffic Projections 13

4. PROJECT-RELATED TRAFFIC CHARACTERISTICS 15
Determination of Trip Generation Rates 15
Existing and Future Revenue Tons of Shipping 16
Trip Generation Analysis 16
Trip Distribution and Assignments 17

5. TRAFFIC IMPACT ASSESSMENT 21
Analysis of Changes of Hourly Traffic Volumes 22
Intersection Level-of-Service Analysis 23
Mitigation 24
Other Traffic Issues 24

LIST OF FIGURES

Figure 1 Project Location Map 2
Figure 2 Existing (2005) Peak Hour Traffic Volumes 8
Figure 3 Background (2025) Peak Hour Traffic Projections 14
Figure 4 Project Trip Assignments 18
Figure 5 Background (2025) Plus Project Peak Hour Traffic Projections 19

LIST OF TABLES

Table 1 Suggested Requirements for Various Types of Traffic Impact Analyses 4
Table 2 Level-of-Service Definitions for Signalized Intersections 9
Table 3 Level-of-Service Definitions for Unsignalized Intersections 10
Table 4 Existing (2005) Levels-of-Service Analysis 11
Table 5 Trip Generation Analysis 17
Table 6 Traffic Projection Worksheet - Route 1 at Route 11 20
Table 7 Traffic Volume Changes Along Study Streets 22
Table 8 Project's Pro Rata Share of Traffic Growth - 2005 to 2025 22
Table 9 Level-of-Service Analysis - Route 1 at Route 11 23

Existing (2005) Levels-of-Service

The level-of-service of the intersection of Route 11 at Route 1 was determined using the operations method described in the *Highway Capacity Manual*. The results of the level-of-service analysis are summarized in Table 4. Shown are the volume-to-capacity ratios, average vehicle delays and levels-of-service of each controlled lane group and the overall intersection.

Table 4 Existing (2005) Levels-of-Service Analysis

Roadway	Approach and Movement	AM Peak Hour			PM Peak Hour		
		V/C	Delay	LOS	V/C	Delay	LOS
Overall Intersection		0.57	12.2	B	0.54	13.7	B
Route 11	Eastbound Left	0.33	41.2	D	0.24	33.2	C
	Eastbound Right	0.11	39.5	D	0.00	31.4	C
Route 1	Northbound Left	0.57	38.4	D	0.49	28.2	C
	Northbound Thru	0.38	3.3	A	0.62	6.8	A
	Southbound Thru	0.61	14.0	B	0.59	20.1	C
	Southbound Right	0.21	9.7	A	0.14	14.9	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections
3. Delay is in seconds per vehicle
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay

The conclusion of this analysis is that all controlled traffic movements currently operate at a Level-of-Service D or better, which is considered an acceptable level-of-service for peak hour conditions. This is consistent with conditions observed during the traffic surveys.

3. PROJECT BACKGROUND TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2025 background traffic conditions. Background traffic conditions are defined as future traffic volumes without the proposed project.

Design Year for Traffic Forecasts

The design, or horizon, year of a project is the future year for which background traffic conditions are estimated. In order to be consistent with the *Port of Guam Master Plan*[3], it was decided to use 2025 as the design year.

[3] GMP Associates, Inc., *Port Authority of Guam Master Plan Report, Progress Edition*, February 1999, page 4-24

Background Traffic Growth

The Guam Master Plan[4] provided data indicating that traffic volumes in the Agat, Piti and Santa Rita areas will increase 36.3% between 2003 and 2020. This equates to an average annual increase of 1.846% per year. This growth rate was used to determine the background growth between 2005 and 2025, which is the design year for this project. The growth factor was calculated to be 1.44 using the following formula:

$$F = (1 + i)^n$$

where F = Growth Factor
i = Average annual growth rate, or 0.01846
n = Growth period, or 20 years

This growth factor was applied to the north-south traffic movements along Route 1. It was not applied to turning movements at the intersection of Route 1 and Route 11 as any increases in traffic along Route 11 will be the result of the project and therefore are included in the project's trip generation analysis presented in the following chapter.

2025 Background Traffic Projections

2025 background traffic projections were calculated by expanding existing traffic volumes by the appropriate growth rate. The resulting 2025 background peak hour traffic volumes are shown in Figure 3.

[4] Duenas & Associates, Inc., *Guam 2020 Master Plan Report, Progress Edition*, July 2004, page 4-24.

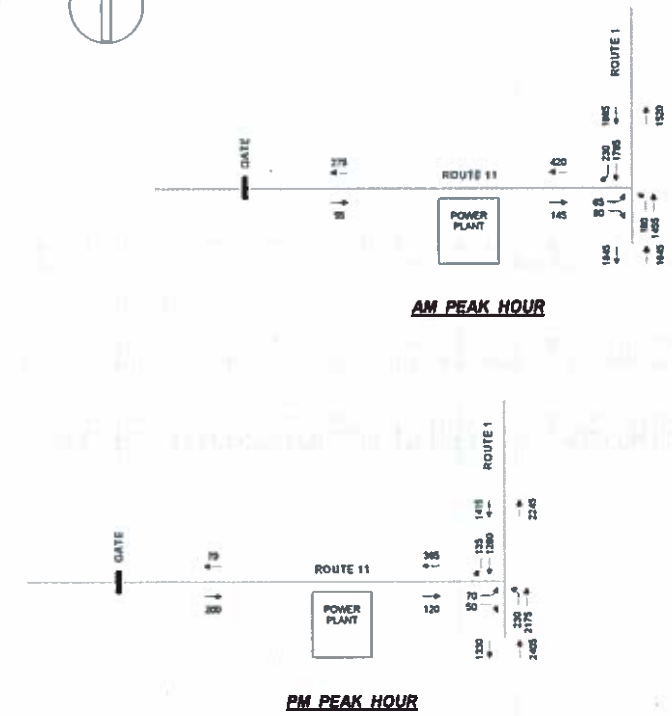


Figure 3
BACKGROUND (2025) PEAK HOUR TRAFFIC PROJECTIONS

4. PROJECT-RELATED TRAFFIC CHARACTERISTICS

This chapter discusses the methodology used to identify the traffic-related impacts of the proposed project. Generally, the process involves the determination of weekday peak-hour trips that would be generated by the proposed project, distribution and assignment of these trips on the approach and departure routes, and finally, determination of the levels-of-service at affected intersections and driveways subsequent to implementation of the project. This chapter presents the generation, distribution and assignment of project generated traffic and the background plus project traffic projections. The results of the level-of-service analysis of background plus project conditions is presented in the following chapter.

Determination of Trip Generation Rates

Future traffic volumes generated by the project were estimated using the procedures described in the *Trip Generation Handbook*.[5] This method uses trip generation rates to estimate the number of trips that a proposed project will generate during the morning and afternoon peak hours. The standard reference for trip generation rates is *Trip Generation* [6], published by the Institute of Transportation Engineers.

Trip Generation does not provide trip generation data for land uses comparable to the proposed project. The most comparable land uses for which trip generation data is provided are "waterport/marine terminal" (Land Use Code 010) and marina (Land Use Code 420).

[5] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 1998, p. 7-12

[6] Institute of Transportation Engineers, Trip Generation, 7th Edition, Washington, D.C., 2003

The trip generation rates provided for waterport/marine terminals are based on the number of berths or acres and rates are provided for total weekday trips only. Therefore, the data can not be used for this impact study as peak hour trip estimates are required to perform the impact assessment.

The trip generation data for marinas are also based on the number of berths and acres. The data provided was also determined to be inappropriate for the proposed project as the marinas for which the data was obtained are recreational, rather than commercial, facilities and include retail facilities and restaurants.

The conclusion is that none of the available trip generation rates were appropriate for the proposed project. Therefore, it was decided to develop trip generation rates for the proposed project based on the estimated number of revenue tons passing through Apra Harbor. The methodology used to estimate the trip generation rates is consistent with the methodology used to determine trip generation rates in *Trip Generation*.

Existing and Future Revenue Tons of Shipping

Existing and estimated future revenue tons of shipping for Apra Harbor was provide by Wil Chee Planning and Environmental, Inc. The Guam Master Plan (GMP) estimates of shipping were used. For 2005, the estimated revenue tons is 2,714,000. The estimate for 2025 is 3,461,000. This implies that in 2025, Apra Harbor will handle an additional 747,000 revenue tons annually.

Trip Generation Analysis

The number of vehicles entering and exiting the harbor were determined from the traffic counts described in Chapter 2 of this report. The inbound and outbound volumes were divided by the estimated 2005 revenue tons, in millions, to determine the number of total, inbound and outbound trips per million annual revenue tons. These calculations are shown in Table 5. As shown, the growth in annual revenue tons will generate an additional 90 trips during the morning peak hour and 75 additional trip during the afternoon peak hour.

In addition to the additional traffic generated by the growth in annual revenue tons of commerce, the harbor may also handle additional cargo transfers from one ship to another. It is our understanding that this transferred cargo is not included in the estimated of revenue tons cited above. It is also our understanding that additional employees may be required to handle this increase in transfer cargo. As there are no estimates of the number of additional employees, it was agreed that the estimated number of peak hour trips generated by the additional annual revenue tons should be increased by 50% to account for the additional employment required to handle the additional transfer cargo. This adjustment is shown in the last two columns of the trip generation analysis table.

The trip generation analysis is summarized in Table 5. The trips shown are the peak hourly trips generated by the project, which typically coincide with the peak hour of the adjacent street. As shown, the project will generate 140 additional trips during the morning peak hour, 115 inbound and 25 outbound. During the afternoon peak hour, this phase will generate 35 inbound and 85 outbound trips for a total of 120 trips.

Table 5 Trip Generation Analysis

Period & Direction		Existing Trip Rates			2025 Trip Estimates			
		Counted Trips	Revenue Tons	Trips per Million Tons	New Revenue Tons (Millions)	New Trips (1)	Factor for New Employees	Total New Trips (1)
AM Peak Hour	Total	329	2.714	121.22	0.747	90	1.5	140
	Inbound	275		101.33		75		115
	Outbound	54		19.90		15		25
PM Peak Hour	Total	268		98.75		75		120
	Inbound	69		25.42		20		35
	Outbound	199		73.32		55		85

Notes
(1) All numbers are rounded to nearest five (5)

The Institute of Transportation Engineers recommends that a traffic impact study should be performed if, in lieu of another locally preferred criterion, development generates an additional 100 vehicle trips in the peak direction (inbound or outbound) during the site's peak hour.[7] Based on the criterion, a traffic impact study is warranted.

Trip Distribution and Assignments

The project generated traffic was distributed at the intersection of Route 1 at Route 11 based on the existing turning movement volumes during the morning and afternoon peak hours. This distribution plan was then used to assign project generated traffic to the appropriate traffic movements at the intersections. The resulting peak hour trip assignments are shown in Figure 4.

2025 Background Plus Project Projections

Background plus project traffic conditions are defined as 2025 background traffic conditions plus project related traffic. The incremental difference between background and background plus project is the traffic impact of the project under study.

2025 background plus project traffic volumes with the project were estimated by superimposing the peak hourly traffic generated by the proposed project on the 2025 background peak hour traffic volumes presented in Chapter 3. The traffic projections for 2025 background plus project conditions are shown on Figure 5. The traffic projection calculations are shown as Table 6.

[7] Institute of Transportation, *Traffic Access and Impact Studies for Site Development, A Recommended Practice*, 1991, page 5.

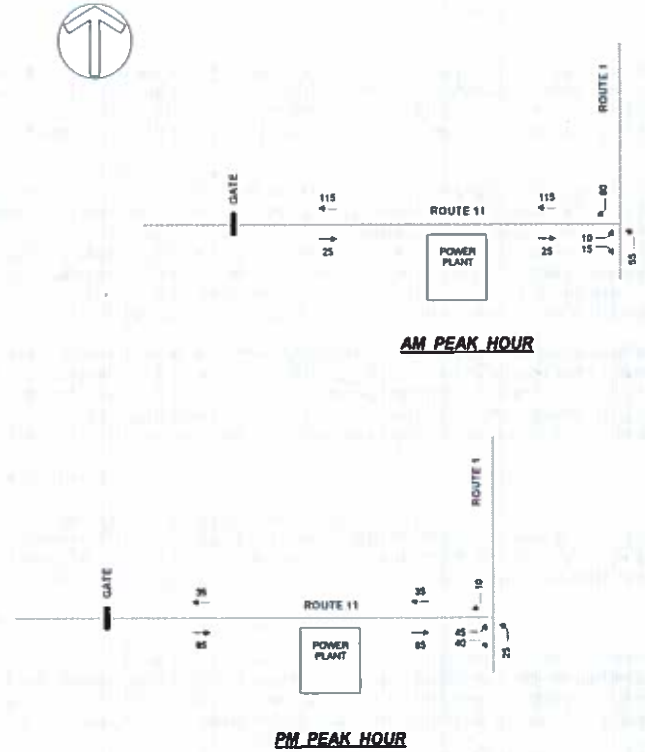
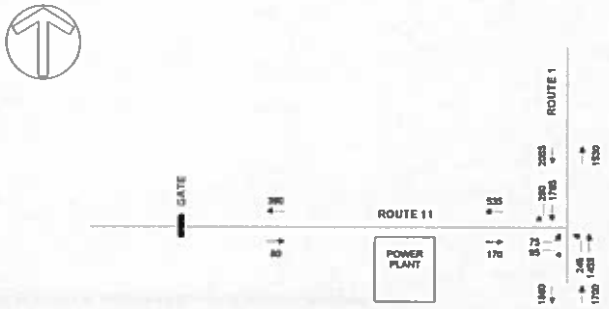
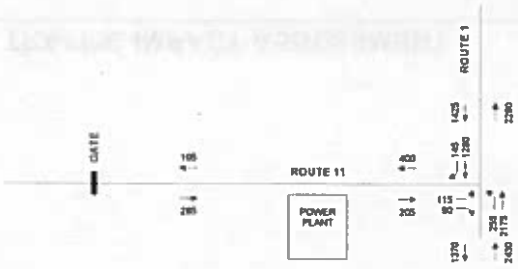


Figure 4
PROJECT TRIP ASSIGNMENTS



AM PEAK HOUR



PM PEAK HOUR

Figure 5
BACKGROUND (2025) PLUS PROJECT PEAK HOUR TRAFFIC PROJECTIONS

Table 6 Traffic Projection Worksheet - Route 1 at Route 11

Approach & Movement		Existing AM	Existing PM	Background Growth (2005 to 2025) AM	Background Growth (2005 to 2025) PM	2025 Background w/o Project AM	2025 Background w/o Project PM	Project Trips AM	Project Trips PM	2025 Background Plus Project Trips AM	2025 Background Plus Project Trips PM
North	Right	230	135			230	135	60	10	290	145
	Thru	1225	890	540	390	1765	1280			1765	1280
	Left					0	0			0	0
East	Right					0	0			0	0
	Thru					0	0			0	0
	Left					0	0			0	0
South	Right					0	0			0	0
	Thru	1010	1510	445	665	1455	2175			1455	2175
	Left	190	230			190	230	55	25	245	255
West	Right	80	50			80	50	15	40	95	90
	Thru					0	0			0	0
	Left	65	70			65	70	10	45	75	115
TOTALS		2800	2885	985	1055	3785	3940	140	120	3925	4060

Notes:
(1) All numbers are rounded to nearest five (5).

5. TRAFFIC IMPACT ASSESSMENT

The purpose of this chapter is to summarize the results of the level-of-service analysis of future conditions with the proposed project. This analysis identifies any potential traffic operational deficiencies. If deficiencies are anticipated, mitigation measures are identified and assessed.

In addition to the level-of-service analysis, the change in traffic volumes along the adjacent roadway segments was calculated to further analyze the impacts of project generated traffic.

Analysis of Changes of Hourly Traffic Volumes

An analysis of the changes in total approach and departure traffic at the intersection of Route 1 at Route 11 was performed. This analysis is summarized in Table 7. As shown, the increases to traffic along Route 1 is 3% or less. The impacts along Route 11 is more drastic as the increase is 50% during the afternoon peak hour at the harbor gate. However, the total number is vehicles is so small that high levels-of-service are expected.

Table 7 Traffic Volume Changes Along Study Streets

Roadway	Location and Direction		AM Peak Hour Without Project	AM Peak Hour With Project	AM Peak Hour Change	AM Peak Hour Percent Change	PM Peak Hour Without Project	PM Peak Hour With Project	PM Peak Hour Change	PM Peak Hour Percent Change
Route 1	North of Route 11	NB	1520	1530	10	0.7%	2245	2290	45	2.0%
		SB	1895	2055	60	3.0%	1415	1425	10	0.7%
	South of Route 11	NB	1645	1700	55	3.3%	2405	2430	25	1.0%
		SB	1845	1860	15	0.8%	1330	1370	40	3.0%
Route 11	West of Route 1	EB	145	170	25	17.2%	120	205	85	70.8%
		WB	420	535	115	27.4%	365	400	35	9.6%
	At Harbor Gate	EB	55	80	25	45.5%	200	285	85	42.5%
		WB	275	390	115	41.8%	70	105	35	50.0%

Table 8 is a summary of the project's pro rata share of traffic growth at the intersection of Route 1 at Route 11. Shown are the peak hourly projections for existing, 2025 background and 2025 background plus project conditions. Lastly, the percentage of traffic growth between 2005 and 2025 as a result of background growth plus related project's traffic and study project traffic is shown. As shown, the project's pro rata share of traffic growth between 2005 and 2025 is 12.4% during the morning peak hour and 10.2% during the afternoon peak hour traffic.

Table 8 Project's Pro Rata Share of Traffic Growth - 2005 to 2025 (1)

Intersection	Period	Existing (2005)	2025 Background	2025 Background Plus Project	Change from Background Growth and Related Projects (2) Volume	Change from Background Growth and Related Projects (2) % Increase	Change from Project Generated Traffic (3) Volume (4)	Change from Project Generated Traffic (3) % Increase
Route 1 at Route 11	AM	2800	3785	3925	985	87.6%	140	12.4%
	PM	2885	3940	4060	1055	89.8%	120	10.2%

Notes:
(1) Volumes shown are total intersection approach volumes or projections.
(2) Background versus existing.
(3) Background plus project versus background.
(4) Project generated traffic

Intersection Level-of-Service Analysis

A level-of-service analysis was performed for 2025 conditions with project generated traffic to identify potential problem locations where improvement may be necessary.

The level-of-service analysis for 2025 conditions was performed using the following assumptions:

1. The intersection configuration of Route 1 at Route 11 is the same as existing.

2. The traffic signal phasing is the same as existing. The timing is optimized for 2025 traffic conditions.

3. Level-of-Service D is the minimum level-of-service acceptable.

The results of the level-of-service analysis for the signalized intersection is shown in Table 9. Shown in the table are volume-to-capacity ratio, control delay per vehicle and Levels-of-Service. The level-of-service analysis was performed using Synchro 6 to optimize the traffic signal timing and the Highway Capacity Software to calculate the volume-to-capacity ratios and average vehicle delays. The level-of-service is based on the calculated delays.

As shown, all traffic movements will operate at Level-of-Service D or better during both peak periods for background and background plus project conditions. The conclusion is that all the traffic movements will operate at an acceptable level-of-service for 2025 background plus project traffic conditions. It should also be noted that there are no changes in the level-of-service of any lane group as a result of project generated traffic except for the southbound through movement. For this movement, level-of-service changed from Level-of-Service A to Level-of-Service B, which is considered a very good level-of-service.

Table 9 Level-of-Service Analysis - Route 1 at Route 11

Approach Roadway	Approach and Movement	Background			Background Plus Project			Changes	
		V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay
AM Peak Hour		0.74	16.1	B	0.79	16.9	B	0.05	0.8
Route 11	Eastbound Left	0.33	41.2	D	0.38	41.7	D	0.05	0.5
	Eastbound Right	0.11	39.5	D	0.20	40.1	D	0.09	0.6
Route 1	Northbound Left	0.57	38.4	D	0.74	45.3	D	0.17	6.9
	Northbound Thru	0.55	4.3	A	0.55	4.3	A	0.00	0.0
	Southbound Left	0.89	22.8	C	0.89	22.8	C	0.00	0.0
	Southbound Thru	0.21	9.7	A	0.28	10.3	B	0.07	0.6
PM Peak Hour		0.76	19.7	B	0.79	20.1	C	0.03	0.4
Route 11	Eastbound Left	0.24	33.2	C	0.40	34.6	C	0.16	1.4
	Eastbound Right	0.00	31.4	C	0.12	32.2	C	0.12	0.8
Route 1	Northbound Left	0.49	28.2	C	0.54	29.2	C	0.05	1.0
	Northbound Thru	0.89	13.9	B	0.89	13.9	B	0.00	0.0
	Southbound Left	0.84	27.6	C	0.84	27.6	C	0.00	0.0
	Southbound Thru	0.14	14.9	B	0.15	15.1	B	0.01	0.2

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay

Mitigation

No mitigation measure are required to mitigate the traffic impacts of the proposed project as all intersections and controlled lane groups will operate at Level-of-Service D, or better, with project generated traffic.

Other Traffic Issues

Regional Traffic Impacts

As the employees of the project may reside over a large area of Guam, it is reasonable to assume that project generated traffic will have an impact beyond the immediate vicinity of the project. However, the further away one is from the project, the less the impact since traffic will dissipate over distance. Since the impact in the immediate vicinity of the project is insignificant, it is reasonable to assume that the traffic impacts of the project will also be insignificant at locations more distant from the project.

Aircraft Carrier Port Visits

It is understood that US Navy aircraft carriers occasionally visit Guam and anchor at Apra Harbor. It is also understood that this occurs only two or three times a year. Accordingly, this is considered a special event and is not specifically addressed in this traffic study. As this is a special event and the number of persons to be transported to and from Apra Harbor will vary widely depending on the size of the aircraft carrier, it is recommended that a special Traffic Management Plan be developed, in association with the applicable agencies.

APPENDIX C

Archaeological Investigation Report

Pacific Legacy

Incorporated

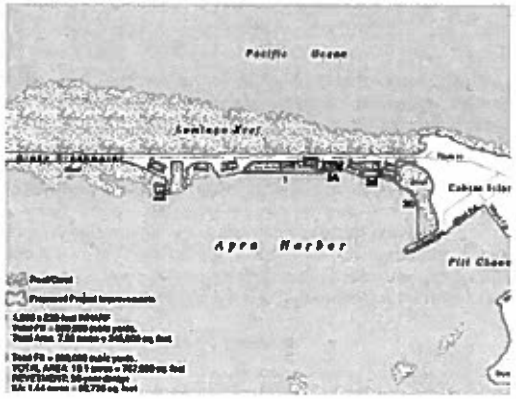
CULTURAL RESOURCES CONSULTANTS

Archaeological Investigations for the
Proposed Harbor Wharf Project
Apra Harbor, Guam
(DACA83-00-D-0012, Task Order 0067)

By

Darlene R. Moore
Rosalind L. Hunter-Anderson
Micronesian Archaeological Research Services
Mangilao, Guam

May 2005



Archaeological Investigations for the Proposed Harbor Wharf Project *Apra Harbor, Guam*

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 ENVIRONMENTAL BACKGROUND 4

3.0 HISTORIC BACKGROUND 7

3.1 Spanish Period 7
3.2 First American Period 9
3.3 Japanese Period/World War II 10
3.4 Second American Period 11

4.0 ARCHAEOLOGICAL BACKGROUND 12

4.1 Prehistoric Period 12
4.2 Historic Period 13
4.2.1 History of Apra Harbor Land Use 14
4.3 Previous Archaeology in the Vicinity of the Project Area 21
4.4 Submerged Cultural Resources in the Vicinity of the Project Area 23
4.5 Site Expectations 26

5.0 RESULTS OF SURVEY 27

5.1 Oil Dock 27
5.2 Sea Plane Ramp 27
5.3 G Wharf 30
5.4 Outhouse Beach 30
5.5 H (Hotel) Wharf 31

6.0 SIGNIFICANCE ASSESSMENTS AND RECOMMENDATIONS 33

7.0 REFERENCES CITED 35

LIST OF TABLE

1. Submerged Cultural Resources 25

LIST OF FIGURES

1. Map of the western Pacific showing the location of Guam 43
2. The Proposed Wharf Improvements and Land Reclamation Project 44
3. Hornbostel's map of Guam 45
4. Apra Harbor in 1913-14 46
5. Map of Cabras Island in June 1941 47
6. Map of Cabras Island in 1942 48
7. Map of Apra Harbor about 1945 49
8. Map of Apra Harbor in 1955 50
9. Map of Apra Harbor showing location of underwater cultural resources 51
10. Map of Apra Harbor showing location of features on the Glass Breakwater and the submerged cultural resources south of the Breakwater 52

LIST OF PHOTOGRAPHS

1. View of the shoreline between Oil Dock and former Marianas Yacht Club (MYC) 53
2. View of the shoreline between the former MYC area and the Sea Plane Ramp 53
3. Sign marking the entrance to the Sea Plane Ramp 54
4. View of the Sea Plane Ramp 54
5. View of the exposed rebar framework on the underwater section 55
6. View of the Sea Plane Ramp being used to launch small watercraft 55
7. Close-up view of the east sidewall of the Sea Plane Ramp 56
8. Close-up view of the underwater section of the west sidewall 57
9. View of four of the concrete-filled steel boxes 58
10. Close-up view of one concrete-filled steel box 58
11. View showing the eroded area on the west side of the Sea Plane Ramp 59
12. A close-up view of the bollard situated at the southwest corner of the Sea Plane Ramp 59
13. View of the concrete foundation situated on the east side of the Sea Plane Ramp 60
14. Cluster of wooden posts near the southeast corner of the Sea Plane Ramp area 60
15. View of three metal posts in the water south of the concrete seawall west of the ramp 61
16. Unidentified metal frame in the water on the east side of the Sea Plan Ramp 61
17. View of the shoreline on the west side of G Wharf 62
18. The bollard in place on the concrete-filled box at the southwest end of G Wharf 62
19. The shoreline of G Wharf taken from the southwest corner of the area 63
20. View of the shoreline between G Wharf and Outhouse Beach 64
21. View of the shoreline along the area known as Outhouse Beach 64
22. Old bollard situated at the southeast corner of the area known as Outhouse Beach 65
23. Wharf ruins at the east end of the area known as Outhouse Beach 65
24. The west end of the Outhouse Beach area 66
25. View of the abandoned sentry post on H Wharf 66
26. View of a pair of bollards on H Wharf 67
27. View of the harbor edge of H Wharf 67
28. Close-up of the harbor edge of H Wharf showing one of the metal cleats 68

1.0 INTRODUCTION

Pacific Legacy, Inc., under subcontract to Wil Chee – Planning and Environmental, contracted Micronesian Archaeological Research Services, Guam (MARS) to conduct archaeological investigations for the proposed harbor wharf improvements and land reclamation at Apra Harbor, Guam (Figures 1 and 2). The primary purpose of the archaeological investigations is to gather data relating to historic resources in the project area and to determine the potential impacts of the proposed project upon them.

The elements of the proposed project include: (1) the construction of a 1,500 x 230-foot deep-draft wharf to the east of Hotel Wharf, improvements will include construction of a cellular sheet pile bulkhead or pier on piles, deposition of approximately 950,000 cubic yards of fill material over 7.92 acres, and construction and installation of mechanized cargo container handling equipment; (2) placement of approximately 500,000 cubic yards of fill material over 18.1 acres of submerged lands in three areas along the east end of the Glass Breakwater, improvements will also include construction of rock revetments, and construction of cargo container storage yard facilities; and (3) dredging of submerged lands to a depth of 55 feet in water adjacent to the proposed 1,500-foot wharf to accommodate deep draft commercial and military vessels (Figure 2).

The archaeological work is mandated by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR Part 60, 36 CFR Part 800, and the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation). Other federal legislation pertaining to the protection of historic properties (e.g., the Antiquities Act of 1906, the National Trust for Historic Preservation Act of 1949, the Reservoir Salvage Act of 1960) and local historic preservation laws of Guam, listed below, potentially apply as well.

Relevant Guam laws include Executive Orders 89-9, 89-24, Public Law 12-126, Public Law 20-104, Public Law 20-151, and Public Law 25-72. Also applicable to archaeological projects are the Dept. of Parks and Recreation's General Guidelines for Archaeological Burials. The Guidelines are pertinent when human skeletal remains are found at an archaeological site, requiring that such remains be avoided if at all feasible. This requirement sometimes results in the redesign of a construction project. If it is not feasible to avoid the human remains, a data recovery project may be implemented, guided by plans specifically written for that project. Archaeological burials are not expected to be encountered in the present project, however.

The NHPA Section 106 procedures include making judgments regarding the presence of historic properties in the project area which qualify for nomination to the National Register of Historic Places. The Register was established to recognize properties (districts, sites, buildings, structures, and objects) that are "significant in American history, architecture, archaeology and culture..." (36 CFR Part 60.1). A practical guide for assessing site significance has been prepared by Hardesty and Little (2000).

Properties are significant if they satisfy each of two categories comprising the National Register criteria for evaluation (36 CFR Part 60.4): (1) they must possess integrity of location, design, setting, materials, workmanship, feeling, and association; and (2) they must be characterized by at least one of the following attributes or criteria:

(a) associated with events that have made a significant contribution to the broad patterns of our history; or

(b) associated with the lives of persons significant in our past; or

(c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) have yielded, or may be likely to yield, information important in prehistory or history.

Section 106 and its implementing regulations define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or in behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency." (36 CFR Part 800.16(y)

It is the responsibility of the lead federal agency for the proposed harbor wharf project to determine if a proposed action is considered a federal undertaking. The lead federal agency is the U.S. Army Corps of Engineers (USACE). USACE and the Guam Historic Resources Division (GHRD) concur that the harbor wharf project is a federal undertaking and that Section 106 of the NHPA applies.

Carried out during planning, the Section 106 process involves defining the Area of Potential Effect (APE), in this case the Apra Harbor area where the proposed modifications will be made and any staging areas utilized during the construction. Once the APE has been established, the Section 106 process proceeds in steps.

Step 1 is Identify Historic Properties. After collecting the documentation needed to identify historic properties, an assessment of the significance of the historic properties is made, using the National Register criteria A-D (listed above).

If no historic properties are present within the APE, then a No Property (No Historic Properties Affected) finding is made and the next step is Step 4 (see below). If historic properties are present within the APE, then Step 2 is implemented.

Step 2 is Assess Effects. A determination of No Effect results when the undertaking will not affect known historic properties. A determination of Adverse Effect

results when the undertaking will harm one or more historic properties. A determination of Adverse Effect may be considered No Adverse Effect if an historic property that is of value for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines.

Other reasons for a finding of No Adverse Effect for historic properties include 1) when the undertaking is limited to the rehabilitation of buildings and structures and is conducted in such a manner that preserves the historical and architectural value of affected properties through conformance with the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic buildings; and 2) when the undertaking is limited to the transfer, lease, or sale of historic properties, and adequate restrictions or conditions are included to ensure preservation of the property's significant historic features.

Step 3 is Consultation. If it is determined that the proposed undertaking will have No Effect on identified historic properties, then all interested parties should be notified and Guam HRD 's concurrence with this finding should be sought. If a determination of No Adverse Effect is made, Guam HRD's concurrence should be sought along with any terms and conditions under which the undertaking should be carried out. Examples of conditions are the implementation of archaeological data recovery plans and/or monitoring plans to collect and preserve significant information that would be lost due to the undertaking. The heritage loss due to the undertaking would be mitigated by these and other measures as deemed appropriate during the consultation. Protection or preservation covenants to be attached to a lease, transfer or sale of a historic property may also be obtained from the Guam HRD.

Step 4 is Proceeding with the Undertaking, in accordance with the stipulations of an executed Memorandum of Agreement (MOA) or under the conditions for a No Adverse Effect determination. No further action is required for No Property (No Historic Properties Affected) or No Effect determinations.

MARS completed an archaeological survey of the land portions of the proposed project area to locate and assess the historical significance of any cultural resources present and to make recommendations about preservation and/or mitigation measures should any significant sites be subject to adverse effects by the proposed wharf improvements. The underwater portions of the project were not investigated.

The results of the land survey and recommendations are presented after the summary of the land use history of the Apra Harbor vicinity, and the summaries of Guam's environmental, historical, and archaeological background. The figures and photographs appear at the end of the text. Information contained herein is submitted as part of the Environmental Impact Statement (EIS) process for the proposed project.

2.0 ENVIRONMENTAL BACKGROUND

At 13°30' north latitude and 145°20' east longitude and 550 square kilometers in area, Guam is the southernmost and largest island in the Marianas chain, a north/south-trending archipelago in the tropical western Pacific Ocean (Figure 1). Guam's climate is maritime tropical and experiences droughts and typhoons in addition to a seasonal rainfall pattern in which the majority of precipitation falls during the northern hemisphere summer months. Average annual rainfall is close to 2500 mm although it is highly variable, and storms can result in markedly higher yearly precipitation totals just as El Nino-influenced droughts can result in markedly lower annual totals (Lander 1994). Northeasterly trade winds prevail during the northern hemisphere winter months, reversing or ceasing during the summer.

The northern half of the island is composed mainly of uplifted limestone with a few volcanic "inliers" that protrude tens of meters above the undulating karstic northern plateau and are associated with freshwater outlets. The soils on the plateau vary in depth, very deep soils occurring in sinks and crevices and shallower soils on elevated and flatter areas. The southern half of the island is composed of volcanic rocks and includes a north-south trending mountain range along the west coast. Capping some of the mountains are remnant limestone patches, from prior to the island's uplift. Streams are short and steep on the west side of the range and long and gradual on the east side of the range. Soils in the south are derived from decaying volcanics, and over geological time, erosion has filled valleys and coastlines with alluvium and colluvium.

The native vegetation of the limestone plateau in northern Guam includes "limestone forest" (Stone 1970), a typhoon-adapted community of shrubs, trees, vines, mosses, and ferns. Many of the plants in this community grow directly on the limestone substrate, and economic plants such as seeded breadfruit (*Artocarpus mariannensis*) and cycads (*Cycas rumphii*) occur along with banyan (*Ficus prolixa*), *Intsia bijuga*, and smaller trees. Patches of bamboo occur in limestone areas as well as volcanic ones and are not confined to wet soils although they do well there.

Guam's limestone forests have been greatly modified and parts eliminated by modern construction, replaced in many places by extensive stands of tangan-tangan (*Leucaena leucocephala*) seeded on Guam after WWII. On the sandy beaches are strand assemblages containing coconut palms (Cocos nucifera), ironwood (*Casuarina equisetifolia*), Pandanus, papaya (*Carica papaya*), *Barringtonia asiatica*, *Pemphis acidula* and *Scaevola taccada*; on the cliffs grow small specialized forms adapted to salty winds.

The native vegetation in southern Guam is a mosaic of grasses (mainly sword grass, *Miscanthus floridulus*) with occasional trees and shrubs such as Pandanus, *Casuarina equisetifolia*, *Morinda citrifolia*, *Glochidion marianum*, and especially in fresh and "healed-over" erosion scars, *Dicranopteris linearis* and *Lycopodium cernuum*. Ravine forests that include betel nut palms (*Areca catechu*) and coconut trees as well as Pandanus and a

variety of vines and shrubs also occur in between volcanic ridges. On the volcanic ridges and nearby slopes with remnant limestone caps, the soil supports upland forests including several of the species that are usually found in limestone forest in the north; these communities may contain economic plants such as bamboo (*Bambusa vulgaris*), seeded breadfruit (*Artocarpus mariannensis*) and betel nut palm, as well as useful hardwoods such as *Intsia bijuga* and *Mammea odorata*.

Guam has mangrove communities including *Bruguiera gymnorhiza* and *Rhizophora mucronata* but presently mangroves are uncommon on Guam, occurring mainly in the Apra Harbor area (Wilder 1976). Wetlands at the heads of streams and in small depressions occur in the interior; the dominant vegetation is usually reed grass (*Phragmites karka*) and bullrush (*Scirpus littoralis*) and in the more extensive wetlands may include the large fern, *Acrostichum aureum*. Other stream mouth and lower riverbank communities include *Scirpus littoralis*, Nipa palms (*Nipa fruticans*), coconut palms, betel nut palms, and a variety of other trees, shrubs, vines, grasses, and ferns.

Soils in interior southern Guam are mostly volcanic-derived (Young 1988a). On some of the higher hills and mesitas, remnant limestone caps (old reef formed prior to uplift of the island) are still in place or have been partially dissolved and eroded downward; these outcrops yield chert nodules of varying quality and quantity, and archaeologists have found evidence that they were exploited by prehistoric islanders for cutting and chopping tools (Williams 2000).

It is commonly believed that Guam's grasslands (*sabana*) were created prehistorically by over-use of the inland soils for farming but there is no archaeological evidence for this—no evidence of intensive farming, no farming tools, in fact very sparse evidence of human activities, such as small artifact scatters and isolated objects. Nor is there ethnographic information about tropical subsistence farmers that would lead to such an expectation (Kunstadter 1978; Ruthenberg 1980; Thurston 1997). Tropical subsistence farmers generally avoid steep and nutrient-poor soils like those under savanna vegetation in Guam, preferring the richer alluvial soils of river valleys and terraces and coastal flats.

That erosion of the inland soils has occurred in the past, bringing clay soils to the southern coasts is undisputed; also undisputed is that fires have occurred in the past, as evidenced by charcoal particles in coastal alluvium (for example, in sediment cores at the Laguas River mouth analyzed by Ward [1995; Athens and Ward 1999]). At issue are not the facts of erosion, sedimentation, and fire in watersheds but whether prehistoric farming in the steep uplands initiated and maintained these processes late in Guam's geological history (i.e., the last 3-4 millennia of the Holocene). Most importantly, in themselves the facts of erosion, sedimentation, and fire do not constitute evidence of human causation of the *sabana*. On the other hand, the close association of upland volcanic soils and savanna vegetation suggests a connection, perhaps due to soil properties. Noting this correlation, soil scientist Fred Young (1988a, 1988b) studied the chemistry of soils supporting grasslands and adjacent forests and concluded that soil acidity is a major factor in determining the distribution of these two vegetations in

southern Guam. The soil under forests was found to be less acidic than the soil under savanna grasses.

The southern mountains (as well as the volcanic inliers in the north) apparently have supported a savanna-type flora for a very long time, certainly prior to human advent in the Marianas 3,500 years ago. Evidence for this is provided by the Guam endemic, *Timonium nitidus* (Bartling) (Stone 1970:560), which grows only in the *sabana*. The presence of a Guam endemic savanna plant indicates the antiquity of this vegetation community on the island, casting further doubt on the idea of its recent formation due to human actions.

Another line of evidence for the antiquity of Guam's savanna is the stability of its boundaries within the Navy property (Ordnance Annex) in south-central Guam despite attempts at wildfire suppression over the last several decades (Wescom pers. comm. 2000). Had fire been a cause of savanna formation, then fire repression should have enabled re-forestation to occur, which has not happened. It appears from the above facts that soil characteristics are a primary factor in determining the occurrence and extent of savanna vegetation on Guam and that prehistoric human actions or even modern human actions, have had nothing to do with it.

3.0 HISTORIC BACKGROUND

Guam's history may be divided into five basic units: the approximately 3000 year-long Prehistoric Period, conventionally divided between the Pre-Latte and Latte Periods, and the Historic Period, conventionally divided into the Spanish, First American, Japanese Occupation/World War II, and Second American Periods. The European and American historic records pertaining to Guam extend back nearly 500 years from the present (Asian records are largely unavailable due to a lack of translation into English). The Prehistoric Period is reviewed under the Archaeological Background section. The main sources of information on the Spanish through Second American Periods summarized below are Carano and Sanchez (1964) and Sanchez (1979, 1988); other sources are cited within the text.

3.1 Spanish Period

If by historic is meant the beginning of written documentation by Europeans, Guam's Historic Period began in 1521, the year Magellan stopped in the Marianas during his attempt to sail around the world. Magellan's discovery of the Marianas was chronicled by an eye-witness, Antonio Pigafetta (for primary texts and English translations see Lévesque [1992:189-220]), and by Francisco Albo in his ship's logbook (Lévesque 1992:221-229; see Rogers [1995] for a detailed consideration of this event). If by historic is meant the use of writing by the indigenes of a place, the date of the beginning of the historic era would be somewhat later than 1521, perhaps when written record-keeping for trade was adopted by the Chamorros, or when children first attended schools run by the padres in the late 17th century. In any case, documentation of ships' visits to the Marianas began with 1521, and writing about the islands increased in volume and detail through the Spanish Period (see R. Lévesque's History of Micronesia in 20 volumes, Lévesque Publications, Québec).

In 1565, Legazpi claimed the Marianas for Spain, ushering in the Spanish galleon era, when the Marianas served as a provisioning port for the large sailing ships that plied between Acapulco and Manila until c. 1815 (Schurz 1939). The local people especially valued iron brought by the Europeans, while the latter sought fresh food and water. The galleon trade brought many imports and different visitors to Guam, as well as deadly diseases to which local people had developed no immunity, unlike the European carriers. Especially after the Spanish conquest, when the Chamorros were living in crowded settlements, epidemic diseases periodically flared, resulting in death and misery for thousands (Underwood 1973).

In 1668, the first Spanish Catholic mission and colony was established at Agana, Guam. Initial attempts at converting the islanders (now called Chamorros) to Catholicism were met with extreme resistance but the padres persevered, with the support of Spanish troops. Several of the Catholic priests and their assistants lost their lives during these struggles. For example, in 1672, Padre Sanvitores, the leader of the initial missionary

group, was killed in Tumon Bay. A shrine located near the Reef Hotel, marks the site of this event. Many struggles and revolts followed the martyrdom of Sanvitores but by the beginning of the 18th century the Spanish conquest was complete. Guam Chamorros and those living in the islands north of Guam were forced to settle in six rural parishes on Guam (Agat, Umatac, Inarajan, Merizo, Pago, Fina), and Agana became the seat of government and of ecclesiastical authority. Umatac was the largest of the parish villages in 1690, with 700 persons (Rogers 1995:70).

While few ethnographic details about pre-conquest Spanish Period Marianas culture are available, hints about late prehistoric subsistence practices are found in the Pobre account (Driver 1989) from a lay brother's stay in Rota in 1602. While the situation in Rota cannot have been precisely the same as in Guam, tentative generalizations about life in the southern Marianas based on the Rota account can be made. The people with whom Pobre resided in Rota had a mixed economy of fishing, including pelagic fishing from sailing canoes, and horticulture (taro, yams, and breadfruit being the staples, rice was also grown and used as a special food). Plantings were made in small plots, some located in the island's interior.

Early in the Spanish Period, fishhooks fashioned from nails or other pieces of iron had replaced the traditional hooks which had been made from shell or bone, as people continued to depend upon the sea for animal protein (Driver 1989). Extrapolating from this information for pre-conquest Guam, it is likely that, as at Rota, people pursued a mixed farming and fishing way of life. The subsistence system of Guam was probably more diverse than Rota's since Guam's land area is much larger and its terrestrial and marine habitats more numerous and varied.

During the Manila galleon era, c. 1565-1815, the Spanish introduced a variety of plants and animals to the Marianas (Safford 1910, Thompson 1947). Also responsible for bringing many new products was the annual supply ship that began making regular deliveries of food and other goods from Cavite in the Philippines in the late 17th and early 18th centuries. Among the major crop introductions were corn, sweet potatoes, paddy rice, (rice [*Oryza sativa*] had been grown prehistorically as well; see Hunter-Anderson et al. 1995a), coffee, and tobacco. Also incorporated into the evolving Marianas culture were the Mexican *metate* and *mano*, to process dried corn, and a metal hoe (*fosino*) to work the land (previously wood, stone, and bone implements had been used). Deer and carabao (water buffalo) from the Philippines, as well as cattle, horses, goats, pigs, and chickens, were brought in for sport, food and farm work.

During the 18th and 19th centuries, other people arrived and made Guam their home. Among these were Filipinos, Japanese, Chinese, and Carolinians (Rogers 1995:100). Some people, like the Carolinians, sought refuge in the Marianas when their home islands were destroyed by typhoons and tidal waves. Others, like a group of Japanese, arrived as laborers to develop agricultural production on Guam (Olive 1984:10). Still other people were transported to Guam from the Philippines as convicts and/or deportees and some stayed on the island once they had completed their sentences (Rogers 1995:101).

The mid-19th century saw extreme difficulties in agricultural production on Guam, as reported by Gov. de la Corte, who wrote that regardless of good or bad harvests, some people starved every year (Carano and Sanchez 1964:155). He hoped building government granaries would relieve this problem but the farmers could not be induced to plant more than was needed for a year at a time. Food problems were compounded by smallpox epidemics, an especially severe one occurring in 1856 when half the island's population died. Hospitals were established in Inarajan and other villages but lack of vaccines and inadequate medical care ensured disasters of this type. Carolinians and later Japanese immigrants replaced some of the population losses. Nonetheless, none of the Spanish governors were unable to change the poor condition of Guam's economy as Spain's empire waned and its long neglect of the Marianas colony continued.

3.2 First American Period

The Spanish Period formally ended on Guam with the arrival of the Americans, who took over administration of the colony in 1898 as a spoil of the Spanish-American War. The islands north of Guam, however, remained in Spanish hands until purchased by the Germans in 1899, along with the Palau Islands, the Carolines including Kapingamarangi and Nukuoro, and two atolls in the Marshall Islands not already controlled by the German Emperor (Spenneman 1999).

Under the new American administration, Guam had a series of Naval governors headquartered in Agana. The naval government provided some employment for local residents, and thus began a wage economy, oriented toward provisioning the American colony. Descriptions of the period appear in Thompson (1947), Safford (1910), and Nelson and Nelson (1992), and for details the reader is directed to these sources as well as Carano and Sanchez (1964) and Rogers (1995).

In an effort to increase local food production, a recurring theme in Guam's colonial history, the government instituted agricultural programs. These were designed to meet the needs of the American military personnel and their families, but not the local population, according to Joaquin Sablan (1990 interview with J. Amesbury). As Spanish governors and others had pointed out previously, local farming was subsistence-based and not commercial; growing crops for sale and working for wages were alien in this context and were undertaken rarely and with little enthusiasm. The naval government wages were relatively high compared to farm incomes and by 1919 one-third of the able-bodied males were working for the government or in trade in Agana (Thompson 1947:129).

Commerce in the early decades of the 20th century was dominated by Japanese firms and merchants, who sold imports to everybody including the new consumers. Later a San Francisco company, Atkins, Kroll was invited into Guam by the naval government and became the biggest and longest lasting of the island's commercial enterprises (Rogers 1995:133). Other government projects begun during this time

include health programs, a public education system that included rural schools, an improved water system in Agana and the rural villages, and better roads.

The four-decade-long early 20th century American interlude on Guam ended with the Japanese bombardment and troop invasion in 1941. The Northern Marianas were already in Japanese hands as a League of Nations mandate (for details see Farrell 1991).

3.3 Japanese Period/World War II

Detailed descriptions of the Japanese Period on Guam, which coincided with U.S. entry and involvement in WWII, may be found in Sanchez (1979, 1988). After bombing the island on July 8, 1941, Japanese troops landed on the shores of East Agana Bay and Tumon Bay on the morning of Dec. 10, 1941. They made their way to Agana, where, after a short battle, they captured the island and established administrative headquarters. The new administrators required Chamorros to wear identification passes. The people had to stand in long lines to obtain the passes from Japanese officials (Rogers 1995). The Japanese administrators also required the Chamorros to follow the Japanese practice of bowing and those who failed to do so were punished.

School reopened in April 1942 and until 1944, life for the Chamorros under Japanese rule was not extremely difficult, although there were agricultural quotas and work requirements (Rogers 1995:171-176). When food got scarce, many Chamorros moved to their ranches where they stayed. Just prior to the U.S. invasion, in early July 1944, villagers were force-marched to concentration camps in the island interior, for example, at Manenggon. With the arrival of military reinforcements in March of 1944, the number of Japanese military increased to about 18,500 people (Denfeld 1997:187). Thereafter, food shortages were common and due to lack of food, many people became malnourished.

Beginning in the early part of 1944, if not before, the Japanese had begun to fortify the island coasts and to build airfields on the north's limestone plateau. In anticipation of an attack from the sea, the section of the shoreline extending south from Tumon Bay to Agat was fortified by the Japanese administration (Crowl 1960:333). A labor force of Chamorro male conscripts dug the caves and trenches, built pillboxes and barricades, and laid the underwater mines that made up the coastal defense system.

The American invasion came on July 21, 1944, after 14 days and 15 nights of bombing and strafing the island from air and sea (Lodge 1954). The American invasion forces landed at Asan and Agat on the southwest coast. It took nine days of fighting for these troops to capture the Final Beach Line (FBL), an arbitrary line drawn along the high ground from Adelup south to Facpi Pt. After losing this ground, the Japanese troops withdrew to the Mt. Santa Rosa and Mt. Mataguac areas in northern Guam for a final stand. On August 10, Guam was again controlled by the Americans (Rogers 1995:193), but Japanese stragglers remained in scattered hide-outs throughout the

remote parts of the island. One last battle occurred on August 10-11. When it was over, Tokyo acknowledged the fall of Guam (Rogers 1995:193).

3.4 Second American Period

The post-war years have seen major changes in landscape and lifestyle on Guam under American administration. Population has increased as have the number of businesses and government agencies. In 1950, the Organic Act was passed, granting U.S. citizenship and some measure of self-government to the Guamanian people. The requirement of U.S. Navy security clearance to enter Guam was lifted in 1962, and by the mid-1960s Japanese tourists began to visit the island. The College of Guam, later to be a university and a land-grant institution with responsibility for Guam's agricultural and community development, was established.

During the 1970s the government and private investors were beginning to build additional housing and to install the infrastructure in support of the new wage and tourist economy. Massive federal subsidies were provided to Guam during the Vietnam war and after including for handling the 50,000 Vietnamese refugees and for aid and rebuilding after supertyphoon Pamela (Rogers 1995:252-255). By the 1980s several hotel, golf course, and resort projects were underway. Federal and local historic preservation laws were being applied, resulting in a growing data base of Guam's archaeological sites. The Guam Historic Preservation Plan of 1976 was published, and nominations to the National and Guam Registers were being made.

The late 1990s saw a downturn in the pace of construction and of tourism on Guam, apparently attributable to Guam's economic ties with the Japanese and other Asian economies which were in decline. However, military construction and systematic inventories of Guam's bases and excess properties provided work for laborers and for archaeologists. The result has been a large amount of data on the distribution and contents of prehistoric and historic sites. These data are confined to technical reports with restricted circulation and remain unsynthesized.

4.0 ARCHAEOLOGICAL BACKGROUND

Archaeologists recognize two broad prehistoric (or pre-European contact) cultural periods in the Marianas, the Pre-Latte and the Latte, while they conventionally divide the historic archaeological record using the same units as the Historic Period (Spanish, 1st American, Japanese/World War II, and 2nd American). Sites are considered historic as opposed to modern if they are at least 50 years old and are considered historically significant if they qualify for nomination to the National Register of Historic Places.

4.1 Prehistoric Period

The Pre-Latte Period extended from initial human occupation of the Marianas about 3,500 years Before Present (3500 BP) until about 1000 BP. Based on differences in the pottery found at archaeological sites of the Pre-Latte Period, finer temporal distinctions have been made within the Prehistoric. For example, shorter time intervals have been proposed for the Pre-Latte Period: Early Pre-Latte (3500-2500 BP) and the Mid-Pre-Latte (2500-1500 BP). A Transitional Period between the late Pre-Latte and the Latte Period has been designated (1500-1000 BP), again based upon pottery attributes, as well as other cultural traits observed archaeologically (see Moore and Hunter-Anderson 1999). It was during the Transitional Period that regular use of the interior portions of the island is indicated archaeologically, mainly by rock shelter sites. More intensive occupation of the island interior for a variety of activities is evident through the Latte Phase, and several coastal settlements grew from small occupations to large residential zones while coastal and inland rock shelters continued to be used for limited activities.

The most prominent characteristic of the Latte Period is the latte stone set, a double-row grouping of pillars and capstones which are found at many sites occupied between 1,000 and 500 years ago. Latte stones occur in coastal sites and inland, often clustered near freshwater sources. Other important Latte Period traits include large basalt mortars, plainware (undecorated, unslipped) ceramics, basalt ground stone adzes, *Tridacna* shell adzes, *Isognomon* shell fishhooks and gorges, slingstones, and human interments within and near latte sets at coastal sites and in more isolated locales in interior sites.

Formal archaeological investigations in the Mariana Islands began during the 1920s (Hornbostel n.d.), but this work remains largely unpublished; see a summary by Thompson (1932). Hornbostel investigated latte features in the Fena district of south-central Guam, noting a distinctive geometric shape of the capstones and columns. This style was known only from Fena and Chandija, also in south-central Guam. Later surveys in the Fena and in the Pulantat area confirmed the use of the geometric style (Hunter-Anderson and Moore 2002; Osborne 1947a). On the basis of his surveys, Hornbostel estimated there were more than 270 latte sites (he called the latte stones "monuments" and sites with latte stones "monument sites," see Thompson 1932) on Guam. Hornbostel prepared a map of Guam showing the distribution of latte sites throughout the island (Figure 3), later published by Reed (1952).

After WWII, systematic excavations in Saipan, Tinian, and Rota by Spoehr (1957) resulted in the formulation of a chronological sequence for the Marianas, mainly through analysis of ceramic variability. On Guam, Osborne (1947b), followed by Reed (1952), conducted surveys, excavations, and restorations of damaged latte sites. Reinman's survey and test excavations during the mid-1960s, published in 1977, provided the archaeological baseline for the island and confirmed the general patterns seen by Spoehr in the islands north of Guam.

Recent work, stimulated by modern development and the implementation of historic preservation laws, has filled in many details about Marianas prehistory. The findings of these projects are detailed in technical reports of the contracting firms which have conducted the work. Their reports are kept at the Guam Historic Resources Division (HRD) library. An overall interpretive synthesis of the northern Marianas has been offered by Hunter-Anderson and Butler (1995) but a similar work for Guam has not been written.

4.2 Historic Period

While a summary and synthesis of Guam's Historic Period sites has not been compiled, archaeologists are aware of their wide temporal and functional ranges. For example there are Spanish military and government architectural remnants and deposits (examples occur at the Plaza de Espana and at various forts on the west coast), religious structures and features (church walls in Umatac), urban residential and commercial structures and deposits (such as in old Agana and Inarajan), and remnant residential and farming deposits at rural lanchos (as at Manenggon Hills and Fena). Photographs and commentary on Spanish architectural remnants in the Pacific islands including Guam were published by Galvan (1998), and Degadillo et al. (1979) compiled illustrations of the Spanish forts of Guam.

First American Period sites include dams and water reservoirs, as well as houses, government, and commercial buildings and their associated deposits in Agana and several other villages. Several improvements to Apra Harbor were made just prior to WWII, such as an oil dock, fuel storage tanks, a breakwater at Luminao Reef and the quarry that provided limestone rock for breakwater (see history of Apra Harbor land use below). Archaeological remains of these early pre-WWII sites are lacking for the most part.

WWII sites are numerous and some are spatially extensive, deriving from Japanese and American military activities during and after the war. Some of these sites were created by Japanese military or civilian government organizations prior to the American invasion, but many reflect wartime and immediate post-war events and programs. They include airfields and support structures; battlefields and bivouac areas, encampments, cave hide-outs, and other fortifications such as concrete pillboxes. After the war, the U.S. military disposed of excess equipment and supplies in several areas, and the rubble of Agana was pushed into the sea, creating the Paseo de Susana.

4.2.1 History of Apra Harbor Land Use

Sites identified during archaeological investigations conducted on the Orote side, and along the inland edges, of Apra Harbor indicate that portions of the harbor shorelines had been utilized during prehistoric times (Dixon et al. 1999, 2004; Fulmer et al. 1999; Hunter-Anderson and Moore 2002; Reinman 1977; Reinman and Nees 1998). However, archaeological evidence of similar utilization of the Cabras Island side of the harbor is lacking. In part, this may be due to the fact that no archaeological investigations were completed prior to the construction of the Glass Breakwater, Commercial Port, and Industrial Park. However, Cabras Island's small size and lack of freshwater may have deterred habitation and agriculture in prehistoric times. Prehistoric use of this side of the harbor was probably limited to fishermen and foragers who frequented the narrow shorelines of Cabras Island and fished the western shallows of Luminao Reef and Calalan Bank.

The early Spanish and missionary accounts indicate that in the last half of the 1600s, some of the Chamorro people were residing in villages located along the northern shoreline of Orote Peninsula on the south side of Apra Harbor and on the high ground inland of the harbor. Perhaps the largest of these settlements was Sumay, a fishing community situated on the shore of Orote Peninsula. Sumay is located south and across the harbor from Cabras Island and the project area.

In the early 1700s, after peace had been achieved between the Spanish and Chamorros, the Spanish began to fortify Apra Harbor. Two forts were built on its Orote side. These were Fort Santiago built in1721 at the top of Orote Peninsula overlooking the entrance to the outer harbor and Fort San Luis built in 1737 along the peninsula's shoreline. The last fortification to be built was Fort Nuestra Senora de los Dolores y la Santa Cruz. Built in 1801, it was situated on an islet in the rocky shallows at the back of the harbor. This fort protected the entrance to the inner harbor.

A fourth defensive position may have been situated on Cabras Island. Shortly after the Americans acquired Guam in 1898, Wheeler (1900:29) reported that a battery of three 6-pounders had been on Cabras Island at the time of Kotzebue's visit in 1817. According to Wheeler (1900:29) this battery had been removed before the Americans arrived. Our review of two translations of the Kotzebue voyage (Barratt 1988; Lévesque 1992) did not locate a description of a Spanish Period defensive position on Cabras Island. Villalobos (1979:6), who described the forts of Guam in 1833, makes no mention of a fortification there nor did he recommend building one there. Possibly one was built after 1833, but if so, a description of it was not found during our literature review.

A harbor map prepared in 1794, by the Malaspina Expedition pilot Juan Inciarte, and labeled "Plan of Port of San Luis d' Apra" depicts Cabras Island [called I. de Apapa Cabras] and the unnamed rocky shoals to the west of Cabras (Lévesque 2000:469). It also shows the village of Sumay, the rivers that flowed into the harbor, and Fort Santa Cruz, completed in 1801 some seven years after this voyage. It is unclear whether construction of the fort had already begun in 1794 or if the map was later updated.

A history of Apra Harbor, compiled by Hunter-Anderson and Moore (2002) indicates that the harbor eventually became the favored anchoring spot on Guam during the Spanish Period. The Manila Galleons, as well as the vessels of the visiting explorers (Kotzebue, Freycinet, Lutke, d'Urville) and the whalers (who regularly stopped on Guam after 1823) sailed into Apra Harbor. The whalers (estimated at 30 ships per year for 30 years) brought cash to the islanders in exchange for local goods and services (Hunter-Anderson and Moore 2002).

In the early 1800s, Apra Harbor was described as having two ports, a large, somewhat dangerous outer one and a small, safer inner one that required a pilot's guidance to enter (Villalobos 1979). The usual anchoring ground was the inner harbor, just north of Fort Santa Cruz (Ibanez 1887:94). By the mid-1800s, a harbor master and crew were housed in the village of Tepungan, a village of a dozen houses on the shoreline (Olive 1984:87) northeast of Cabras Island. At that time, the occupants of this village maintained fish weirs on the reef flat at the mouth of the Masso River (Ibanez 1887:93). This river debouches into the Apra Harbor shoreline east of Cabras Island.

In order for small boats to make their way to the shore from ships at anchor in the inner harbor, navigable channels were created through the reef flats at the back of the harbor (Olive 1984:87-88). There were two landings where passengers and cargo were unloaded. One was at Sumay on Orote Peninsula, and the other was at Piti in the vicinity of the present power plants, opposite the east end of Cabras Island. Once ashore, people made their way along the roads to Hagåtña, where the governor resided. Of these two landings, apparently Piti was the favored spot, perhaps because it was closer to Hagåtña and the road from Piti to Hagåtña was in better condition than was the road between Sumay and Piti.

By 1872, a pier had been built at the Piti landing; it was constructed on strong *molave* posts covered to the high water mark with copper sheeting (Ibanez 1887). The pier had *ifil* (*Intsia bijuga*) wood flooring and benches placed along its length. The walls were constructed of woven *carrizo* (*Phragmites karka*) and the roof was swordgrass thatch. A spacious *cumarin* (shed) provided shelter for the carts and carriages that carried people and goods to and from Hagåtña (Ibanez 1887:97-98). In 1885, a stone office building, used by the captain of the port, was built near the pier (Olive 1984:63).

Descriptions of Cabras Island in the late 1800s indicate that it was then a low, rugged mass of limestone, edged by narrow strands of sandy beach (Ibanez 1887:93; Villalobos 1979:33). The island, covered by low, dense vegetation, was separated from Guam's shoreline by about 100 feet of shallow reef flat (Villalobos 1979:33). Fishermen frequented its small sandy beach strands and in 1887 Don Joaquin Portusach of Hagåtña kept goats there (Ibanez 1887:93).

Two rocky shoals, Luminao Reef and Calalan Bank, extended in a westerly direction from the western end of Cabras Island. Calalan Bank had a small rocky flat at its very southwestern tip called the "Piedras de la Fragata Espanola [Rocks of the Spanish Frigate]" that were at a depth of 15 ft (Ibanez 1887:94). The Bank and Rocks got their

names in 1814, when the Spanish frigate *Santiago*, alias *Infante Don Carlos*, was wrecked on these shoals. The passengers, crew, and some of the cargo of silver pesos were saved (Ibanez 1887:94-95). A group of Carolinians, who were on Guam at the time, assisted with the salvage efforts (Carrell 1991:88, citing Barratt 1984:14). Although it was recommended that a breakwater be built that incorporated Luminao Reef and Calalan Bank as far as the Spanish Rocks (Olive 1984:88), the breakwater project was never implemented during the Spanish Period.

The Americans sailed into Apra Harbor and took over Guam in 1898. Because Guam was remote and was to be used as a coaling station, President McKinley decided that the Department of the Navy would be responsible for administrating the island (Carano and Sanchez 1964:183). The main coal storage area was to be on Cabras Island. Due to the shallow waters that were located between the ships at anchor in Apra Harbor and the shorelines, the naval administrators quickly found that transporting cargo from their ships was extremely difficult (Nelson and Nelson 1992:151). In fact, Governor Sewell, in 1903, decided that it would be more practical to leave the re-provisioning coal on the collier rather than off-loading it, and he asked that a collier be permanently assigned to Guam for this purpose (Carrell 1991:144). For a detailed history of the ships that anchored in Apra Harbor during the First American Period see Carrell (1991).

Improvements to the Piti landing and the small boat channels (Piti and Sumay) were among the first public works projects carried out by the U.S. Navy. Crews were employed, whenever the tide was high (day or night), to bring the small, loaded boats to shore. During low tides, men were assigned to clear the Piti Channel of rocks, and deepen and widen it (Nelson and Nelson 1992). At Piti a Navy Yard was built inland of the landing, the quay was extended, a storage shed was constructed, and repairs were made to the Hagåtña-Piti Road (Cox et al. 1926; Nelson and Nelson 1992). A power line connected the Piti landing to the Hagåtña power plant.

Improvements on Cabras Island during this time included a causeway built from Piti to the east end of the island. The causeway had a passage wide enough to permit boats to pass (Cox et al. 1926:50). By 1914 a wharf, a coal storage facility and a quarantine station had been built on Cabras Island (Figure 4). The wharf was located along the Cabras Island shoreline just east of the present oil dock, the coal shed was located just inland of the wharf, and the quarantine station was located at the east end of the island. Due to the subsequent construction of the oil dock, the industrial park and commercial port, only the ruins of the quarantine station remain on Cabras Island (see below). Also depicted on Figure 4 are Luminao Reef, Calalan Bank, Spanish Rocks, the Piti landing, the Masso River, and roads and fields in the vicinity of Piti.

Navigational buoys and lights in Apra Harbor were improved after the cable ship *Scotia* struck the Spanish Rocks of Calalan Bank in 1904 (Rogers 1995:129). This accident happened when the ship's captain and crew were blinded by the early morning sun as they attempted to enter the harbor. The ship sank in shallow water not far from where the Spanish frigate had sunk in 1814 after hitting the same rocks (Rogers 1995:129). The loss of the *Scotia* was the second of three ships lost during the period 1898 to 1941. In

1900 the *Yosemite* was lost when it sank during a typhoon, ran aground on the shoals at Calalan Reef, was blown off, lost an anchor at Spanish Rocks and disappeared. In 1917, the German ship *Cormoran* was scuttled during WWI (see below).

On the basis of a topographic survey of Guam in 1913-1914, a coastal defense plan was formulated and its implementation by the U.S. Marines began in 1914 (Hunter-Anderson and Moore 2002:14). By 1915 Apra Harbor was defended by two six-inch guns at Tipalao on Orote Peninsula, four six-inch guns at Orote Point and two six-inch guns on Cabras Island (Denfeld 1997:139-140). These guns were removed from Guam in 1931 as the island was disarmed in accordance with international treaties negotiated in the 1920s (Denfeld 1997; Rogers 1995). It is not known if ruins of the Cabras Island gun position remain.

Another boat channel, called the Tepungan channel, was completed in 1933 (Alexander 1933:61, 1935). Barges used the Tepungan channel to transport coal from Cabras Island to Hagåtña, where it was used to fuel the power plant.

Figure 5 shows Cabras Island in June of 1941. By then the Piti Channel had been extended to the Cabras Island wharf shown on Figure 4 and two causeways connected the east end of the island to the shoreline. One causeway ended at the Navy Yard and the other ended along the Piti shoreline.

Finally, by mid-1941, after more than 40 years of continuously requesting funds from the federal government to make improvements to Apra Harbor, a sum of $4.7 million dollars was authorized (Rogers 1995:121, 157). The money was to be used to build a breakwater on Luminao Reef and fuel tanks on Cabras Island (Denfeld 1997:141).

Chicago Bridge and Iron Company received the contract for the construction of five steel fuel tanks and began work in May 1941 (Denfeld 1997:141). A map of Apra Harbor (Figure 6) at the end of 1941 shows the facilities on Cabras Island including four fuel storage tanks, the 850 yards-long mole and oil dock, the Piti channel, and the quarry on Cabras Island where rock to build the breakwater was obtained; it also shows the completed breakwater on Luminao Reef, the Piti Navy Yard, and the lanes in Apra Harbor most frequently used for seaplane take offs and landings.

The one mile-long stretch of breakwater, to the end of Luminao Reef, was 36 feet wide and 5 feet high and included sea plane facilities (Anonymous 1982:12). It is not likely that these sea plane facilities included the Sea Plane Ramp. A report entitled *Strategic Study of Guam* (Office of the Chief of Naval Intelligence 1944) contains no description of a sea plane ramp or other docking facilities along the new breakwater. It does describe the oil dock, the four "dolphins" at the oil dock, and the rock-filled mole that led from Cabras Island to the oil dock. Fuel oil and gasoline lines had been laid along the mole. The sea plane facilities described in the 1982 report may have consisted of a sea plane anchorage. A map of the Apra Harbor sea plane facilities as of December 1941 shows an anchorage near the Luminao Reef breakwater, but this map depicts no shoreline facilities (MARC n.d.).

Sea planes had been using Apra Harbor for landings and take-offs since 1921 when a U.S. Marine sea plane unit was assigned to Sumay, where the Marines were based (Hunter-Anderson and Moore 2002:14). This flying group was removed from Guam in 1931 when the island was disarmed (Denfeld 1997; Rogers 1995). In 1935 Pan American Airways (PAA) leased the Sumay seaplane facilities and, with the navy's help, dredged the Sumay landing channel. At Sumay, PAA built another hangar, a shop, a warehouse, a terminal building and a twenty-room hotel (the Skyways Inn) for their trans-Pacific China Clipper services (Rogers 1995:153). The first PAA passenger sea plane landed in Apra Harbor in 1936 and anchored off Sumay (Rogers 1995:154).

The fuel tanks built in 1941 on Cabras Island had just been completed and filled when the Japanese attacked Guam on December 8 (Denfeld 1997:141). The tanks were not hit when the Japanese bombed the navy facilities at Piti, but two of them were intentionally destroyed by H.Y. Sackers, a civilian Public Works employee (Denfeld 1997:150). Apparently the only anti-aircraft fire that the attacking Japanese airplanes encountered during their pre-invasion strike on Piti came from the guns on the small naval craft anchored at the Piti naval yard (Apple 1980:24).

The Japanese no doubt utilized the oil dock and the remaining fuel storage tanks during WWII, but little is known about additional improvements made to the Cabras Island side of the harbor during the Japanese Occupation. Prior to the U.S. invasion of Guam in 1944, the Japanese had fortified Cabras Island as part of their coastal defensive system (Apple 1980). The Americans landed at Asan and Agat on Guam's west coast and when they captured Cabras Island on July 22-23, 1944, they found that the beaches had been mined and dummy gun positions erected (Apple 1980).

Almost immediately after their landing, U.S. troops began re-constructing damaged facilities and building new ones. Improvements to Apra Harbor were among the first projects initiated (Bureau of Yards and Docks 1947:349). By October 1944 six piers (42 by 350 ft) had been completed and a seventh was under construction in the harbor, and five concrete barges had been sunk to temporarily extend the breakwater along Calalan Bank (Bureau of Yards and Docks 1947:349). Then typhoon-generated waves destroyed or damaged the piers, destroyed parts of the breakwater, and seriously damaged the sunken barges. The damage was repaired and by July 1945 there were "14 quay-wall berths, nine pontoon piers, two wooden piers for fueling, ten LST berths, and one submarine pier" in the harbor (Bureau of Yards and Docks 1947:350).

At least four of these facilities were located on the Cabras Island side of the harbor. An Area Allocations Map, dated October 1944, shows three structures built out into the harbor from the south side of the breakwater, and the Oil Dock first built in 1941 (Figure 7). Labeled A, B, C and E (with A on the west and E on the east) on another version of this map, the four features are in the vicinity of the present project area, but it is not clear if they were all in place in October 1944 or planned.

According to Denfeld (2005), the 1944-45 pontoon pier construction activities utilized steel boxes that measured 5 x 7 x 5 ft deep. Designed by Captain John N. Laycock, they were called "Magic Boxes," and Denfeld (2005) reports that they were one of the great inventions of WWII along with "Liberty ships, Landing Ship Tank (LSTs), amphibious landing craft, C-47 aircraft, the jeep, and Marston Mat runway material."

Writing about the pontoons, Denfeld (2005) indicates that the first pontoon idea dated to 1935 when an officer in the Navy's Bureau of Yards and Docks observed a civilian commercial sectional barge. This barge was built of steel boxes fitted together. In 1939, with war planning and increased defense funding available, Captain Laycock launched a study of sectional pontoons that could be used to build causeways to bring heavy equipment ashore. Working with cigar boxes and a slide rule, Captain Laycock determined how to join the sections (with connectors called "jewelry") and calculated maximum pier length. He found that an effective size for each box was 5 x 7 x 5 ft. The steel plates on the bottom and top of each box were 1/4-in thick, while the sides and ends were 1/8-in thick. With "jewelry" attached, each steel cube weighed 2,600 pounds. Test versions of the boxes were ready in May 1941, and field tests conducted a few weeks later proved them to be a success. Thousands of steel boxes were produced by a number of different steel manufacturers.

Denfeld (2005) states "that the boxes could be formed into various shapes and found a number of uses. The Navy's 1944 Pontoon Gear Manual listed 31 standard assemblies. They included landing barges, causeways, seaplane ramps, wharves, floating drydocks, tug boats, dredges, floating cranes, and fuel barges. Configurations varied with use. For example, the 50-ton barge had a three-box width and seven-box length. Causeways had lengths (called strings) appropriate to wading needs with a two-box width to accommodate trucks and tanks."

Continuing, Denfeld (2005) observes that the first use of pontoon piers in the Pacific occurred at Kwajalein in February 1943 where they served as causeways and self-propelled barges. Special propulsion units with either outboard or inboard motors powered the barges. Two of these propulsion units survive today on Peleliu Island, Palau (Denfeld 1988:90). Following their use in the Marshall Islands, the pontoon assemblies saw wide service in the Pacific. They were critical in the drive across the Central Pacific, and they served a significant role at Guam.

According to Denfeld (2005), "innovative Seabees found other uses for the steel boxes. Placed on trucks they served as road sprinklers. Used as water tanks in the camps they provided hot shower water-warmed by the sun. At Guadalcanal, a Seabee baker converted one into a large oven."

Denfeld (2005) indicates that few pontoon assemblies survive today. The Seabee Museum, Port Huemene, has a display case with some small models and a few survive on Peleliu in causeway and barge form. According to Denfeld (2005), the role the pontoons played in the Allied victory during WWII has not received sufficient attention.

If the three features (A-C) on the south side of the breakwater were built using the pontoon building technique, then some steel box remnants may be found along the harbor side of the breakwater shoreline.

Figure 7 also shows the facilities on Cabras Island in 1944 including a fleet post office, a quarry operated by the 5th Naval Construction Brigade (NCB), a special camp for the 13th NCB and the 76th NCB boat pool. The boat pool was located on the southeast side of the Cabras Island. The NCB camps probably had shop facilities for truck repair, engine and tire repair, compressor shops, and a heavy equipment repair shop and a rigging loft (Anonymous 1982:E-8).

After WWII ended in September, 1945, the Navy began bidding out construction of military projects to American civilian contractors. J.H. Pomeroy Company of San Francisco was awarded the contract to build the breakwater which was completed in June 1947, and "named the Glass Breakwater in honor of Captain Henry Glass who seized Guam for the United States nearly a half-century earlier" (Rogers 1995:204). The harbor was dredged and portions of the former reef flats were filled to build the breakwater and to create land for military facilities such as those at Polaris Point and the fuel pipeline road. On the harbor side of the Glass Breakwater, Oil Dock and the three quays shown on the earlier allocation maps were retained, although they may have been re-built during the 1945-47 construction period. The shorelines on either side of the Oil Dock were developed as landing areas for Landing Ship Tanks (LSTs) (Tudor Engineering Co. 1964:68). The LST landing area on the west side of the oil dock is within the project area, but now supports a tank farm.

In 1966, the Government of Guam re-acquired Cabras Island from the federal government and a ground-breaking ceremony was held for the construction of the new commercial port (Guam Daily News 1966a:np). Facilities at the new port included new wharves with dredged approaches (Guam Daily News 1966b:1). Construction was completed in 1969 (Anonymous 1982:12). It is not clear when G (Golf or Gulf) Wharf and H (Hotel) Wharf were built, but H Wharf appears on a 1955 map of Apra Harbor (Figure 8) which suggests that the Navy continued to improve the facilities along the Glass Breakwater after 1947. The 1955 facilities shown on Figure 8 include the oil dock, the three docks built prior to 1947, H Wharf and Dog Leg Pier. It is likely that G Wharf (built on B quay) was renovated in 1960 when it began to be used to store bulk cement. According to the report prepared by Tudor Engineering Co. (1964), prior to 1960 bulk cement was stored in LSTs. G Wharf appears on a map of the harbor facilities in the 1960s (Tudor Engineering Co. 1964:10, 47), and it may have been renovated since then. The Apra Harbor USGS map (2000) shows the features on the south side of the breakwater; on this map the three quays built in 1944-47 are still designated A, B, and C.

During the Vietnam War the navy's ammunition wharf was at H Wharf (Rogers 1995:248) and this wharf may have been renovated during that time. According to Rogers (1995:248),

> "Military truck convoys loaded with bombs took priority on the crowded two-lane highway from the breakwater through the port area to Marine Drive and then to Andersen [Air Force Base] or to the Naval magazine at Fena. Department of Defense regulations require ammo wharfs to be beyond a two-mile blast radium from civilian facilities in case of accidental explosions. Ordnance could be unloaded at H Pier only through waivers. Faced with these constrictions, in 1967-68 the navy conducted a survey to locate a new site for an ammo wharf on Guam."

Subsequently, the Navy's ammunition wharf was moved from H Wharf to Orote Peninsula, across the harbor from H Wharf, and additional lands on Cabras were then turned over to GovGuam to build the Industrial Park dedicated in 1971 (Pacific Daily News 1971:22). By 1970 the Marianas Yacht Club (MYC) operated a small anchorage in the area between the Sea Plane Ramp and the fuel storage tanks that had been previously used by the U.S. Coast Guard (Tudor Engineering Co. 1964:10). During the years that the MYC operated in this location, typhoons sank at least five vessels that had been moored in this area. In the 1990s the MYC facility moved to another location in the inner harbor. Ruins of concrete block walls and a concrete slab now mark the location of the former MYC facility.

Civilians have used the Sea Plane Ramp to launch small recreational craft, while commercial fishing boats, tour boats, and visiting ships tie up at G and H wharves. The harbor is and has been a popular recreational area for privately operated motorized watercraft and sailboats. People fish in the harbor and along its shorelines. The shipwrecks and coral reefs are popular dive spots for locals as well as tourists.

4.3 Previous Archaeology in the Vicinity of the Project Area

An archaeological survey of a portion of Cabras Island, completed in 1977, identified one site, the only recorded site on Cabras Island. The site, Site 66-03-1116 (HRD Site Files), consisted of the concrete ruins of the historic quarantine station built about 1914 (Price 1977:3). These ruins were located on the south side of the island approximately 250 yards west of the power plant canal and about 20 yards north of the main road. The site included a rectangular set of concrete foundations, measuring about 20 feet long by 7 ft wide. An assessment of the condition of the site at that time indicated that it was disturbed and deteriorated. Its current condition is unknown, and it is outside the current project area.

An archaeological survey for the Harbor of Refuge in the lower Piti Channel area found no significant cultural resources but collected a number of historic glass bottles (Hernandez 1984). Some of the bottles dated to pre-WWII times and they provide tangible evidence of the utilization of the Piti Channel during the First American Period (Hernandez 1984).

In 1998, a management plan for the cultural resources in the Apra Harbor naval complex was prepared and at that time the Glass Breakwater was assessed as eligible for listing

on the National Register of Historic Places under Criterion (a) (association with events important in history) and Criterion (b) (an example of 1940 breakwater construction techniques) (Lauter-Reinman 1998:120). Lauter-Reinman (1998:120) stated that the breakwater retains its integrity of location, design, setting, materials and workmanship. As yet, it remains to be nominated to the Register.

Other archaeological sites have been documented in the district of Piti. For example, an archaeological survey of Guam in 1965-66, Reinman (n.d.) documented a single latte structure on the Piti shoreline between the Sasa River and the Piti power plant, just south of the road to Fuel Docks and west of Marine Corps Drive. At that time, it was an 8-stone structure with 7 of the 8 uprights still in place and pottery was scattered all around the set. The set was seen in 1994 and its condition at that time was good (Hunter-Anderson et al. 1995b:15).

An inventory survey in 1995 of a 19-acre parcel of land on the south side of the road to the Fuel Docks identified seven archaeological sites including ceramics and bottles from pre-WWII and WWII times, the possible remains of a disturbed latte set (Site 5), and a basalt mortar (Site 7) (Hunter-Anderson et al. 1995b). Before the mortar could be documented in its archaeological context, heavy equipment belonging to the Government of Guam moved it to the governor's complex at Adelup where it was placed with a reconstructed latte set. Presumably it is still there. Four shovel tests completed at Site 7 were culturally sterile, although marine shells and an unworked chunk of basalt were observed on ground surface. These five sites indicate that this part of Piti was utilized in historic times (historic ceramics, bottles dating to the early part of the 20th century as well as WWII) and prehistoric times (Latte Period). No evidence of its use during early prehistoric times (Pre-Latte Period) was found. This parcel of land is now a protected wetland habitat.

An archaeological survey was conducted within approximately 800 acres in the Piti area between the Masso River on the north and the Big Guatali River on the south and Marine Corps Drive on the west (Dixon et al. 1999). The survey identified 75 archaeological sites including 25 prehistoric, three 19th and mid-20th century, five WWII Japanese positions, and 37 WWII post-U.S. invasion. Material recovered from four of the prehistoric sites was radiocarbon dated and yielded the following calibrated ages: AD 10-360, AD 675-1015, AD 1635-1950, and AD 1645-1950 (Dixon et al. 1999:116). These dates suggest that the area was more intensively utilized after AD 1, since no evidence of its use during the early Pre-Latte Period was obtained.

Paleosediment cores were taken at Tipalao Marsh on Orote Peninsula (Athens and Ward 1993:196) and at the mouth of the Laguas River in Apra Harbor (Athens et al. 2004). Athens et al. (2004) suggest that the appearance of charcoal particles in the Laguas core about 4300 years cal. BP (before present) marks the arrival of people on the island. This date is considerably earlier than the date of 3500 years BP which is generally accepted as the beginning of the Pre-Latte Period on Guam. Achugao, a Saipan site, has yielded the oldest date, c. 3470+/-120 (Butler 1995 Table 5-1); Guam's earliest site, Huchunao, has been dated to 3030+/-90 (Dilli et al. 1998).

A survey of 82 acres situated south of the Laguas River between Marine Corps Drive on the east and the Apra Harbor shoreline on the west identified two archaeological sites (Hunter-Anderson et al. 2001). One site (66-03-1723) is an abandoned U.S. military fuel storage complex (post-WWII) and the other (66-03-1722) is a rock shelter complex that included a prehistoric component. This latter site appears to have been utilized from prehistoric times to the present (it is currently being farmed). Two radiocarbon dates were obtained on material recovered from the site. The ages range from AD 655-1380, indicating that the site was utilized during the Latte Period, or possibly a little earlier. Human skeletal remains exposed in a test at this site were left in place.

A survey of about 116 acres situated south of Polaris Point between Marine Corps Drive on the east and the Apra Harbor shoreline on the west identified five archaeological sites including a prehistoric rockshelter, two artifact scatters, one site with two latte sets, and a hilltop site with five foxholes (Dixon et al. 2004:40). The site with the latte sets (66-03-1897) was radiocarbon dated (AD 1440-1640) (Dixon et al. 2004:112), indicating that this part of the Apra Harbor shoreline was utilized during the late Latte Period.

There are several historic sites in the Piti area. The Atantano Shrine (66-03-1012), located on the inland side of Marine Corps Drive in Piti municipality, consists of three inscribed plaques in a concrete monument. Originally the site was built to honor Don Felipe Cerain, a Spanish governor who built the road and developed the rice fields in the area. Fort Santa Cruz, an historic site from the Spanish Period, was once located along the Apra Harbor shoreline (Degadillo et al. 1979). It was destroyed during harbor expansions after WWII. The pre-war Masso Dam still exists a short distance east of the Guam Veterans Cemetery (Lotz 1994). The Piti Guns (66-03-1046) a Japanese defensive position is located in the hills behind Piti village. This site is part of the Japanese coastal fortification system built to defend the island against a U.S. beach invasion.

4.4 Submerged Cultural Resources in the Vicinity of the Project Area

Underwater cultural resources have been identified in Apra Harbor (Carrell 1991). Some of these sites have been documented and others remain undocumented. The documented wrecks in the vicinity of the project area include the remains of four vessels (*Cormoran, Tokai Maru, Kitsugawa Maru,* and *Nichiyu Maru*) and one Japanese plane (*Val*) (Carrell 1991). The *Cormoran* dates to WWI and the other four wrecks date to WWII. Two of these shipwrecks, the *SMS Cormoran* (HRD Site 66-03-1037), a German vessel, and the *Tokai Maru* (HRD Site 66-03-1089), a Japanese vessel, are on the Guam and the National Registers of Historic Places (Table 1). Although the *Kitsugawa* (HRD Site 66-03-1154) and *Nichiyu Maru* (HRD Site 66-03-1155), have been assigned site numbers and mapped, they have not been placed on either register. The *Val* has not been mapped, but it has been described (Carrell 1991:526).

The Carrell (1991) report contains detailed information about the positions and conditions of the three (*Cormoran, Tokai Maru, and Kitsugawa*) wrecks documented in 1991. The *Nichiyu Maru* site report contains detailed information about its condition and position. The other resources listed on Table 1, as well as several unlisted resources

have not been assessed or adequately documented. The unlisted resources in the vicinity of the project area include at least four barges and a Landing Craft Utility (LCU) on the harbor side of the Glass Breakwater, as many as five private yachts in the former MYC area, a naval tug located southwest of Buoy 1, and a tug near the Sea Plane Ramp (Edwards in Carrell 1991:325, 484).

Figure 9 is a map of Apra Harbor, adapted from Lauter-Reinman (1998), that shows the location of the known submerged resources in the vicinity of the project area. When these numbered locations are compared with a list of underwater features in Craib and Yoklavich (1996:43) the following information is gained. The *Nichiyu Maru* (5) is adjacent to Oil Dock; five wrecks of yachts and fishing boats (6-10) occur between Oil Dock and the Sea Plane Ramp; a tug (11) is shown just off shore from the Sea Plane Ramp; the *Cormoran* (15) and the *Tokai Maru* (16) are southwest of Buoy 1 which is in the harbor south of Outhouse Beach; a Japanese tug (17) and the *Kitsugawa Maru* (18) lie to the southwest of these; and unexploded ordnance lies in the water just off Dog Leg Pier. The figure also shows at least eight other ruins along the Calalan leg of the breakwater, including several Japanese barges, which are outside the project area.

Figure 10, from the research of Lotz and Lotz (2001) also shows the locations of some of the cultural resources in the vicinity of the project area:

Number 145 indicates the Glass Breakwater

Number 146 indicates the Sea Plane Ramp

Number 147 indicates Outhouse Beach

Number 148 indicates H Wharf

Number 149 indicates Dog Leg Pier (a good dive spot),

Number 150 indicates Family Beach (another good place to snorkel, scuba dive, and windsurf).

Number 151 marks the wreck of the *Nichiyu Maru*, a Japanese freighter that was damaged by a torpedo from the U.S. submarine *Permit* in 1943 and sunk by shelling from the U.S. destroyer *Caperton*, on June 25, 1944. The freighter, built in 1938, currently lies below the fuel pier (Oil Dock) in 100 feet of water. The *Nichiyu Maru* was drawn and photographed by the HRD. It is within the present project area near the Oil Dock (Gorco Pier).

Number 152 is the *Tokai Maru*, a Japanese passenger-cargo ship that was initially damaged in 1943 by torpedoes from the U.S. submarine *Flying Fish*. Later on in 1943 the U.S. submarine *Snapper* fired torpedoes and sunk the ship in 120 feet of water next to the *Cormoran*. The *Tokai Maru* was drawn and photographed (Carrell 1991).

Table 1. Submerged Cultural Resources Identified in the Vicinity of the Project Area.

Site Name	Age	Site Number	Guam Register	National Register	Documentation, Drawings	Reference
Scotia	1904				No	Carrell 1991, Lotz and Lotz 2001,
Cormoran	1917	66-03-1037	July, 1974	April, 1975	Yes, Carrell	Carrell 1991, Lotz and Lotz 2001, HRD Site Files
Tokai Maru	WWII	66-03-1089	July, 1988	July, 1988	Yes, Carrell	Carrell 1991, Lotz and Lotz 2001, HRD Site Files
Nichiyu Maru	WWII	66-03-1155			Yes, HRD	Carrell 1991, Lotz and Lotz 2001, HRD Site Files
Kitsugawa Maru	WWII	66-03-1154			Yes, U.S. Navy	Carrell 1991, Lotz and Lotz 2001
Val *(dive bomber)*	WWII				Documentation	Carrell 1991, Lotz and Lotz 2001
Japanese Tugboat	WWII				No	Lotz and Lotz 2001
4 yachts and 1 fishing boat	1970-1990?				No	Carrell 1991, Lauter-Reinman 1998, Craib and Yoklavich 1996

Number 153 is the *SMS Cormoran*, a German ship whose captain scuttled it in 1917 rather than surrender it to the Americans. The *Cormoran* has been drawn and photographed (Carrell 1991). To reach these two wrecks (152 and 153), divers usually tie their boats to one of several mooring buoys placed south of the Sea Plane Ramp.

Number 154 is a Japanese Tugboat that was used to place torpedo nets across the harbor, and provide tug and salvage services during the Japanese occupation of Guam. According to Lotz and Lotz (2001:53), "The tug was first hit by U.S. aircraft strafing and was later sunk by a torpedo." The tugboat has not been documented.

Number 155 marks the *Kitsugawa Maru* a Japanese freighter that was towed to Apra Harbor after being damaged on Guam's east coast in April 1944. The freighter was sunk in June 1944. It lies in 144 ft of water. The *Kitsugawa Maru* has been drawn and photographed (Carrell 1991).

Number 156 marks the *Val*, a Japanese Navy dive bomber shot down in 1944. It lies in 80 feet of water. According to Lotz (in Carrell 1991:526), the plane was buried nose first into the bottom with its tail and fixed landing gear pointing into the air. A good portion of the tail section is missing. An unsuccessful attempt to raise the plane many years ago resulted in separating the wing and flipping the *Val* upside down. The *Val* has not been drawn and photographed.

Number 157 marks an American Tanker and sunken barges in 40 to 120 feet of water. These have not been documented.

Number 158 is the *Scotia*, a cable ship that sank in 1904 after hitting the rocks while entering the harbor. The *Scotia* has not been documented.

Number 159 marks the Western Shoals at depths ranging from 5 to 75 feet. Number 160 marks Hourglass Reef, a good dive spot with depths up to 100 feet.

Four of the six known major shipwreck sites in Apra Harbor have been mapped and documented, three (*Kitsugawa, Tokai and Cormoran*) by the National Park Service (Carrell 1991) and one, *Nichiyu Maru*, by HRD (HRD Site Files). Carrell (1991) recommended that two other wrecks, the *CS Scotia* and *SS Caribe*, located near the mouth of the harbor, be afforded the same level of mapping documentation that was completed on the other four. While these two wrecks have yet to be mapped, they are not expected to be affected by the port expansion project.

4.5 Site Expectations

Due to the presence of made-land in the vicinity of the project area, no prehistoric sites are likely to exist along the breakwater shoreline. Known historic sites include the Glass Breakwater and the Oil Dock first built in 1941, modified in 1945-47, and updated since then; the remains of the three wharves built in 1944-47 (A, B, and C); H Wharf built in the 1950s, and G Wharf built about 1960. Sites other than these are not expected to be identified during the archaeological investigation of the project area shoreline.

This project did not involve an underwater survey, but the archival review indicates that several wrecks have been identified in the vicinity of the project area. Possibly other objects and wrecks, dating to all periods of Guam's history, exist in the underwater portions of the project area.

5.0 RESULTS OF SURVEY

The project area is located on the southern margin of the Glass Breakwater. It begins on the east with the Oil Dock and the shoreline fronting the tank farm and extends west to H Wharf (Figure 2). The plan for the proposed improvements indicates that the areas between the existing wharves will be filled and edged with sheet pilings. The existing facilities in this area from east to west include the Oil Dock, Sea Plane Ramp, G Wharf, Outhouse Beach, and H Wharf. Dog Leg Pier, at the west end of the Glass Breakwater, is outside the project area.

Two archaeologists from MARS inspected the shoreline portion of the project area on March 10, April 7 and April 15, 2005 and took photographs and measurements of the existing facilities and features on the Apra Harbor side of the Glass Breakwater. The team began with the shoreline east of the former MYC facility and worked west to H Wharf. The photographs appear at the end of the report, after the figures.

5.1 Oil Dock

Oil Dock, also called Gorco Pier, was initially built during the 1941 construction that marked the first attempt to build a breakwater along Luminao Reef. Since then the pier has been upgraded and is in use presently. Although the original structure would have been old enough to be eligible for nomination to the National Register of Historic Places, it has been rebuilt and repaired over the years and is currently in use. It is likely that none of the original construction is visible, but this is a secure area and we did not walk along the pier.

The shoreline fronting the present tank farm between Oil Dock and the MYC area is formed of coral boulders placed there to make hard land and protect the shoreline. This zone contains no significant cultural resources. Our archival review suggests that this area formerly was used as a LST landing, but it is now part of the fuel tank facility (Photo 1). The ruins of the MYC facility, in the area formerly used by the U.S. Coast Guard, date to about 1970. They are too recent to be considered historically significant. In addition, they are in poor condition and have lost their structural integrity as they are now part of the fuel tank facility. Photo 2 shows the shoreline between the former MYC area and the Sea Plane Ramp. This area contains no significant cultural resources.

5.2 Sea Plane Ramp

The Sea Plane Ramp (Figure 7:C) was built either in 1944-45, immediately after the U.S. retaking of Guam, or during the 1945-47 construction of the Glass Breakwater. It is the only relatively intact feature of the three original docking features (A-C) built on the south side of the beakwater during the 1940s. On the 1944 Area Allocations map referred to above, the Sea Plane Ramp area was designated as "C". A sign marks the entrance to the Sea Plane Ramp area (Photo 3).

The backfilled area making up the Sea Plan Ramp is quite large, and in addition to the ramp and seawall, the area contains a steel bollard (stout post used to secure mooring lines), the ruins of a concrete foundation, a small concrete slab, a row of ironwood trees, and more than one abandoned vehicle chassis. The backfilled area measures about 360 ft east/west along the shoreline of the breakwater and it extends into the harbor for a maximum distance of about 400 ft from the road along the south side of the breakwater. The ramp is about 170 ft west of the east side of the filled area.

The concrete ramp is 29 ft wide and its length above water is about 40 ft (Photo 4). It extends below the water line for an unknown distance. Above the water line the surface of the ramp is in good condition. Below the water line, the surface has eroded exposing the rebar used to strengthen the concrete (Photo 5). The ramp is still used to launch small watercraft (Photo 6).

Each side of the ramp is edged with a concrete and metal wall that continues below the water line. Near the point where the ramp meets the water, the sidewall is 1 ft high. These ramp-edge-walls are built of alternating blocks of concrete and rock-filled open rectangles of metal pilings, with a solid concrete facing along the ramp (Photos 7 and 8). The metal piling rectangles and the concrete blocks measure about 1 ft by 1 ft 6 in.

On either side of the seaward end of the ramp, the ramp sidewalls join seawalls. The seawalls are made of concrete and interlocking metal pilings that face the backfilled area, which forms the level parking area around the ramp. This seawall is 2 ft wide, and at the point where it joins the ramp sidewall, it is 1 ft 8 in taller than the sidewall. On the east side of the ramp the seawall extends about 80 ft. On the west side of the ramp the seawall extends about 77 ft. The seawall, which may be newer construction than the rest of the backfilled area, is stepped along its length. Its western and eastern portions are about 1 ft 8 in taller than the sections that join the ramp sidewall. At its eastern and western ends, the seawall is about 6 ft tall. The seawall appears in good condition.

East and west of the seawall, eroded areas are exposed and they provide information about the techniques used to construct the backfilled area. Visible along the shoreline at the east end of the eastern seawall are the remains of five concrete-filled metal boxes (probably the WWII "Magic Boxes" described by Denfeld [2005]) linked together by a steel beam to form the seaward edge of the backfilled area (Photos 9 and 10). The boxes are now badly corroded, each measures about 7 ft long (north/south), 5 ft wide (east/west), and is at least 4 ft deep (the bases are buried in sand and rocks). A space of eight inches separates each box from the next. Small rocks fill the spaces between the boxes.

Another eroded area occurs along the shoreline at the western end of the west seawall and the remains of other concrete-filled metal boxes can be seen in the water in this area (Photo 11). Inland of this alignment there is a metal bollard set into a concrete base. The concrete slab measures 10 ft long (north/south) by 9 ft 11 in (east/west) and its upper

surface is 1 ft 9 in above the surrounding ground surface. The metal base for the bollard measures 3 ft 3 in (east/west) by 3 ft 2 in (north/south), and is 2 inches thick. The bollard is 2 ft 3 in tall and has a diameter at the top of 1 ft 6 in and a diameter at the base of 1 ft 3 in. The bollard shaft has two horizontal "ears", each is 6 inches long (Photo 12). Sometimes vessels tying up at G Wharf secure their lines on this bollard. It may have been added to the Sea Plane Ramp about 1960 when G Wharf was built.

The concrete foundation on the east side of the Sea Plane Ramp area measures 20 ft 9 in long (north/south) by 14 ft 2 in wide (east/west) (Photo 13). The walls are 6 in thick and 1ft 10 in tall. At regular intervals along the tops of the walls, rusty metal bolts are visible. These would have served to secure a metal super-structure to the foundation. The space enclosed by the walls is hard surfaced (not smoothed concrete). There is an opening in the wall of each narrow end. The north opening is 10 ft 9 in wide. The south opening is 10 ft 8 in wide. A concrete pad runs the entire length of the south end. It is 4 ft wide and about 5 in thick. The southern end of the structure is about 86 ft north of the harbor edge of the backfilled area.

A small concrete slab is located on the surface of the backfilled area about 22 ft east of the top of the ramp. This slab measures 7 ft 10 in long (east/west) by 7 ft 5 in wide (north/south), and is 7 in thick

A wooden post cluster, forming a rectangle in plan, is located near the southeast corner of the filled area. The cluster is made up of nine posts arranged in three rows of three (Photo 14). The diameter of a single post is about 11 inches and the arrangement measures about 3 ft 2 in by 3 ft 8 in. The tallest post measures 4 ft 10 in. Possibly this configuration once supported a light or other signaling device.

A row of three metal posts is located in the water off the southern edge of the filled area (Photo 15). An unidentified metal framework is located in the water on the east side of the filled area (Photo 16).

The Sea Plane Ramp and the filled area exhibit structural integrity and are in fair condition. However, unless the eroded areas are repaired, they will continue to deteriorate during the storms that frequently hit Apra Harbor, and the ramp and seawalls eventually will be destroyed. The metal box remains situated along the harbor edge of the backfilled area are in poor condition, and it is not likely that they can be preserved. They suggest that the Sea Plane Ramp area was built either in 1944-45 (during WWII) or during the 1945-47 post-war construction, since utilization of the metal box building technique was not invented until WWII and would not have been utilized on Guam before 1944 (Denfeld 2005). If it is not possible to preserve the ramp and its immediate area, then perhaps a sign could be erected at the site to mark its place in Guam's history.

There is a strip of shoreline between the Sea Plane Ramp and G Wharf, the next wharf west of the ramp. This area will be filled. There are no significant cultural resources along this shoreline.

5.3 G Wharf

G Wharf (Figure 7.B) is the next wharf west of the Sea Plane Ramp (Photo 11). It is currently used as a docking facility and fuel lines run the length of its pier. It appears to be in good condition and it was probably built or re-built in the 1960s when it began to be used to store cement (Tudor Engineering Co., 1964). It appears to have incorporated the middle ("B") of the three quays built along the breakwater in the 1940s. Although it has been modified with concrete buttresses, a new pier, and a circular concrete pad with a diameter of 121 ft, remnants of the concrete-filled metal box construction technique used during WWII, remain at the harbor's edge (Photo 17). Two bollards remain in place along the shoreline, one at the southeast corner and another at the southwest corner. The distance between the two old bollards is 300 ft. The old bollard alignment is about 300 ft south of the road along the south side of the breakwater.

The steel base of the bollard at the southwest corner is one-inch thick and it measures 3 ft 8 in (east/west) by 3 ft 1 in (north/south) (Photo 18). The base is mounted on a concrete-filled steel box. The cylindrical, steel-clad concrete bollard is 3 ft 11 in tall and has a top diameter of 1 ft 1 in. Photo 19 shows a view of the G Wharf shoreline taken from this bollard.

Photo 20 shows the shoreline between G Wharf and Outhouse Beach. No cultural resources occur along this shoreline.

5.4 Outhouse Beach

It is likely that the area now known as Outhouse Beach (there is an outhouse there) marks the remains of "A" quay and it was built at the end of WWII (1944-45) or during the 1945-47 construction of the Glass Breakwater (Figure 7.A). In this presently undeveloped area, much of the shoreline has eroded (Photo 21). Two bollards stand at the eastern end of this area and one remains on a block in the water at the western end. The distance between these two bollards in the water is about 344 ft. The distance from them to the road along the south side of the breakwater is about 85 ft. Visible in the water between the two bollards is a row of corroded metal pieces, possibly remnants of the boxes that once formed the harbor edge of this quay.

At the east end, the cylindrical bollard on the concrete-covered block in the water is 2 ft 10 in tall and it has a top diameter of 1ft 2 in (Photo 22). A date of 9/29/2000, written in the concrete surface of this block, suggests that concrete was poured on the block in recent years, perhaps in an effort to repair it for use as a stable fishing spot. Originally this block was probably a "Magic Box", remnants of metal are visible on its northern and western faces.

The second eastern bollard, located toward the breakwater from the first, sits on a concrete slab (10 ft square and 1 ft tall) on made land (Photo 23). The words "CHICKEN LEG" were seen written in a newer patch of concrete in this area. The bollard's square

metal base with rounded corners measures 3 ft 2 in and is 1 ½ in thick. The bollard is 2 ft 2 in tall. Its top diameter is 1 ft 5 ½ in and its base diameter is 1 ft 2 in. This bollard has two horizontal "ears" that stick out on opposite sides of its main shaft, 1 ft. 2 in above its base. Each ear is 9 in long. It is likely that this bollard and its concrete base was added after "A" quay was first built.

The height of the southwestern bollard is 3 ft and it has a diameter of 1 ft 1 in. It is mounted on a slightly tilted concrete block that measures about 7 ft 2 in by 5 ft 6 in and 3 ft 7 in tall. Presently, snorkelers and scuba divers utilize the west end of the Outhouse Beach area near the southwestern bollard (Photo 24).

If the two old bollards and the alignment of metal remnants at Outhouse Beach mark the harbor edge of the former "A" quay built in the 1940s, the feature is in poor condition and has lost much of its integrity.

5.5 H (Hotel) Wharf

H Wharf was used as an ammunition wharf during the Vietnam War. It appears on a map dated 1955 (Figure 8), although it may have been renovated since it was first built, perhaps in the 1950s. The wharf appears to be in fairly good condition; on its eastern side there is an abandoned sentry post. Abandoned metal buildings, abandoned boats and equipment occur on its breakwater side where some large nets used by commercial fishing boats are currently stored. The harbor side of the wharf is being used as a docking facility; the concrete wall along the wharf's edge is about 400 ft long.

The concrete sentry post (Photo 25) is in poor condition. It has four walls and a concrete roof that extends over its footprint. The structure is about 4 ft 8 in square and 7 ft 5 in tall. There is a door on its western side and a small window on each of the other three walls. The door is 2 ft 5 in wide and 7 ft tall. The windows measure about 2 ft square. A metal electrical box is mounted on the exterior surface of the south wall.

Three paired sets of bollards occur near the center of the inland length of H Wharf, other sets of bollards and cleats occur along its harbor edge, and two sets of bollards occur along its east side.

Each inland bollard is set in a base that measures about 3 ft 3 in square, and its metal post has a diameter of 1 ft 2 in at the base and 1 ft 10 in at the top and it is 3 ft 9 in tall. The distance between the center posts is about 12 ft (Photo 26).

The harbor edge bollards are shorter. Two posts are in a single base that measures 4 ft 9 in long by 1 ft 10 in wide (Photo 27). The diameter of each post measures about 1 ft 2 in at the base and it widens to 1 ft 8 in at the top. The posts are about 1 ft 6 in tall and the distance between their centers is about 3 ft.

Metal cleats occur at intervals along the harbor edge of the wharf (Photo 28). Each cleat is about 2 ft 8 in long, 7 in wide, and 10 in tall, and is set into a base that is 1 ft 10 in long.

Also at intervals along the edge of the wharf are concrete utility boxes that once had water lines and spigots to supply fresh water to the ships docked there (Photo 28). One of these boxes measures about 6 ft 4 in long by 4 ft 3 in wide. The end walls of this box are 8 in thick and the sidewalls are 5 in thick. The tops of the box walls are 10 in above the level surface of the wharf.

The two pairs of red bollards on the east side of the wharf are 3 ft 5 in tall and have a top diameter of 2 ft. Each post has one horizontal "ear" which projects from the shaft for a distance of 5 in. The distance between the centers of the pair of posts is 5 ft 3 in. These bollards are the only ones with markings, the letters "CS" appear on each post above the ear.

6.0 SIGNIFICANCE ASSESSMENTS AND RECOMMENDATIONS

The survey 1) documented the remains of the three quays that had been built during 1944-47 along the harbor side of the breakwater, 2) noted G Wharf (built about 1960), and 3) described H Wharf (built by 1955). All but G Wharf appear to be 50 years old, or older, which is old enough to consider them eligible for nomination to the National Register of Historic Places. With the exception of G Wharf, the wharves could be considered significant under Criterion (a), which states that they must be associated with events that have made a significant contribution to the broad patterns of our history. In the application of Criterion (a), the Sea Plane Ramp (C), the early portion of G Wharf (B), and Outhouse Beach (A) may qualify because of their possible association with WWII. H Wharf may qualify because of its association with the Vietnam Conflict.

The three quays could also be considered significant under Criterion (c) which states that the properties must embody the distinctive characteristics of a method of construction. The WWII "Magic Box" construction technique that apparently was used to build portions of these three features may be considered a unique characteristic. However, considering their present condition and their history of remodeling and modifications, they may not be significant under National Register Criteria. Guam's HRD should be consulted to determine if they concur with the non-significant assessment. If they do, the documentation included herein may be considered adequate to mitigate the loss of these features from the archaeological record, if preservation is not feasible.

Alternatively, the quays could be considered as features of the Glass Breakwater and, as such, they could be included along with the breakwater in a nomination to the National Register. Previously, Lauter-Reinman (1998) suggested that the Glass Breakwater was eligible for listing on the National Register, but the nomination forms have yet to be completed. If the three quays are nominated along with the breakwater, additional archival research may locate photographs, engineer's drawings, and more detailed descriptions of the "Magic Box" quay construction.

H Wharf is in better condition than the three older quays, but there is little on its surface to remind us of its role in the transportation of ammunition from military ships at anchor in the harbor to the appropriate magazines on Guam's military bases during the Vietnam Conflict. Guam's HRD should be consulted to determine if they concur. If they do, the documentation included herein may be considered adequate to mitigate its loss from the archaeological record in the event that its preservation is not feasible. If not, more archival and/or oral history could be pursued.

As a mitigation measure, the roles these four features played in supporting U.S. participation in WWII and subsequent military activities within the Asian region could be described in one or more plaque(s) placed in the new wharf area, perhaps near the Sea Plane Ramp and/or on H Wharf.

The proposed dredging for the port expansion could damage some of the underwater cultural resources, including the significant wrecks documented by the Carrell (1991) report, and other yet-to-be-identified remains. The wrecks in the former MYC area are not old enough to be eligible for listing on the National Register.

No underwater investigations were undertaken during this project. We recommend that once the area to be dredged has been defined, but before construction begins, an underwater archaeological survey be completed to insure that all cultural resources in the underwater portion of the project area have been located and evaluated for historical significance. In the event that significant underwater cultural resources cannot be avoided during the dredging, then their loss to the archaeological record should be adequately mitigated in compliance with an approved mitigation program, according to Section 106 protocols.

At least one area of unexploded ordnance was previously located in the water southwest of H Wharf (Figure 9) and the proposed dredging is likely to encounter other occurrences as well. It is recommend that an UXO specialist be present to monitor the handling and disposal of these materials.

The dredging is likely to expose cultural material from Guam's entire historic past, not only equipment and ammunition dating to WWII. Perhaps as the dredged material is dumped, an archaeologist could examine it to determine if significant artifactual remains have been retrieved. These could include Spanish Period canons, canon balls, and other items and equipment. Prehistoric materials may also be found. However, for an examination of dredged material to be effective, an observation technique needs to be designed to overcome the tendency for submerged items to be covered with silt and sand and thus not easily recognized.

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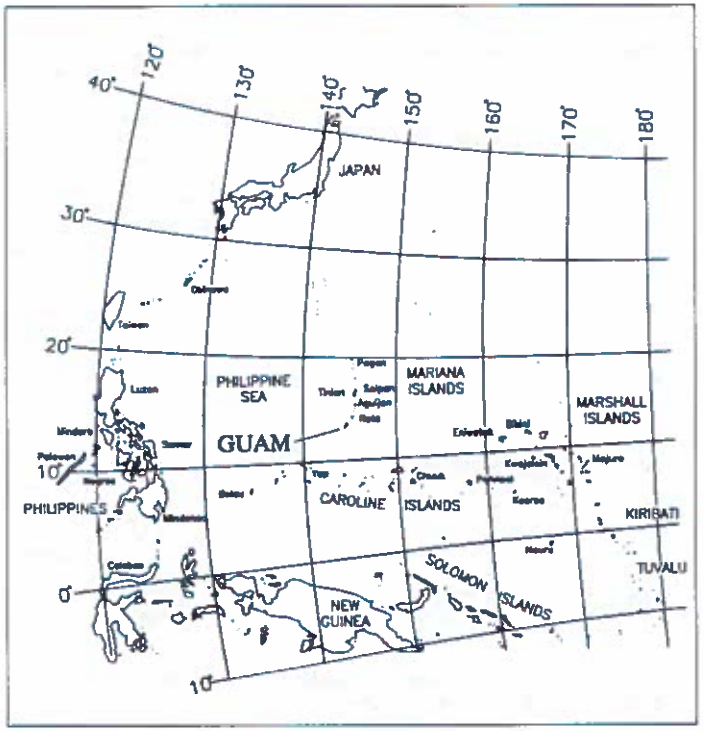


Figure 1. Map of the western Pacific showing the location of Guam.

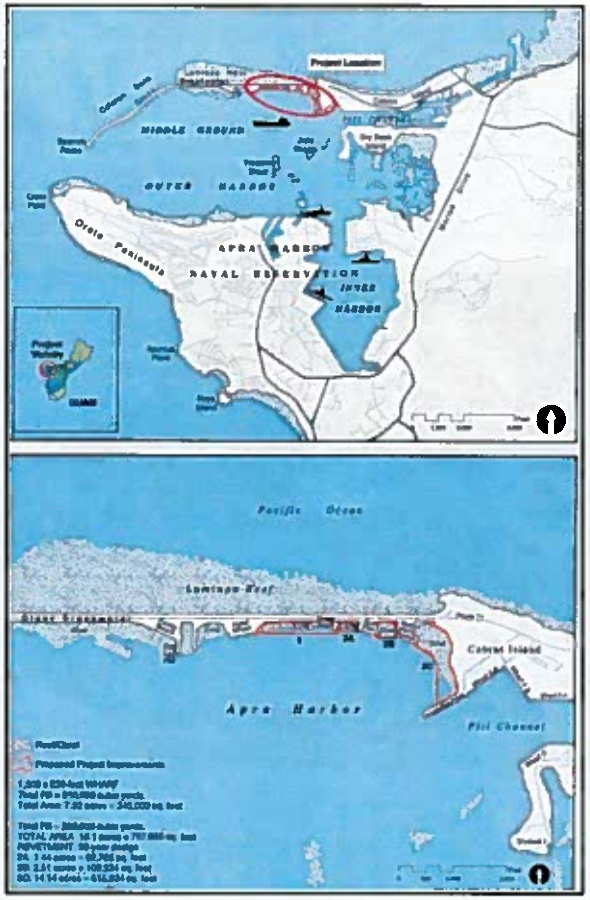


Figure 2. The Proposed Wharf Improvements and Land Reclamation project in Apra Harbor (provided by the Port Authority of Guam and the Army Corps of Engineers).

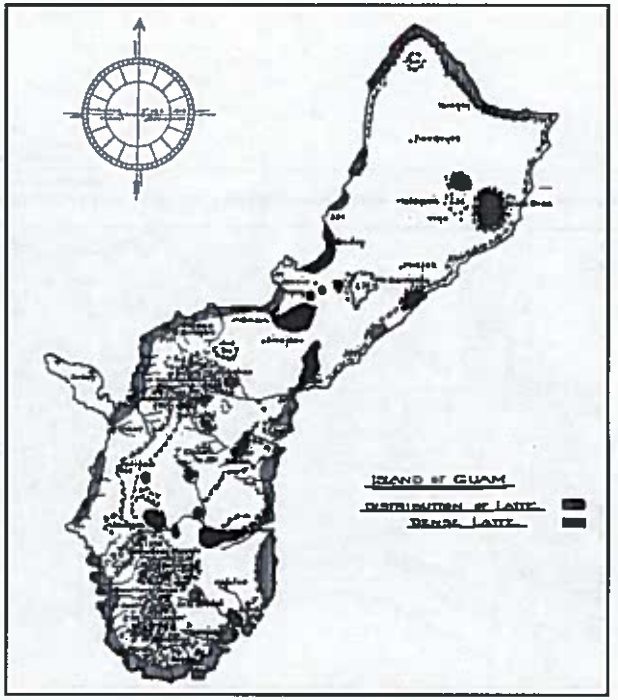


Figure 3. Hornbostel's (n.d.) map of Guam showing the distribution of latte and dense latte (taken from Reed 1952).

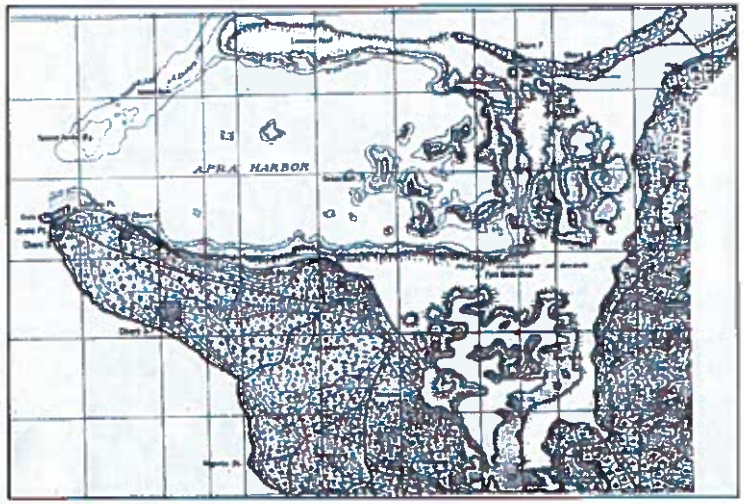


Figure 4. Section of a map of Guam showing Apra Harbor in 1913-14 (after Sturdevant 1914).

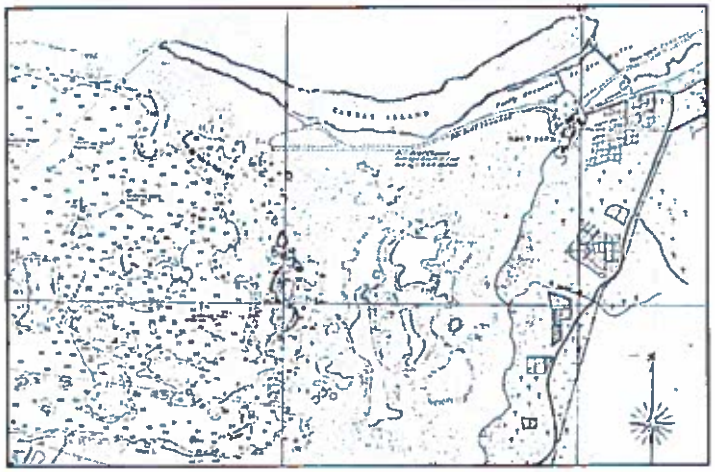


Figure 5. Map of Cabras Island showing the Pits Channel and the wharf in June 1941, prior to the pre-war construction of the breakwater (MARC vertical file).

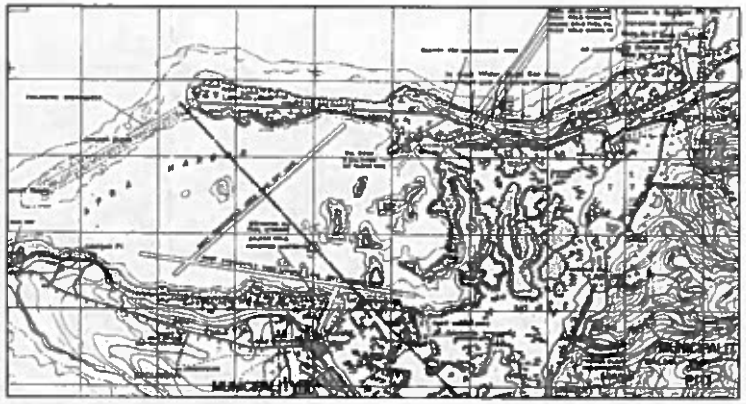


Figure 6. Section of a Marine Corps Map of Guam, with corrections made to 1942, showing the Cabras Island side of Apra Harbor. Note the completed breakwater, the fuel storage tanks, the Piti channel and the Oil Dock. The Oil Dock is located west of the pre-war wharf on Cabras Island.

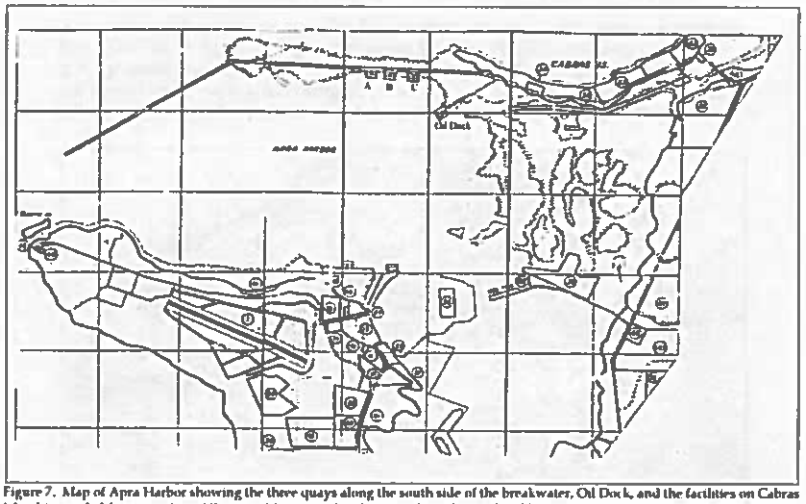


Figure 7. Map of Apra Harbor showing the three quays along the south side of the breakwater, Oil Dock, and the facilities on Cabras Island (compiled from two Area Allocation Maps; one dated 1944 and another undated but post 1944). The Cabras Island facilities include a fleet post office (34), 5th NCB quarry (58), 16th NCB (special) Camp (63), and 76th NCB boat pool (75).

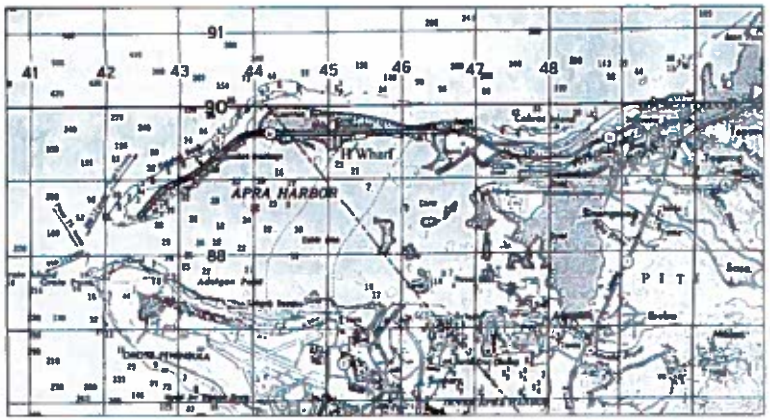


Figure 8. Map of Apra Harbor in 1955 showing the facilities on the south side of the Glass Breakwater, including H Wharf (Army Map Service 1955).

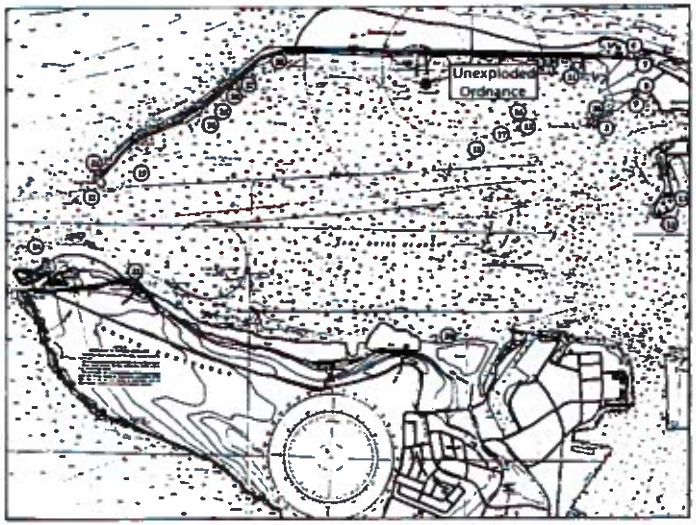


Figure 9. Map of Apra Harbor showing the location of underwater cultural resources in the vicinity of the project area (adapted from Lauter-Reinman 1998:Management Map 23). The numbers in the project area are: 5=*Nichuyu Maru*, 6=Marianas Yacht Club (MYC) private yacht *Wusper*, 7=MYC private yacht, 8=MYC private yacht *Explorer*, 9=MYC private fishing boat, 10=MYC private yacht *Ondine*, 11=tug. While the numbers 15-18 are outside the immediate project area they may be vulnerable to ships and equipment accessing the project area. They are 15=*SMS Cormoran*, 16=*Tokai Maru*, 17=Japanese tug, 18=*Kitsugawa Maru* (information taken from Table 3 [Craib and Yoklavich 1996:43]). An occurrence of unexploded ordnance is shown in the water south of Dog Leg Pier (outside the project area).

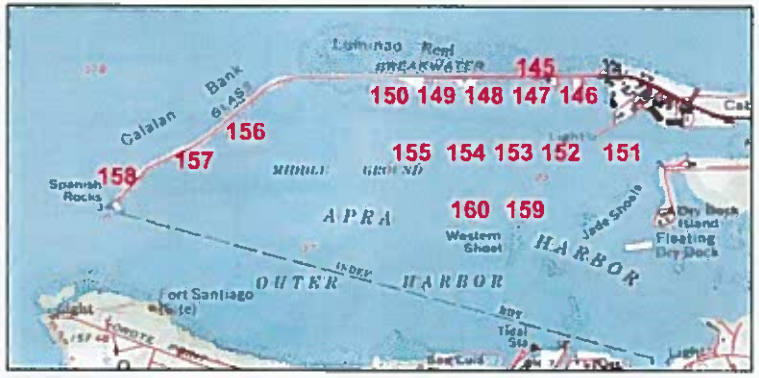


Figure 10. Map of Apra Harbor showing the location of features on the Glass Breakwater and the submerged cultural resources south of the Breakwater (taken from Lotz and Lotz 2001:51). 145 = the Glass Breakwater, 146 = the Sea Plane Ramp (G Wharf is not numbered on this figure but it is located between 146 and 147) , 147 = Outhouse Beach, 148 = H Wharf, 149 = Dog Leg Pier, 150 = Family Beach, 151 = *Nichiyu Maru*, 152 = *Tokai Maru*, 153 = *S.M.S. Cormoran*, 154 = Japanese Tugboat, 155 = *Kitsugawa Maru*, 156 = the *Val*, 157 = American Tanker and sunken barges, 158 = *Scotia*, 159 = Western Shoals, 160 = Hourglass Reef.



Photo 1. View of the shoreline between Oil Dock, on the right, and the former Marianas Yacht Club (MYC), on the left. The camera is facing east.



Photo 2. View of the shoreline between the former MYC area, on the right, and the Sea Plane Ramp, on the left. The Glass Breakwater is in the background. The camera is facing northeast.



Photo 3. Sign marking the entrance to the Sea Plane Ramp. The sign is at the southern edge of the road that runs along the south side of the Glass Breakwater. The camera is facing northwest.



Photo 4. View of the Sea Plane Ramp (with abandoned battery). The camera is facing southwest.



Photo 5. View of the exposed rebar framework on the underwater section of the ramp. The camera is facing south.



Photo 6. View of the Sea Plane Ramp being used to launch small watercraft. The camera is facing west. G Wharf is in the background.



Photo 7. Close-up view of the east sidewall of the Sea Plane Ramp showing construction details. The camera is facing south.



Photo 8. Close-up view of the underwater section of the west sidewall of the Sea Plane Ramp. The camera is facing south.



Photo 9. View of four of the concrete-filled steel boxes ("Magic Boxes") at the harbor's edge east of the Sea Plan Ramp. The camera is facing west.



Photo 10. Close-up view of one concrete-filled steel box on the east side of the Sea Plane Ramp. The camera is facing south.



Photo 11. View showing the eroded area on the west side of the Sea Plane Ramp. Note the fisherman fishing off the concrete-filled steel box that marks the southwest corner of the area. Lines from a vessel moored at G Wharf are secured around a bollard mounted on a concrete slab located on the breakwater side of the fisherman. The camera is facing west.



Photo 12. A close-up view of the bollard situated at the southwest corner of the Sea Plane Ramp. This bollard and concrete may have been added to the area when G Wharf was built in 1960. The camera is facing south.



Photo 13. View of the concrete foundation situated on the east side of the Sea Plane Ramp area showing the west side of the entrance at the south end of the structure. The camera is facing north.



Photo 14. Cluster of wooden posts near the southeast corner of the Sea Plane Ramp area. Note the concrete-filled metal boxes in the background. The camera is facing southwest.



Photo 15. View of three metal posts in the water south of the concrete seawall west of the ramp. The camera is facing south.



Photo 16. Unidentified metal frame in the water on the east side of the Sea Plane Ramp area.

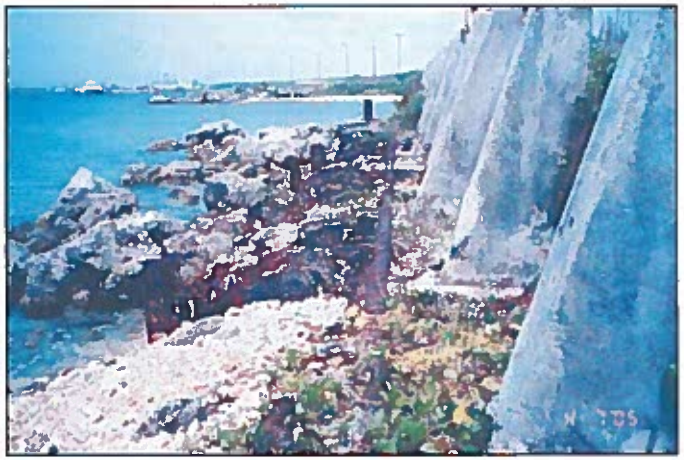


Photo 17. View of the shoreline on the west side of G Wharf showing the remains of concrete-filled steel boxes on the harbor side of the more recent concrete buttresses. The camera is facing west.



Photo 18. The bollard in place on the concrete-filled box at the southwest end of G Wharf. The camera is facing west.

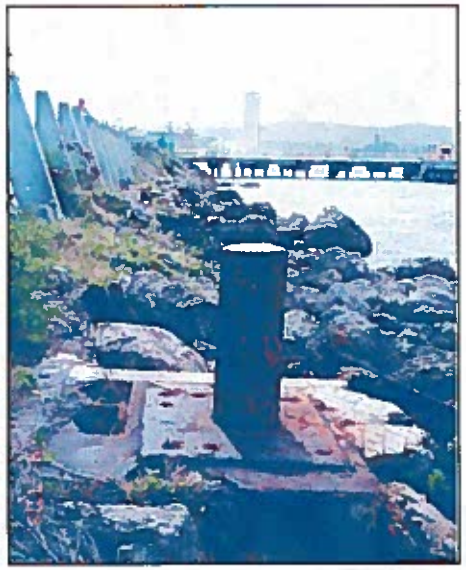


Photo 19. The shoreline of G Wharf taken from the southwest corner of the area. The camera is facing east. The G Wharf pier is in the background.



Photo 20. View of the shoreline between G Wharf and Outhouse Beach. The camera is facing west. H. Wharf is in the background.



Photo 21. View of the shoreline along the area known as Outhouse Beach. Note the alignment of metal objects in the water; these may be remnants of the concrete-filled steel boxes that once edged the harbor side of this old quay. The camera is facing west. H Wharf is in the background.



Photo 22. View to the west from the old bollard situated at the southeast corner of the area known as outhouse Beach. The camera is facing west. Note the alignment of metal remnants in the water and another bollard at the far end. H Wharf is in the background.

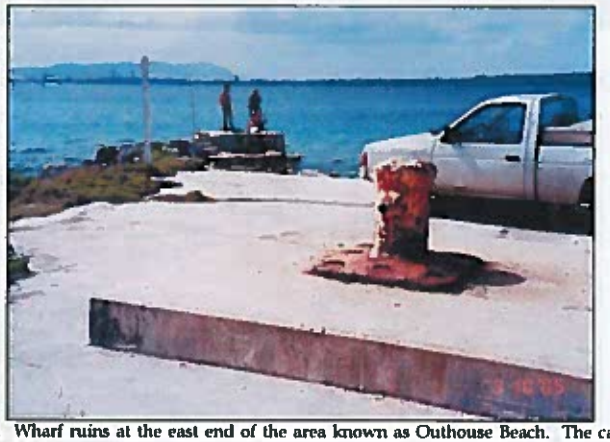


Photo 23. Wharf ruins at the east end of the area known as Outhouse Beach. The camera is facing southeast.

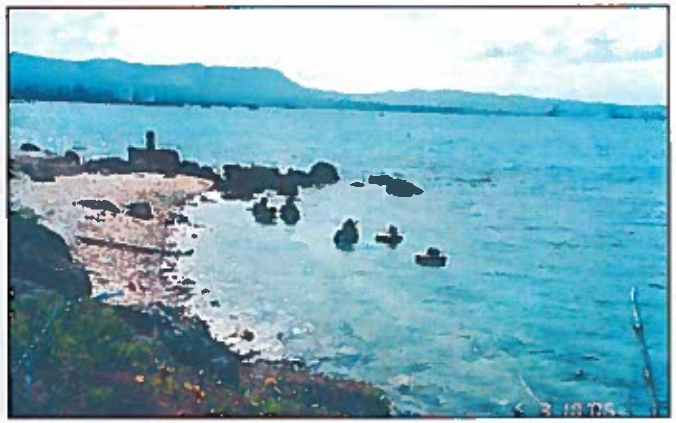


Photo 24. The west end of the Outhouse Beach area. Note the divers entering the water in the foreground and the bollard on a concrete-filled box in the background.



Photo 25. View of the abandoned sentry post on H Wharf. The camera is facing northeast.



Photo 26. View of a pair of bollards on H Wharf. Note another pair in the background. The camera is facing west.



Photo 27. View of the harbor edge of H Wharf showing a pair of bollards next to a raised concrete curb and one of the concrete boxes between curb sections. The camera is facing west.



Photo 28. Close-up of the harbor edge of H Wharf showing one of the metal cleats used to secure mooring lines.

APPENDIX D

National Historic Preservation Act Section 106 Consultation Findings

APPENDIX E

Coastal Zone Management Act Consistency Review

GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT

DATE OF APPLICATION _____

NAME OF APPLICANT _____

ADDRESS _____

TELEPHONE NO _____

Fax No _____

E-Mail Address _____

TITLE OF PROPOSED PROJECT Apra Harbor Deep-Draft Wharf Improvements and Fill Project

COMPLETE FOLLOWING PAGES

FOR BUREAU OF STATISTICS AND PLANS ONLY:

DATE APPLICATION RECEIVED

OCRM NOTIFIED _____ LIC AGENCY NOTIFIED _____

APPLICANT NOTIFIED _____ PUBLIC NOTICE GIVEN _____

OTHER AGENCY REVIEW REQUESTED _____

_____

_____

DETERMINATION: **( ) CONSISTENT** **( ) NON-CONSISTENT** **( ) FURTHER INFORMATION REQUESTED**

OCRM NOTIFIED _____ LIC AGENCY NOTIFIED _____

APPLICANT NOTIFIED _____

ACTION LOG 1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

DATE REVIEW COMPLETED:

Working Draft (Application Not Submitted)

GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT

Project Description

The Proposed Project (Project) would involve the construction of a deep-draft wharf in Apra Harbor, consisting of a concrete deck with a piled foundation. This concept utilizes individual piles driven in a grid across the site to support the concrete deck. As proposed, the wharf would be approximately 1,512 feet in length and 215 feet in width providing an overall wharf deck area of approximately 325,080 square feet. These dimensions include a 113-foot wide concrete deck on pre-cast concrete piles and 102 feet of backlands on fill. The proposed wharf facility would also include roadway and utility improvements including potable water, sanitary sewer, and electrical services.

Dredging of the seabed along the wharf face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required navigational depth of 55 feet below mean sea level (MSL).

In addition to construction of a deep-draft wharf, the Project involves the reclamation of three sites (Sites 1, 2 and 3) with containment dikes to the east of the proposed deep-draft wharf. At the present time, the Port Authority of Guam (PAG) does not have specific development plans for the three reclamation sites. However, it is the intent that the reclamation sites remain open for eventual use as additional operating backland and container yard space in support of the proposed adjacent deep-draft wharf facility.

Background

Apra Harbor is located on the central western side of Guam and is home to the only deep-draft commercial and military ports on the island. Apra Harbor is one of the largest protected harbors in the Pacific. Apra Harbor is an improved, natural deepwater lagoon protected by Orote Peninsula on the south and Cabras Island on the north. The harbor entrance is located at the west side of the lagoon. The Orote Peninsula, which projects 3.5 miles west-northwestward from Guam's west coast, forms the harbor's southern boundary. The harbor's northern side is formed by a 15,000-foot-long breakwater which is partially man-made. The man-made portion of the breakwater lies west of Cabras Island and [illegible] the Glass Breakwater.

The harbor is further divided into Outer Apra Harbor, Inner Apra Harbor and the Commercial Port. Outer Apra Harbor measures approximately 3 miles long (east to west) by 1.5 miles wide (north to south) and is used primarily for the mooring of both commercial and U.S. Navy vessels. Inner Apra Harbor is located at the southeast portion of the lagoon and measures approximately 1 mile long (east to west) by 1.5 miles wide (north to south). Inner Apra Harbor is used exclusively by the U.S. Navy. The Apra Commercial Port is located on Cabras Island, along with other private industrial operators, at the northeast end of Outer Apra Harbor.

The Commercial Port serves as a transshipment point for the Western Pacific region, and is equipped to handle containerized, breakbulk, fish, as well as passenger traffic. The port provides direct service to Hawaii, U.S. mainland, Asia, and Micronesia. For all practical purposes, Apra Harbor is the commercial hub of the island of Guam.

The principal objective of the proposed modifications is to provide infrastructure improvements to the Commercial Port at Apra Harbor. Commercial shipping is the primary means of supplying materials to the island of Guam and underlies the importance of improving the current infrastructure at the island's only commercial port.

The primary purpose of the Project is to provide a deep-draft wharf facility and operational backlands in Apra Harbor that would allow for the berthing of Post-Panamax cargo vessels and Nimitz-Class aircraft carriers. Post-Panamax vessels are large container cargo ships that require a draft depth of 55 feet. At present, Apra Harbor is unable to accommodate Post-Panamax vessels due to navigation and landside facility limitations. In addition, the proposed wharf facility would be able to service deep-draft cruise ships, U.S. Navy aircraft carriers, and other large naval vessels on a contingency basis.

In addition to providing Apra Harbor with new facilities to accommodate today's largest cargo vessels, the Project would ultimately provide additional wharf space and operational backlands to reduce vessel congestion, increase efficiency of cargo distribution at the commercial port, and increase Port revenues.

Proposed Construction

There are three major elements that comprise the proposed improvements. The major project elements are as follows:

(1) The construction of a deep-draft wharf approximately 1,500 feet x 215 feet in dimension to the east of Hotel Wharf. The improvements would include construction of a pier on piles, deposition of

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approximately 83,525 cubic yards of fill material over approximately 7.5 acres, and construction and installation of mechanized cargo container handling equipment.

(2) Placement of approximately 285,762 cubic yards of fill material over approximately 17 acres of submerged lands in three reclamation sites along the east end of the Glass Breakwater. Improvements also would include construction of rock revetments and the eventual development of operational backland facilities, and

(3) Dredging of submerged lands to a depth of 55 feet in the waters adjacent to the proposed 1,500 foot deep-draft wharf face to meet the navigational requirements of deep draft commercial and military vessels.

The cost for constructing the deep-draft wharf facility is estimated at approximately $36,800,571. Construction costs for the filling of submerged lands are estimated at approximately $30,742,116. The total overall project cost is estimated at approximately $67,542,687 (PAG, 2005).

Specific start dates for construction have not yet been determined due to present funding uncertainties. However, for the purposes of the Environmental Impact Statement (EIS) and to maintain some consistency with other Guam planning documents, the projected buildout year for the Project was set at year 2025. It is anticipated that construction would likely be phased and take approximately two to four years to complete. Therefore, the projected construction period for the Project would be between the years 2021 – 2025.

The Project may be inconsistent with a number of GuamCoastal Zone Management Program policies to varying degrees (ES-5). However, it is anticipated that through compliance with future environmental permitting requirements, implementation of appropriate mitigation measures, and continued consultation with the Guam Coastal Management Program (GCMP), potential adverse impacts to Guam's coastal zone resulting from the Project would be reduced and/or eliminated. Consequently, a determination of consistency (to the maximum extent practicable) of the Project with the GCMP objectives and policies is expected. (p. 44)

DEVELOPMENT POLICIES (DP):

DP1. Shore Area Development

Intent	To insure environmental and aesthetic compatibility of shore area land uses.
Policy	Only those uses shall be located within the Seashore Reserve which - enhance, are compatible with or do not significantly detract from the surrounding coastal area's aesthetic and environmental qualities, such as beach access facility, or - can demonstrate dependence on shoreline location and the lack of feasible alternative sites.
Discussion	The Project is consistent with DP1, Shore Area Development.

Apra Harbor is Guam's only deep-draft commercial port. As such, it is the logical and most appropriate location for the Project. The necessary uses and facilities to support port operations are already in place at Apra Harbor. Apra Harbor accommodates military and commercial vessels, including containerized, breakbulk, ro-ro, recreational and passenger ships. The northeast portion of Apra Harbor accommodates various private industrial operations, which includes among others, a power plant, petroleum handling facilities and tank farms. Construction of the deep-draft wharf, associated infrastructure improvements, and land reclamation to accommodate future operating backland and container yard space is consistent with the light industrial and maritime-based operations at the Apra Harbor Commercial Port. The Project is entirely compatible with the surrounding coastal area's aesthetic and environmental quality and would not promote long-term land use incompatibilities.

DP2. Urban Development

Intent	To cluster building spaces such that coherent community design, function, infrastructure support and environmental compatibility are assured.
Policy	Commercial, multi-family, industrial and resort-hotel zone uses and uses requiring high levels of public facilities shall be concentrated within appropriate zone as outlined on the Guam Zoning Code.

Discussion	Not Applicable.

DP3. Rural Development

Intent	To provide a development pattern compatible with environmental and infrastructure support suitability and which can permit traditional lifestyle patterns to continue to the extent practicable.
Policy	Rural districts shall be designated in which only low density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure including functional sewering is provided.
Discussion	Not Applicable.

DP4. Major Facility Siting

Intent	To include the national interest in analyzing the siting proposals for major utilities, fuel and transport facilities.
Policy	In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, Guam shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.
Discussion	The Project is consistent with DP4, Major Facility Siting.

Commercial shipping is the primary means of supplying materials to the island of Guam and underlies the importance of improving the current infrastructure at the island's only commercial port at Apra Harbor, Guam's only deep-draft harbor. Current wharf conditions preclude the ability to accommodate modern deeper draft vessels and engineering studies have determined that existing cargo piers cannot be dredged further without compromising their structural integrity. In addition, the Project is necessary to ease the existing congested conditions and meet the increased demand for docking space. Expansion and modernization of the commercial port facilities to accommodate future demand and modern deep-draft vessels is vital to Guam's economic interests. The commercial shipping industry links Guam to destinations in Asia and the U.S. mainland, and is of paramount importance not only to Guam's economy, but to its day-to-day life.

The Project is consistent with and furthers the goals and objectives of Guam's comprehensive development plans and policies. The Project has been identified in the Guam Comprehensive Economic Development Strategy as a High Priority project. It also is listed as a high priority in the Administration's policy plan "Ten Strategic Initiatives to Stabilize and Grow Guam's Economy" (1.4.3).

DP 5. Hazardous Areas

Intent	Development in hazardous areas shall be governed by the degree of hazard and the land use regulations.
Policy	Identified hazardous lands, including flood plains, erosion-prone areas, air installations' crash and sound zones and earthquake fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety or welfare of the people of Guam, and complies with land use regulations.
Discussion	Not Applicable.

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DP 6. Housing

Intent	To promote efficient community design placed where the resources can support it
Policy	The government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and manmade hazards, and recognize the limitations of the island's resources to support historical patterns of residential development
Discussion	Not Applicable

DP 7. Transportation

Intent	To provide transportation systems while protecting potentially impacted resources
Policy	Guam shall develop an efficient and safe transportation system, while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, coral reefs and other coastal resources
Discussion	Not Applicable

DP 8. Erosion and Siltation

Intent	To control development where erosion and siltation damage is likely to occur
Policy	Development shall be limited in areas of 15% or greater slope by requiring strict compliance with erosion, sedimentation, and land use regulations, as well as other related land use principles for such areas
Discussion	Not Applicable

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RESOURCES POLICIES (RP):

RP1. Air Quality

Intent	To control activities to ensure good air quality
Policy	All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality
Discussion	The Project is consistent with RP1 Air Quality

Impacts to air quality primarily would be short-term and limited to the construction phase. Long-term impacts to air quality is expected to be negligible

The principal source of short-term air quality impacts would be associated with the Project's construction activities. Construction activities would impact air quality by generating fugitive dust as well as gaseous and particulate emissions from various fossil fuel-fired equipment, such as dredges, trucks, loaders, pavers, etc. In addition to the onsite impacts attributable to construction activity, there also will be offsite impacts due to the operation of concrete and asphalt batching plants needed for the construction of new piers, buildings, sidewalks and roadways. Such plants routinely emit particulate matter and other gaseous pollutants. The batch plants that would produce this concrete and asphalt are all permitted by the Guam Environmental Protection Agency (GEPA), in accordance with the Guam Air Pollution Control Standards and Regulations. In order to obtain their operating permits, plants must demonstrate their ability to comply with emission and ambient air quality standards. Typical concrete and asphalt batch plants on Guam are outfitted with "baghouses" to allow for particulate matter. These controls have a normal efficiency of 95 to 99 percent.

During the construction period, fugitive dust control measures will be implemented to reduce the amount of particulate matter emissions. Such measures may include erecting dust screens around construction sites, dust suppression, and wind speed reduction.

In the long-term, increased traffic volumes in the vicinity of the project areas would contribute minimally to ambient carbon monoxide concentration levels. Mobile emissions analyses indicate the overall trends in carbon monoxide levels at the project sites are expected to be insignificant mainly due to 1) the relatively small increase in projected traffic, 2) attrition over time of older higher polluting vehicles, and 3) federal emission control programs mandating cleaner emissions from newer vehicles (PCR, 2006).

Refer to Section 3.8.4 and 3.8.5 of the EIS for a full discussion of potential air quality impacts and proposed mitigation measures.

RP2. Water Quality

Intent	To control activities that may degrade Guam's drinking, recreational, and ecologically sensitive waters
Policy	Safe drinking water shall be assured and public recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuaries, reef and aquifer areas
Discussion	The Project is partially consistent with RP2. Water Quality

The Project will have no impact on drinking water and ecologically sensitive waters. The principal source of drinking water for the civilian population of Guam is the "Northern Guam Lens," a groundwater aquifer located in northern Guam. The aquifer is far enough away to preclude any potential impacts resulting from the Project.

The Project, however, is expected to have some adverse impact on the quality of Apra Harbor's recreational waters. Impacts include both short-term, construction-related and dredging impacts, and long-term operational impacts. Short-term impacts can be mitigated to such an extent as to render them negligible.

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Waters within Apra Harbor are classified as M-2 (Good) and M-3 (Fair). The waters in the Project area and its immediate vicinity are classified as M-3, which is intended for general, commercial, and industrial use, while allowing for protection of marine life, aesthetic enjoyment, and limited body contact recreation. Specific intended uses within the M-3 classification include shipping, boating, berthing, industrial cooling water, and marinas. The waters of the Outer Apra Harbor are classified as M-2, which must be of sufficient quality to allow for propagation and survival of marine organisms, aesthetic enjoyment, and whole body contact recreation. (p. 123)

In the short-term, construction-related activities would temporarily increase turbidity of the water column during dredging and pier construction. Construction activities are most likely to influence the water quality parameters of turbidity and total suspended solids (TSS). Results from a three-dimensional circulation and transport model showed that during worst-case TSS loading, a TSS plume exceeding background levels of 5mg/L could extend 1,094 yards to the west along the shoreline, and thus, could impact Family Beach and Hotel Wharf Beach.

In addition to increased turbidity and TSS, there exists the potential for contaminants within the sediment to be suspended/re-suspended in the water column by dredging. As such, sediment dredged as part of the Project would need to be analyzed for contaminant risk per Inland Testing Manual (ITM) guidance. Furthermore, dredged sediment would be staged, dewatered, and otherwise handled in accordance with applicable GEPA laws and regulations. It should be noted that the Project would not introduce new contaminants into the harbor sediment. Rather, chemical constituents of the dredged material generated during wharf construction would be the same as the sediments already within Outer Apra Harbor. Likewise, the chemical constituents of any runoff from the dredged material placed in the proposed reclamation sites would be the same as those in the adjacent bay.

All dredging and fill activities would be required to comply with the forthcoming United States Army Corps of Engineers (USACE) Section 404 permit and the GEPA issued Section 401 Water Quality Certification (WQC). The WQC will ensure that proposed activities do not violate water quality standards, including Guam's standards for chemical concentrations in the water column. In addition to regulatory compliance, dredging activities would incorporate best management practices (BMPs) to maximize water quality impacts. BMPs for land side construction and dredging operations should greatly reduce the likelihood of significant adverse impacts to water quality during the construction phase.

During the construction phase, the quality of stormwater runoff would be controlled by provisions of the National Pollution Discharge Elimination System (NPDES) permit for construction activities and BMPs. BMPs may include development of a Storm Water Management and Pollution Prevention (SWMPP) plan, use of sedimentation basins, frequent inspections of temporary stormwater control facilities by construction personnel, and proper operation and maintenance of such facilities during the construction period. The small quantities of oil, grease and Total Petroleum Hydrocarbons (TPHs) that may also occur in the stormwater would be controlled by provisions in the SWMPP plan and stormwater BMPs which would be developed.

Operational impacts on water quality could result from increased harbor traffic and/or contaminant discharges. Direct impacts from harbor traffic would be the re-suspension of bottom sediments. In addition, with wharf operations there always exists the possibility of leakage or accidental spillage of petroleum, oil, lubricant (OOL), or other contaminants, including waste discharge, into harbor waters. Potential waste discharges from large vessels (with cargo and cruise ships) that could potentially contaminate and adversely impact harbor water quality include black water, gray water, bilgewater and fuel.

In-water movement and docking of vessels at the proposed deep-draft wharf facilities would result in the re-suspension of bottom sediments due to turbulent water motion induced by ships' propellers and thrusters, thus increasing turbidity of the water column and other associated particle-related impacts. As a result, water quality in the harbor would be adversely impacted.

Proposed land side improvements also would result in an increased amount of impervious surface area surrounding the harbor. Increased impervious surfaces could lead to increased stormwater runoff into Apra Harbor. Stormwater from paved areas at the Project sites might contain dust and dirt from paved areas and rooftops. Small quantities of oil and grease and (TPHs) similar to those found in surface runoff from parking lots and roadways and washings of vehicles may also occur in the stormwater. It is expected that there would be no significant quantities of nutrients, BOD, toxic substances, PCBs, pesticides, fecal coliform, and heated or salty flows associated with stormwater discharges from the Project.

Refer to Sections 3.11.4 and 3.11.5 for a full discussion of potential water quality impacts and proposed mitigation measures.

Comment [e1]: Are there any mitig/storm measures for/ to address long-term impacts?

RP3. Fragile Areas

Intent	To protect significant cultural areas, and natural marine and terrestrial wildlife and plant habitats
Policy	Development in the following types of fragile areas including Guam's Marine Protected Areas (MPA) shall be regulated to protect their unique character: historical and archeological sites wildlife habitats pristine marine and terrestrial communities limestone forests ravine forests mangrove stands and other wetlands coral reefs
Discussion	The Proposed Project is consistent with RP3 Fragile Areas

Of the above listed types of fragile areas, the Project will have no impact to wildlife habitats, pristine marine and terrestrial communities, limestone forests, ravine forests, and mangrove stands and other wetlands coral because these fragile areas do not exist within the project area. Historical and archaeological sites may potentially be impacted by the Project, however, those potential for adverse impacts should be negligible with the implementation of mitigation measures identified in the EIS. As a result of the Project, there will be adverse impacts to coral reef habitats.

Historical and archaeological sites. The possibility of adverse impacts to some existing and recent historical structures (i.e. Hotel Wharf, Seaplane Ramp, and Golf Pier) could occur as a result of the construction of abutting portions of proposed wharf and dike structures. In contrast, the entire Outhouse Beach area including the remnant historical structures associated with the former "A" quay would be eliminated by the proposed deep-draft wharf facility.

Quays A, B, and C, would be permanently lost during construction of the Project. However, these three quay/loading features built on the Glass Breakwater during the 1940's are deteriorated and in poor condition, they have endured remodeling and modification, and have lost much of their integrity. As such, we have determined that they are not eligible for listing on the National Register of Historic Places. As a mitigation measure, Guam (State) Historic Preservation Officer (SHPO) has concurred that documentation included in the Archaeological Investigation Report contained as Appendix C of the EIS) would be adequate to mitigate the loss of the quays and other potentially historic landside structures (Sea Plane Ramp and H Wharf) from the archaeological record.

In-water construction activities are not anticipated to adversely impact submerged cultural resources in the Project vicinity. However, proposed dredging could impact some underwater cultural resources, including the known significant wrecks discussed in Section 3.5.2 of the EIS, and other possible unidentified remains and cultural resources (e.g., Spanish Period canons, canon balls, and other items and equipment).

As a mitigation measure, dredging contractors would be made aware of the locations, and instructed to avoid areas with known submerged cultural resources. Furthermore, dredging contractors would be advised of the potential for their work to expose significant cultural resources spanning many centuries. Contractors would also be directed to contact the Guam SHPO in the event anything of cultural interest is discovered.

The PAG in 2002 initiated early consultation with the Guam Historic Resources Division (GHRD), and in 2005 the U.S. Army Corps of Engineers initiated Section 106 consultation with GHRD and other interested parties in accordance with the National Historic Preservation Act of 1966. At this writing, Section 106 consultation is ongoing and will ensure protection of historic and potentially historic resources that may be impacted by the Project. Thus far, Section 106 consultation has resulted in the identification of potentially historic landside and submerged resources, concurrence on measures to mitigate the loss potentially historic landside structures, and Guam SHPO recommendation that an underwater reconnaissance survey be conducted in advance of dredging activities to determine the level of any further archaeological work.

Refer to Sections 3.5.4, 3.5.5 and Appendices C and D of the EIS for a full discussion of potential impacts to historical and archaeological sites, proposed mitigation measures, and documentation of consultation with SHPO.

Reefs
Refer to discussion under RP2 Marine Resources.

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Wildlife habitat and terrestrial communities (Section 3 12 2) The landscape in the Project area is that of a highly disturbed nature being originally created as man-made fill, and perhaps regularly cleared of much vegetation by overwash of typhoon waves Thus, the area is colonized by salt-tolerant, fast-growing species most of which are less than 7 feet in height with the exception of ironwoods (*Casuarina equisetifolia*) and coconut palms (*Cocos nucifera*) The plants are all common coastal plants and ruderal weeds, equipped to deal with environmental conditions associated with this harsh coastal environment The fast lands of the project area are dominated by Indian fleabane (*Pluchea indica*), beach morning glory or *akiohn tasi* (*Ipomoea pes-caprae* subsp *brasiliensis*), *tangan tangan* (*Leucaena leucocephala*), and *nanasso* (*Scaevola sericea*)

The disturbed nature of the project area provides limited and low quality habitat No federally listed endangered terrestrial species are known to occur in the Project area Furthermore, given the highly disturbed and developed character of the Project areas, terrestrial fauna was not observed during the biological reconnaissance survey Considering the Project site characteristics and the urban and industrial nature of the immediate surrounding areas the terrestrial fauna which might be expected to occur in the project areas include feral animals such as cats (*Felis domesticus*), rats (*Rattus spp.*), and dogs (*Canis familiaris*)

Mangrove stands and wetland coral (Section 3 12 2) No delineated wetlands are known to occur within the Project area Estuarine wetlands are the main wetland type that occurs in the Apra Harbor vicinity Six wetlands are located in the vicinity of the Project area The nearest delineated wetland to the Project area is the Sasa Bay Wetland, situated approximately one mile to the east of the Project site The largest concentrations of wetland mangroves also exist along the eastern shore of Apra Harbor The wetlands and mangroves in Apra Harbor are of sufficient distance from the Project area that they and the resources they support, should not incur any adverse impacts resulting from the Project

Pristine marine communities The Project will have no adverse impact on pristine marine communities, as they are not present within the vicinity of the Project Waters within Apra Harbor are classified as M-2 (General) and G-3 (Fair), which are suitable for general, recreational, commercial and industrial use, yet are of sufficient quality to support marine organisms

Limestone and ravine forests The Project will have no adverse impact on limestone or ravine forests, as they do not exist within the vicinity of the Project

RP4. Living Marine Resources

Intent To protect marine resources in Guam's waters

Policy All living resources within the waters of Guam, [illegible] fish, shall be protected from over harvesting and, in the case of corals, sea turtles and marine mammals from any taking whatsoever

Discussion The Proposed Project is not consistent with RP4

Apra Harbor is home to a vibrant and thriving marine community, including well-developed reefs with some of the highest coral cover on Guam, and a diverse biota of algae, invertebrates and fish The Project will result in permanent and temporary impacts to coral reefs and benthic communities that support these marine resources While it is anticipated that there will be no direct taking of fish, sea turtles and other marine organisms, the Project will cause permanent and temporary impacts to marine habitats that may result in indirect impacts to the living marine resources

Construction activities would result in the direct loss of coral reef habitat and all of the environmental and ecological functions and values associated with this habitat However, eventual replacement of lost ecological services and values of the marine resources in the immediate area of the wharf is anticipated due to the effects of ongoing wharf operations and vessel traffic Indirect impacts to marine communities in the [illegible] current areas adjacent to the Project site would also occur, but these communities are expected to largely recover over time

Increased turbidity could potentially harm surrounding coral communities in the harbors Furthermore, the disturbance and mixing of bottom sediments into the water column could result in secondary impacts to the harbor's benthic communities by lowering dissolved oxygen (DO) levels and increasing nitrogen and phosphorus levels Sediment re-suspension would result in increased turbidity and suspended solids levels in the water column, which would in turn result in an increase and decrease in nutrient concentrations (nitrogen and phosphorus) and dissolved oxygen levels, respectively Additionally, transport of re-suspended sediments outside the harbor could possibly have a negative impact on benthic reef communities in nearby open

coastal waters (AECOS, 2006) In addition to increased turbidity and TSS, contaminants suspended/re-suspended in the water column by dredging have the potential to chemically alter coral gametes and larvae, and prevent normal fertilization and development As such, sediment dredged as part of the Project would need to be analyzed for contaminant risk per Inland Testing Manual (ITM) guidance Furthermore, dredged sediment would be staged, dewatered, and otherwise handled in accordance with applicable GEPA laws and regulations

Benthic Habitat
The waters within and in the vicinity of the Project site contain complex benthic communities, including diverse coral reef and fish communities, which will be impacted by Project construction and operational activities The Project will cause the permanent loss of benthic habitat as well as non-permanent impacts from construction-related disturbance.

Non-permanent impacts will result primarily from the suspension of particulates during dredge and fill activities In addition, there will be disturbance of the substrate from the temporary placement of anchors and mooring lines It is estimated that 102 9 acres of marine habitat may be impacted from sediment suspension and re-suspension during construction activities Additionally, approximately 20 58 acres may be impacted as a result of sediment deposition and 3 3 acres are estimated to be impacted by the temporary placement of anchors and mooring lines

Coral Reefs (Section 3 12 3 1)
The coral reef community that occurs in the shallow marine environment (reef flat, reef crest, and reef slope) is the primary habitat of concern at the Project site This shallow marine environment functions to provide nursery areas for juvenile reef fish such as wrasses, parrotfish, surgeonfish and others, reef crest habitat, which is characterized by boulders, rubble and sand on a calcareous reef matrix, with ample macro-algae cover and low to moderate amounts of live coral

In general, waters within the Project areas did not have a high percentage of live coral coverage A total of 24 coral species were identified within the Project area and immediate vicinity during the biological field survey The percentage of live coral colony coverage within the project area and surrounding reef varied from 0 percent (uncolonized) in areas approaching 100 percent The sites proposed for construction are comprised mainly of sparsely colonized [illegible] areas with scattered coral colonies with coverage generally less than 10 percent of the bottom

An estimated 28 83 total acres of coral reef would be lost permanently due to the Project—[illegible] acres resulting from construction of the deep-draft wharf, and 16 65 acres resulting from the reclamation of sites 1, 2, and 3 The shallow reef flat habitat would sustain the largest permanent loss due to the construction of the wharf and reclamation The shallow reef provides nursery habitat and vegetated shallows that support macro-algae and seagrass that may be used by sea turtles Loss of the reef crest (4 42 acres) and reef slope (4 88 acres) habitats will be less than the reef flat areas However, their loss is still considered significant because these habitats support areas of high live coral cover and high fish diversity

Reef Fish and Essential Fish Habitat (Section 3 12 3 3) Within the project area the shallow reef flat zone is not especially rich in fishes A total of 33 fish species occur within the reef flat habitat type By comparison, 104 different fish species occur in both the reef crest and slope habitats Fish observations throughout the reef crest and slope habitat types in the project area were numerous and included species that are culturally important, and fish that are recreationally and commercially important (USFWS, 2006) The area of greatest fish diversity appears to be the inlet between Hotel Wharf and Dog Leg Pier (AECOS, 2006)

Marine Mammals
No endangered marine mammals are known to occur within the project site or the immediate surrounding harbor waters Therefore the Project is not anticipated to result in any impacts to protected marine mammal species

Sea Turtles
Both the endangered hawksbill and threatened green sea turtle are known to nest on Guam as a whole, and there have been occasional sightings of leatherback turtles as well Areas within Apra Harbor have long been used by sea turtles for forage and resting The federally listed threatened green sea turtle (*Chelonia mydas*) has been observed within both Outer and Inner Apra Harbor, but mostly outside of the immediate project area Green sea turtles may utilize the waters within the Project area because at least three species of algae from the [illegible]-green algae identified as green sea turtle forage were observed at the Project site Seagrass at the Project site may also be utilized by sea turtles Various invertebrate and algal taxa observed in the Project area, including sponges, coelenterates bryozoans, mollusks, arachnidates, algae such as Codium, and seagrass have been documented as Hawksbill forage

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Due to the presence of sea turtles within the Project area, there does exist the potential for impacts However, proper precautions will be undertaken during construction and dredging activities to minimize the potential for harming these marine resources Sea turtles could also be indirectly impacted by the loss of foraging and nesting grounds within the Project area

The PAG would maintain close coordination and consultation with the National Marine Fisheries Service during project planning, design, and construction activities NMFS recommendations for protection and conservation of sea turtles would be incorporated into the construction phase of the Project During construction activities, procedures will be implemented to minimize potential adverse impacts to sea turtles Such procedures may include the cessation of construction activities if sea turtles are observed entering waters in the vicinity of the active construction site, to resume once the turtle(s) have left the area of their own accord

Refer to sections 3 13 2 and 3 13 5 of the EIS for a full discussion of potential impacts to sea turtles and proposed mitigation measures

Compensatory Mitigation A compensatory mitigation plan will be developed in coordination with the U S Fish and Wildlife Service, the National Marine Fisheries Service, the U S Environmental Protection Agency, the Guam Department of Aquatic and Wildlife Resources, the U S Army Corps of Engineers Regulatory Branch and other interested parties The Plan will compensate for the permanent loss of marine resources and would include the following components

1) Documentation of anticipated impact area,
2) Assessment of resources anticipated to be impacted,
3) Correlation of anticipated impacts and compensatory mitigation,
4) Scientific monitoring of compensatory mitigation,
5) Establishment of performance standards and evaluation criteria, and
6) Determination of the effectiveness of implemented compensatory mitigation

Possible compensatory mitigation measures being considered include Fish Aggregating Devices (FADS), coral transplantation and Best Management Practices (BMPs) It is not likely that any single mitigation measure could adequately avoid, minimize, or compensate for the degradation and loss of coral reefs and their associated ecological functions However, the combined effects of multiple measures implemented in a coordinated manner, at appropriate geographic and time scales could adequately mitigate these losses

FADS The areas under the proposed wharf platform would overtime develop into a productive benthic habitat supporting a variety of marine species The pier pilings essentially would act as FADs, however, if they are designed and located to attract pelagic fish species The pilings could be outfitted with floating objects (e g , logs, coconuts, rope or plastic bottles) to increase their attractiveness to fish and therefore enhance their effectiveness as FADs

Coral Transplantation Transplanting of coral and the creation of marine preserves are established methods of compensation for unavoidable coral reef habitat loss Possible transplant receiver sites are the submerged lands to the west of the project area and Dog Leg Reef These areas have ample water flow and exhibit existing healthy coral populations

BMPs In addition to technology based mitigation measure, BMPs also could be incorporated into the mitigation plan as a means to further minimize project-related impacts The mitigation plan could describe in general terms BMPs which would need to be adhered to and would be described in detail in the project construction management plan

RP5. Visual Quality

Intent	To protect the quality of Apra Harbor's natural scenic beauty
Policy	Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails
Discussion	The Project is consistent with RP5 Visual Quality

The proposed improvements and their associated operations are consistent with the existing maritime industrial setting of the harbor area and do not degrade scenic resources and significant views The visual character of Apra Harbor is typical of most commercial industrial port settings with shed-like structures, expansive parking, loading and storage areas, service/utility facilities, and minimal trees and landscaping Furthermore, the proposed improvements would not alter or damage any important scenic coastal landforms or other visual resources in the surrounding area since work would be limited to within the existing harbor

Potential impacts to the visual character of the project area and vicinity would mainly be associated with short-term construction-related activities Construction activities would involve the presence of equipment and workers along roadways that may temporarily interfere with some coastal views from roadways, however, this would be a relatively minor, short-term disruption

Existing unimproved areas (e g , proposed reclamation sites and the Outhouse Beach area) would be replaced by modern, port facilities However, long-term impacts on visual quality of the area are not anticipated to occur since the Project and its associated operations would be consistent with the overall existing maritime industrial setting of Apra Harbor

Light emissions from the new facility, once operational, should not detract from the visual quality of the area The surrounding harbor area is heavily industrialized consisting mainly of the commercial port and military facilities, both of which emit relatively high levels of ambient light Therefore, the addition of new lighting to support the proposed facilities should not add substantially to the already high ambient light level However, measures will be taken to minimize the spillover effect into areas outside the harbor In addition, new lighting will comply applicable lighting codes and standards

Refer to Sections 3 6 4 and 3 6 5 of the EIS for a full discussion of potential impacts to visual quality and proposed mitigation measures

RP6. Recreation Areas

Intent	To encourage environmentally compatible recreational development
Policy	The Government of Guam shall encourage development of varied types of recreational facilities located and maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and tourist areas and protect beaches and such passive recreational areas as wildlife, marine conservation and marine protected areas, scenic overlooks, parks, and historical sites Developments, activities and uses shall comply with the Guam Recreational Water Use Management Plan (RWUMP)
Discussion	The Project is not consistent with RP6 Recreation Areas

The Project does not include any recreational development and therefore will not further the objectives and policies for recreation areas Furthermore, the Project will eliminate permanently one of recreation SCUBA diving activities in the nearshore waters at Outhouse Beach The placement of the proposed deep-draft wharf facility would occupy the entire area from the eastern side of Outhouse Beach to the eastern side of Hotel Wharf precluding the use of this rocky shoreline for instructional SCUBA diving activities

Recreational access and activities at the Sea Plane Ramp and Family Beach however would not be affected by the proposed improvements Additionally, the Project would not adversely impact recreational SCUBA diving activities at sunken vessel and reef sites in Outer Apra Harbor as these submerged resources are situated at considerable distances from the proposed deep-draft wharf berthing area

As a mitigation measure, prior to the start of construction activities PAG would notify recreational users and the general public about the loss of Outhouse Beach as a result of the Project PAG would then initiate a working dialog with SCUBA organizations such as the Micronesian Dive Association, private SCUBA commercial operators, and the general public (recreational users) to identify a substitute location suitable for conducting similar SCUBA diving activities By working with these existing associations whose users and recreational users knowledgeable with the area, criteria could be established that would help PAG identify substitute locations to compensate for the loss of recreational activities at Outhouse Beach

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The Project on its face is not consistent with intent and policies of RP6 However, given the overall context of recreational activities and areas that will remain available after construction of the Project, and given the proposed mitigation measures, the loss of recreational activities at Outhouse Beach is should be rendered negligible

Refer to Sections 3 6 4 and 3 6 5 of the EIS for a full discussion of potential impacts to recreation areas and proposed mitigation measures

RP7. Public Access

Intent	To ensure the right of public access
Policy	The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Guam recreation areas, parks, scenic overlooks, designated conservation areas and their public lands Agreements shall be encouraged with the owners of private and federal property for the provision of reasonable access to and use of resources of public nature located on such land
Discussion	The Propose Project is partially consistent with RP7 Public Access

The Project will subsume Outhouse Beach As such public access to this rocky shoreline area will be eliminated In the short-term, public access to currently available beaches and other shoreline areas within the vicinity of the Project may be restricted due to construction activities However, permanent public access to these areas will be maintained after construction is completed Permanent public access to Seaplane Ramp, which is situated between Reclamation Sites 1 and 2, may have to be coordinated with PAO container cargo schedules once these areas become operational as backland (facilities and container yard space

RP8. Agricultural Lands

Intent	To stop urban types of development on agricultural land
Policy	Critical agricultural land shall be preserved and maintained for agricultural use
Discussion	**Not Applicable**

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FEDERAL CONSISTENCY SUPPLEMENTAL INFORMATION FORM

Date: _____

Project/Activity Title or Description Apra Harbor Deep-Draft Wharf Improvements and Fill Project

Location Apra Harbor, Piti, Guam

Other applicable area(s) affected, if appropriate _____

Est Start Date _____ Est Duration _____

APPLICANT

Name & Title _____

Agency/Organization _____

Address _____

Zip Code _____

Telephone No. during business hours:

A/C ( ) _____

A/C ( ) _____

Fax ( ) _____

E-mail Address _____

AGENT

Name & Title _____

Agency/Organization _____

Address _____

Zip Code _____

Telephone No. during business hours:

A/C ( ) _____

A/C ( ) _____

Fax ( ) _____

E-mail Address _____

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CATEGORY OF APPLICATION (check one only)

( ) I Federal Agency Activity ( ) II Permit or License ( ) III Grants & Assistance

TYPE OF STATEMENT (check one only)

( ) Consistency
( ) General Consistency (Category I only)
( ) Negative Determination (Category I only)
( ) Non-Consistency (Category I only)

APPROVING FEDERAL AGENCY (Categories II& III only)

Agency
Contact Person _____

Telephone No. during business hours
Area Code ( )_____
Area Code ( )

FEDERAL AUTHORITY FOR ACTIVITY

Title of Law
Section _____

OTHER GUAM APPROVALS REQUIRED

Agency	Type of Approval	Date of Application	Status

Working Draft
(Application Not Submitted)

APPENDIX F

Air Quality Impact Report

AIR QUALITY IMPACT REPORT

Environmental Impact Statement for Proposed Wharf Improvements and Fill at Apra Harbor, Guam

Prepared for:
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July 2006

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TABLE OF CONTENTS

1 INTRODUCTION 1-1

2 AIR QUALITY STANDARDS 2-1

3 EXISTING AIR QUALITY 3-1

4 CLIMATE AND METEOROLOGY 4-1
- 4.1 Climate 4-1
- 4.2 Surface Winds 4-2

5 SHORT TERM IMPACTS 5-1
- 5.1 On-Site Impacts 5-1
  - 5.1.1 Controls 5-2
- 5.2 Off-Site Impacts 5-3

6 MOBILE SOURCE IMPACTS 6-1
- 6.1 Mobile Source Activity 6-1
- 6.2 Emission Factors 6-1
- 6.3 Modeling Methodology 6-1
- 6.4 Results 6-2

7 CONCLUSIONS AND MITIGATION 7-1
- 7.1 Short Term Impacts 7-1
- 7.2 Mobile Source Impacts 7-1

8 RESOURCES AND REFERENCES 8-1

LIST OF TABLES

Table 2-1 NAAQS and Guam Ambient Air Quality Standards 2-2

Table 3-1 Apra Heights Substation, PM_{10} Data October 1999 – September 2000 3-1

Table 3-2 Apra Heights Substation SO_2 Data October 1999 – September 2000 3-2

Table 4-1 Climatological Norms, Means and Extremes for Guam 4-1

Table 5-1 Control Options for General Construction Open Sources of PM-10 5-3

LIST OF FIGURES

Figure 1-1 Project Location Map 1-2

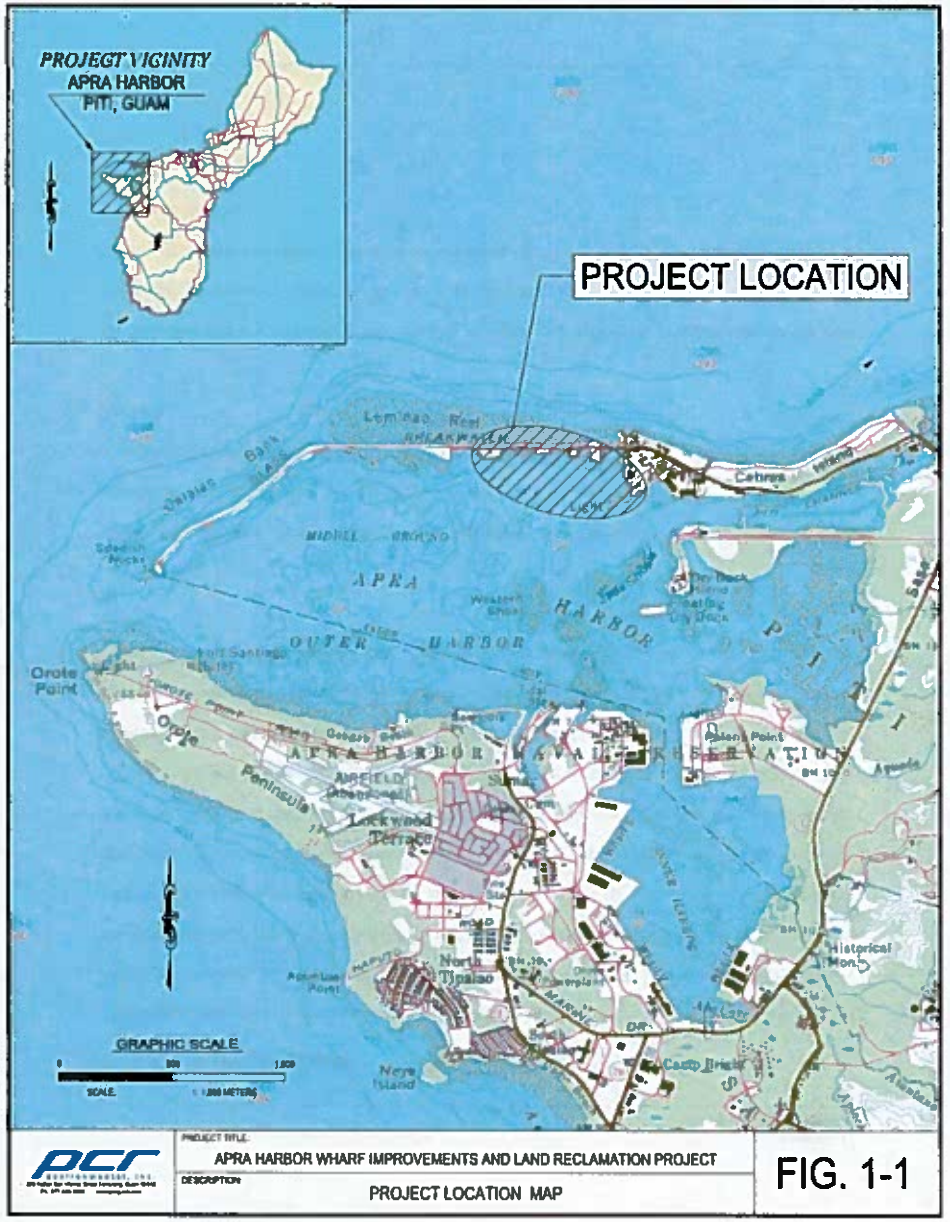
Figure 4-1 Representative Wind Rose Plot for the Month of January 4-3

Figure 4-2 Representative Wind Rose Plot for the Month of August 4-3

1 INTRODUCTION

Apra Harbor, which is located on the central western side of the island of Guam, serves as Guam's sole commercial seaport (Figure 1-1). Apra Harbor commercial port operations handle both containerized and conventional cargo, imported to the island from various locations, worldwide. Currently, the Port Authority of Guam is proposing modifications to Apra Harbor to improve maritime access and service to the island of Guam. The proposed modifications would provide additional cargo container storage area, and berthing facilities to accommodate the newest generation of large deep draft container vessels and cruise ships within outer Apra Harbor, along the southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. The proposed modifications and harbor improvements include the following actions:

- Construction of a new 1,500 feet wharf to the east side of "Hotel Wharf," which may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities.
- Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater, which may include construction of cargo container storage yard facilities and construction of rock revetment
- Dredging the submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500 feet wharf to accommodate military vessels and deep draft commercial vessels.



The purpose of this report is to assess the short and long-term impacts of the proposed improvements on air quality. Harbors can be considered "indirect sources" of air pollution as defined in the federal Clean Air Act since their primary association with air quality is their inherent attraction from mobile sources. The proposed improvements are expected to generate additional motor vehicle traffic for the transport of materiel and people to and from the site. Therefore, much of this report will focus on the expected increase in traffic to the area and the consequent effects on air quality using existing and future generated data.

Air pollutant emissions will also be generated as a result of construction and demolition on site due to vehicular activity, grading, and general dust-generating construction activities. These impacts on air quality have also been addressed.

2 AIR QUALITY STANDARDS

The United States Environmental Protection Agency (USEPA), under the Clean Air Act (CAA) of 1970, has developed concentration-based standards called National Ambient Air Quality Standards (NAAQS) for all pollutants that are harmful to public health and the environment. The USEPA has established both primary and secondary NAAQS under the CAA. Primary standards define levels of air quality that are necessary to protect public health with an adequate margin of safety. Secondary standards are established levels to protect public welfare from any known adverse impacts, through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values. The primary and secondary standards for principal automotive pollutants, such as nitrogen dioxide (NO_2), and ozone (O_3), are identical. There are no secondary standards for carbon monoxide (CO).

Guam has adopted most of the NAAQS standards and the current applicable air quality standards for Guam can be found in the Guam Air Pollution Control Standards and Regulations. A summary of all NAAQS and Guam Ambient Air Quality Standards (GAAQS) can be found in Table 2-1.

Guam standards are identical to the NAAQS for PM_{10}, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Guam has the same primary standards for ozone for the one (1) hour averaging period, but has no standard for the eight (8) hour period. Guam does not have any standards for $PM_{2.5}$.

Table 2-1 NAAQS and Guam Ambient Air Quality Standards

Criteria Pollutant	Averaging Period	NAAQS Primary	NAAQS Secondary	Guam Primary	Guam Secondary
Particulate Matter (PM_{10})	Annual Arithmetic Mean[2]	50	50	50	50
	24 hr[1]	150	150	150	150
Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean[3]	15	15	--	--
	24 hr[4]	65	65	--	--
Sulfur Oxides	Annual Arithmetic Mean	80 (0.03 ppm)	--	80 (0.03 ppm)	--
	24 hr[1]	365 (0.14 ppm)	--	365 (0.14 ppm)	--
	3 hr[1]	--	1,300 (0.5 ppm)	--	1,300 (0.5 ppm)
Nitrogen Dioxide	Annual Arithmetic Mean	100 (0.053 ppm)	100 (0.053 ppm)	100 (0.053 ppm)	100 (0.053 ppm)
Carbon Monoxide	8 hr[1]	10* (9 ppm)	--	10* (9 ppm)	--
	1 hr[1]	40* (35 ppm)	--	40* (35 ppm)	--
Ozone	8 hr[5]	156 (0.08 ppm)	156 (0.08 ppm)	--	--
	1 hr[1]	235 (0.12 ppm)	235 (0.12 ppm)	235 (0.12 ppm)	235 (0.12 ppm)
Lead	Quarterly Average	1.5	1.5	1.5	1.5

*All concentrations are reported as $\mu g/m^3$ except CO, which is reported as mg/m^3.

1 - Not to be exceeded more than once per year

2 - To attain this standards, the 3 year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 $\mu g/m^3$.

3 - To attain this standards, the 3 year average of the weighted annual mean $PM_{2.5}$ concentration at each monitor within an area must not exceed 15 $\mu g/m^3$.

4 - To attain this standards, the 3 year average of the 98th percentile of 24- hour concentrations at each population oriented monitor within an area must not exceed 65 $\mu g/m^3$.

5 - To attain this standards, the 3 year average of the fourth-highest daily maximum 8 hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08ppm

3 EXISTING AIR QUALITY

There is little ambient air quality data available for Apra Harbor, however, the Guam Power Authority has made some data available to PCR for the purposes of this report.

Since 1978, the United States EPA has designated the entire island of Guam as non-attainment for the primary sulfur dioxide (SO_2) NAAQS due, in part, to the air quality violations at Piti and Tanguisson Power Plant. In 1982, USEPA redesignated the non-attainment area to only include two (2) small circular areas with a radius of 3.5 kilometers around Piti Power Plant and Tanguisson Power Plant. The proposed project site is included in the non-attainment area around the Piti Power Plant. The Guam Power Authority implemented air quality monitoring program in the non-attainment areas and data has been collected for the following contaminants:

- PM_{10}
- Sulfur Dioxide (SO_2)

There is currently no ambient air quality data for the other criteria pollutants, which include nitrogen dioxide, carbon monoxide, ozone, and $PM_{2.5}$.

Table 3-1 Apra Heights Substation, PM_{10} Data October 1999 – September 2000

Sample Date	Highest 24-hr Average	Quarterly Average
October – December 1999	23.9	13.8
January – March	19.2	13.7
April – June	20.9	13.1
July – September	15.5	9.7
Annual Arithmetic Mean	23.9*	12.6

*99th Percentile 24-hour

Table 3-2 Apra Heights Substation SO_2 Data October 1999 – September 2000

Month	Highest 3-hr Average (ppb)	Highest 24-hr Average (ppb)	Monthly Average (ppb)
October 1999	4.3	0.40	0.395
November 1999	0.3	0.00	0.000
December 1999	0.0	0.00	0.000
January 2000	4.7	0.61	0.027
February 2000	79.2	10.17	0.329
March 2000	129.4	18.27	0.459
April 2000	0.8	0.13	0.00
May 2000	4.6	0.40	0.00
June 2000	0.0	0.00	0.00
July 2000	3.2	0.31	0.00
August 2000	10.5	2.48	0.00
September 2000	4.6	0.88	0.00
		Annual Average	0.118

Source: Guam Power Authority Ambient Air Quality Monitoring Network Annual Data Report October 1999 - September 2000.

NAAQS and GAAQS: 3 hr = 0.5 ppm (0.0005 ppb)
24 hr = 0.14 ppm (0.00014 ppb)
Average = 0.03 ppm (0.00003 ppb)

4 CLIMATE AND METEOROLOGY

4.1 CLIMATE

Each decade, the National Oceanographic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) compiles thirty-year climate normals for temperature, precipitation, and heating and cooling degree-days. The average value of a meteorological element over 30 years is defined as a "climatological normal." The most current climate normals for Guam are for the 1971 to 2000 period.

Table 4-1 below provides the climatological norms, means, and extremes for Guam as compiled by the National Climatic Data Center.

Table 4-1 Climatological Norms, Means and Extremes for Guam

Parameter	Descriptor	Value
Temperature (°F)	Daily Maximum	95
	Daily Minimum	54
	Annual Mean	79.2
Precipitation (inches)	Maximum Monthly	40.13
	Minimum Monthly	0.50
	Annual Mean	8.38
Humidity (%)	Normal	79
Wind Speed (mph)	Mean	10.3
Sunshine	Percent of possible	46
Sky Cover (Mean # of days)	Clear	16.6
	Partly Cloudy	133.4
	Cloudy	207.9

Source: National Climatic Data Center

4.2 SURFACE WINDS

While temperature and humidity vary only slightly throughout the year, wind conditions vary markedly and it is the variations in wind conditions, which really define Guam's two primary and two secondary seasons. The two primary seasons are the dry season, which extends from January through April, and the wet season, which extends from mid-July to mid-November. The secondary seasons are May to mid-July and mid-November through December (NOAA 2005).

At all times of the year, the dominant winds are the trade winds, which blow from the east or northeast. The trades are strongest and most constant during the dry season (January through April), when wind speeds of 13 – 21 knots are common. During the primary rainy season (mid-July through mid-November), there is generally a breakdown of the trade winds and a shift occurs, a small percentage of the time, with winds blowing from the west and west-southwest. This notable seasonal difference in wind direction with northeasterly trade winds occurring in the dry season, but more variable winds prevalent in the wet season is evident in the wind rose plots for the months of January and August (Figures 3-1 and 3-2). The average annual wind speed as recorded by NOAA was 9 knots for 2005.

Figure 4-1 Representative Wind Rose Plot for the Month of January

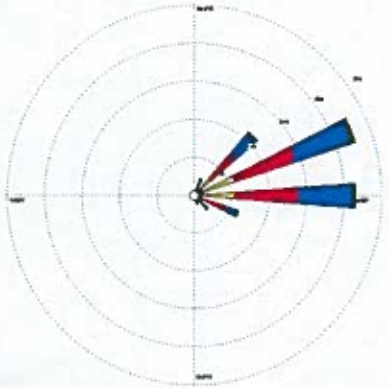
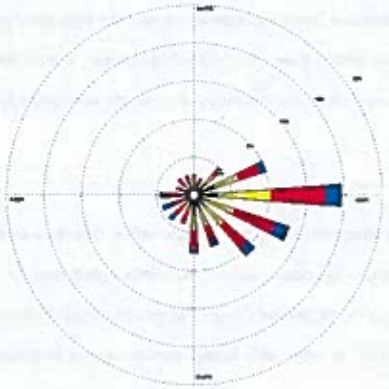


Figure 4-2 Representative Wind Rose Plot for the Month of August



5 SHORT TERM IMPACTS

5.1 ON-SITE IMPACTS

The principal source of short-term air quality impacts will be associated with the construction activities for the project. These activities generate fugitive dust as well as gaseous and particulate emissions from various fossil fuel-fired equipment, such as dredges, trucks, loaders, pavers, etc.

Building and road construction are examples of construction activities with high emissions potential. Emissions during the construction of a building or road can be associated with land clearing, drilling and blasting, ground excavation, cut and fill operations (i.e., earth moving), and construction of a facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions results from equipment traffic over temporary roads at the construction site.

Based on EPA field measurements of total suspended particulate (TSP) concentrations surrounding apartment and shopping center construction projects, the approximate emission factors for construction activity operations are 1.2 tons/acre/month of activity. The value is most applicable to construction operations with: (1) medium activity level, (2) moderate silt contents, and (3) semiarid climate. Because the above emission factor is referenced to TSP, use of this factor to estimate particulate matter (PM) no greater than 10 µm in aerodynamic diameter (PM-10) emissions will result in conservatively high estimates. Also, because derivation of the factor assumes that construction activity occurs 30 days per month, the above estimate is somewhat conservatively high for TSP as well.

Vehicles hauling construction materials and debris can also at times increase automotive pollutant concentrations along adjoining existing streets as well as on the project site itself. The additional construction vehicle traffic may also cause temporary reduction in average travel speeds, due to congestion on feeder roads, which results in an increase in vehicle emissions.

5.1.1 Controls

Because of the relatively short-term nature of construction activities, some control measures are more cost effective than others. Wet suppression and wind speed reduction are 2 common methods used to control open dust sources at construction sites, because a source of water and material for wind barriers tend to be readily available on a construction site. However, several other forms of dust control are available. Table 5-1 displays each of the preferred control measures, by dust source.

Table 5-1 Control Options for General Construction Open Sources of PM-10

Emission Source	Recommended Control Method(s)
Debris Handling	Wind speed reduction Wet suppression[a]
Truck Transport[b]	Wet suppression Paving Chemical stabilization[c]
Bulldozers	Wet suppression[a]
Pan Scrapers	Wet suppression of travel routes
Cut/fill Material Handling	Wind speed reduction Wet suppression
Cut/fill Haulage	Wet suppression Paving Chemical stabilization
General Construction	Wind speed reduction Wet suppression Early paving of permanent roads

[a] Dust control plans should contain precautions against watering programs that confound trackout problems.
[b] Loads could be covered to avoid loss of material in transport, especially if material is transported offsite.
[c] Chemical stabilization is usually cost-effective for relatively long-term or semi-permanent unpaved roads.
[d] Excavated materials may already be moist and not require additional wetting. Furthermore, most soils are associated with an "optimum moisture" for compaction.

5.2 OFF-SITE IMPACTS

In addition to the onsite impacts attributable to construction activity, there will also be offsite impacts due to the operation of concrete and asphalt batching plants needed for the construction of new piers, buildings, sidewalks and roadways. Such plants routinely emit particulate matter and other gaseous pollutants. The batch plants that will be producing this concrete and asphalt are all permitted by the Guam EPA, in accordance with the Guam Air Pollution Control Standards and Regulations. In order to obtain their operating permits, they must demonstrate their ability to comply with emission and ambient air quality standards. Under the federal EPA's Title V Operating Permit requirements, which are incorporated in Guam's rules, air pollution sources must regularly attest to their compliance with all applicable requirements. Typical concrete and asphalt batch plants on Guam are outfitted with

"baghouses" to filter for particulate matter. These controls have a normal efficiency of 95 – 99%.

6 MOBILE SOURCE IMPACTS

6.1 MOBILE SOURCE ACTIVITY

The Apra Harbor Wharf Improvements and Land Reclamation Project Traffic Impact Assessment Report (Rowell 2005) served as the basis for this mobile source impact analysis. Existing and projected future peak-hour traffic volumes for the roads serving the project site were obtained from that report. Since air quality impact is typically greatest in the vicinity of intersections, and since the closest residential receptors to an increase of air pollution are also located near an intersection, the intersection of Route 1 (Marine Corps Drive) and Route 11 (Cabras Highway) was the focus of this analysis.

6.2 EMISSION FACTORS

Automotive emission factors for carbon monoxide (CO) were generated for calendar years 2005 and 2025 using EPA's Mobile Source Emissions Model. Due to an unavailability of an age distribution of registered vehicles on Guam, national averages were used in the model.

6.3 MODELING METHODOLOGY

Mobile source air quality modeling has historically focused on estimating concentrations of non-reactive pollutants, primarily carbon monoxide (CO). This has been the case because CO is relatively stable in the atmosphere, having a half-life in the order of approximately one month, and it comprises the largest fraction of automotive emissions.

Using the traffic data provided, modeling was performed for the aforementioned intersection for the years 2005 and 2025.

6.4 RESULTS

According to the traffic study, Project Generated Traffic is estimated to increase traffic 12.4% in the mornings (a.m.) and 10.2% in the afternoon (p.m.) by the year 2025. The Mobile Source Emissions Model predicts that composite CO concentrations will decrease from a current (2005) 11.218 grams/mile to 4.379 grams/mile in 2025, or an approximately 60% decrease per vehicle mile driven. This is attributable to the federal motor vehicle emissions control program, which causes increasing traffic volume to be offset by increasingly more stringent emissions standards for new vehicles. Over time older, higher emitting vehicles are eventually replaced by newer, lower emitting vehicles, with the net result often being lower total emissions despite increased traffic volume.

7 CONCLUSIONS AND MITIGATION

The project site is located on the end of a peninsula (Cabras Island) in the westernmost part of Guam, with climatic conditions that create prevailing tradewinds from a northeasterly direction the majority of the year. The closest residential receptors to the site are 2 miles away (Piti Village to the northeast and Naval Station to the south). The distance from potential receptors and the prevailing wind that carries potential pollution out over the Philippine Sea is also the reason that eight (8) of Guam's ten (10) power plants are located on Cabras Island, approximately 1 mile to the northeast of the site.

7.1 SHORT TERM IMPACTS

Since Guam's climate is considered humid, there is a somewhat reduced potential for fugitive dust. However, it will still be important to employ adequate dust control measures during construction periods, especially during the dry season. Dust control measures are proposed in Section 5.1.1 and should be implemented to minimize fugitive emissions.

Short-term air quality impacts due to offsite activities supporting the proposed harbor improvements, such as concrete and asphalt production, appear to be de minimus due in large part to the high removal efficiency of control devices typically found at such production facilities. In addition, each batch plant must have operating permits that are regulated by the Guam EPA.

7.2 MOBILE SOURCE IMPACTS

As reported in the previous section, compliance with local and federal carbon monoxide standards is demonstrated in peak hour traffic conditions. Therefore, no special mitigative measures are required.

8 RESOURCES AND REFERENCES

Clean Air Act, 42 U.S.C.A 7409 (CAA 109) National primary and secondary ambient air quality standards.

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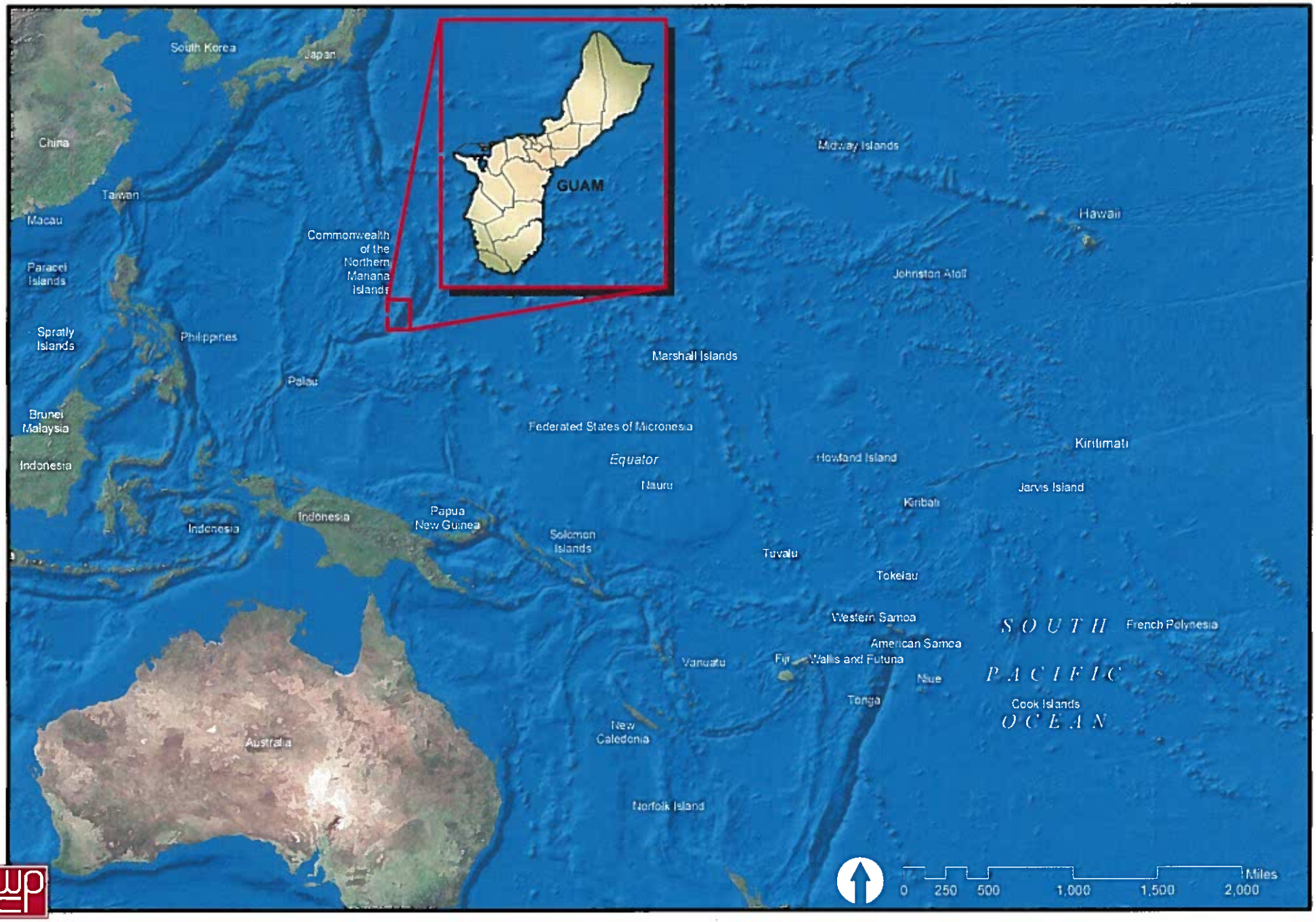
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Guam Environmental Protection Agency. Redesignation Request for the Piti SO_2 Nonattainment Area, 12 August 1996.

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DACA83-00-D-0012, Task Order Number 0067

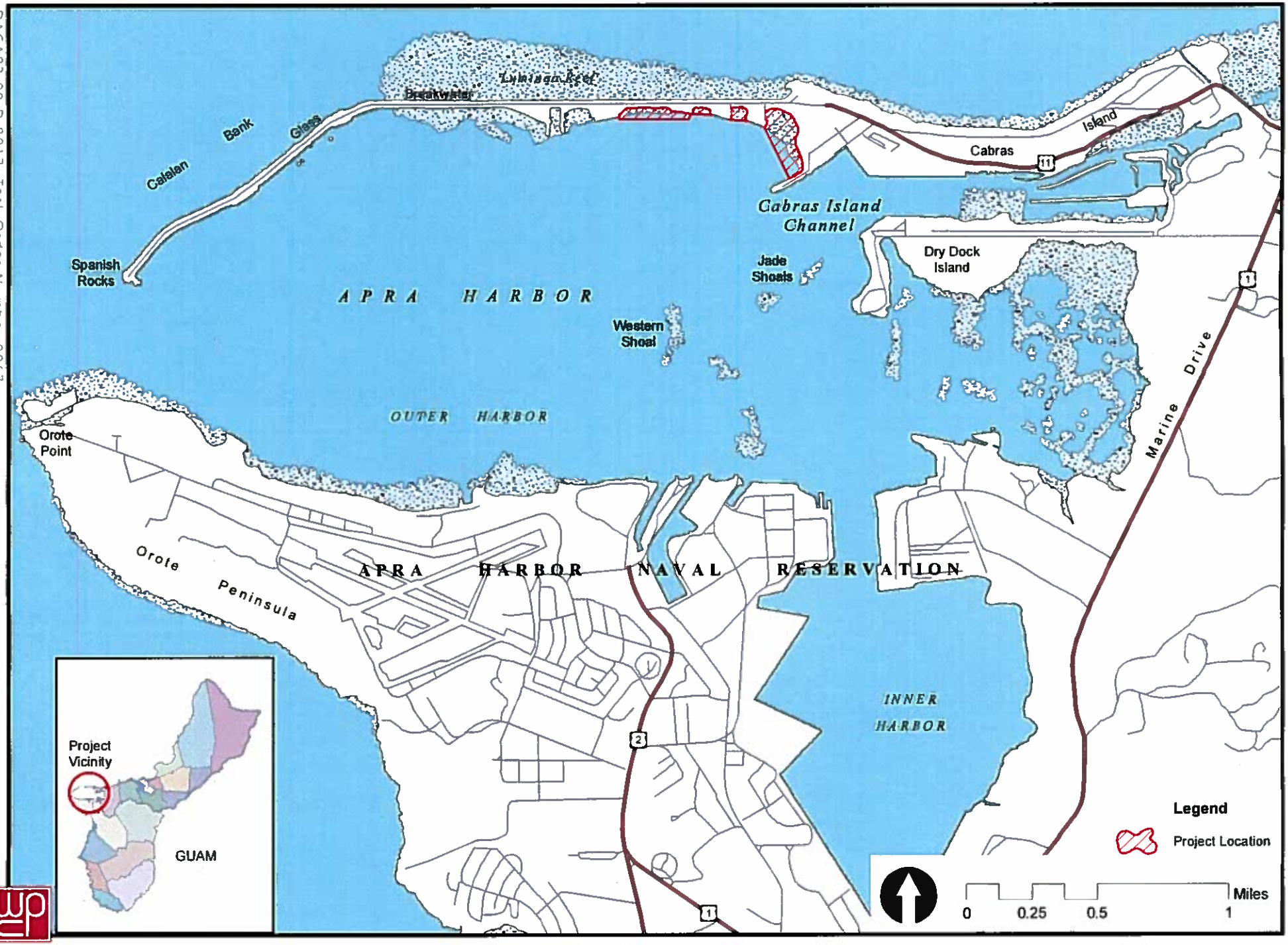


LOCATION MAP

FIGURE 1-1

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

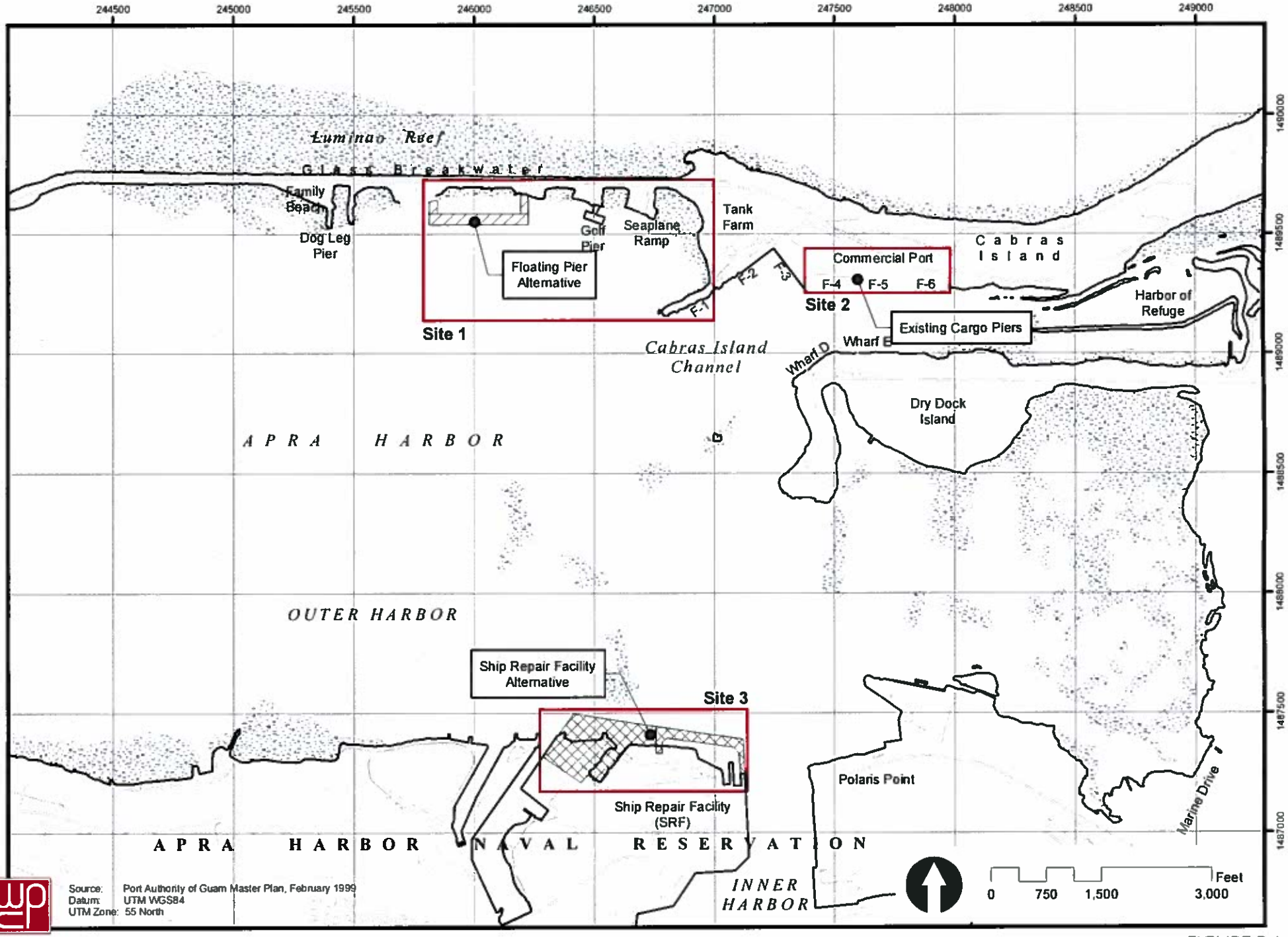


APRA HARBOR

FIGURE 1-2

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



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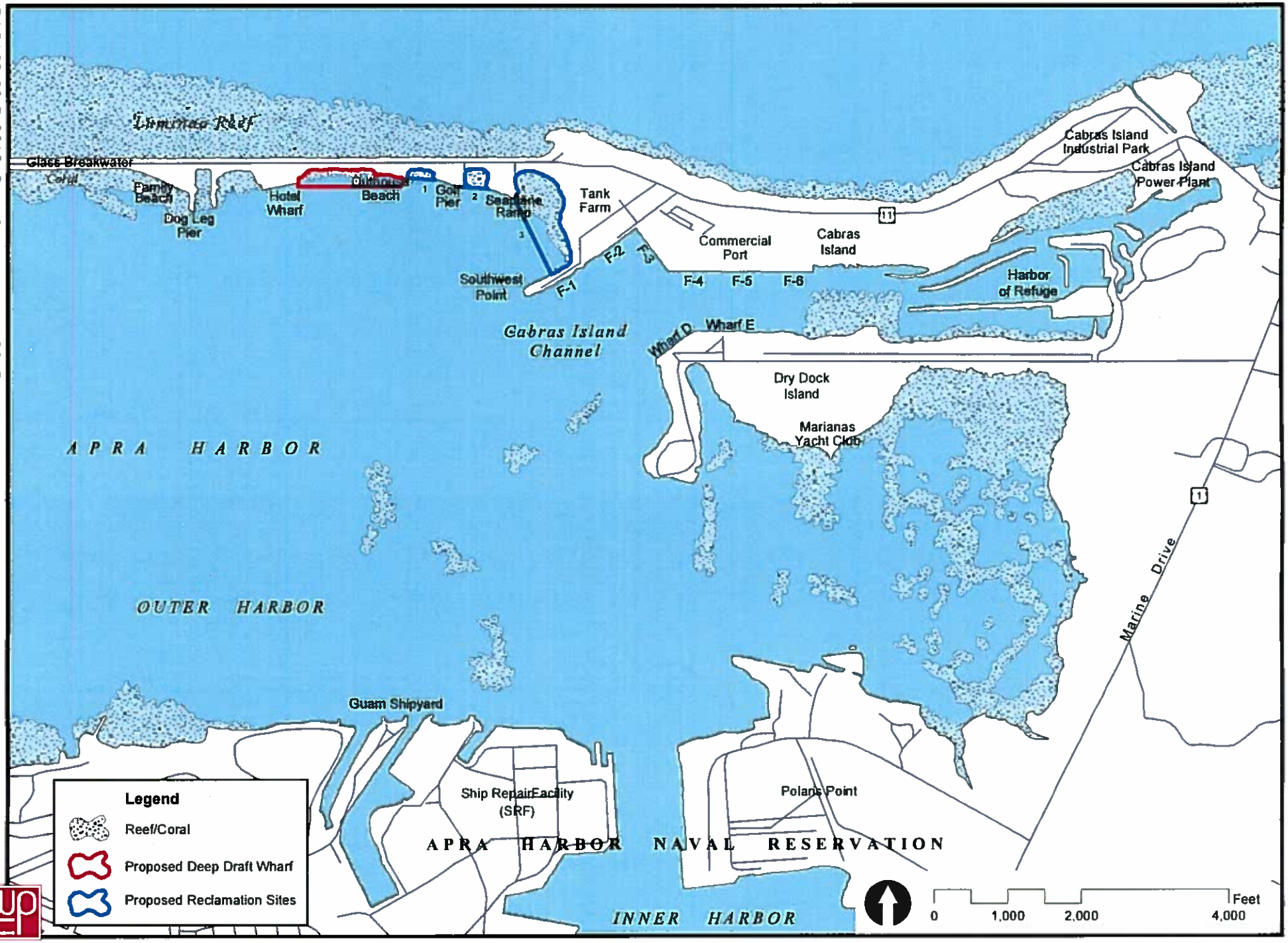
ALTERNATE SITES EVALUATED

FIGURE 2-1

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067

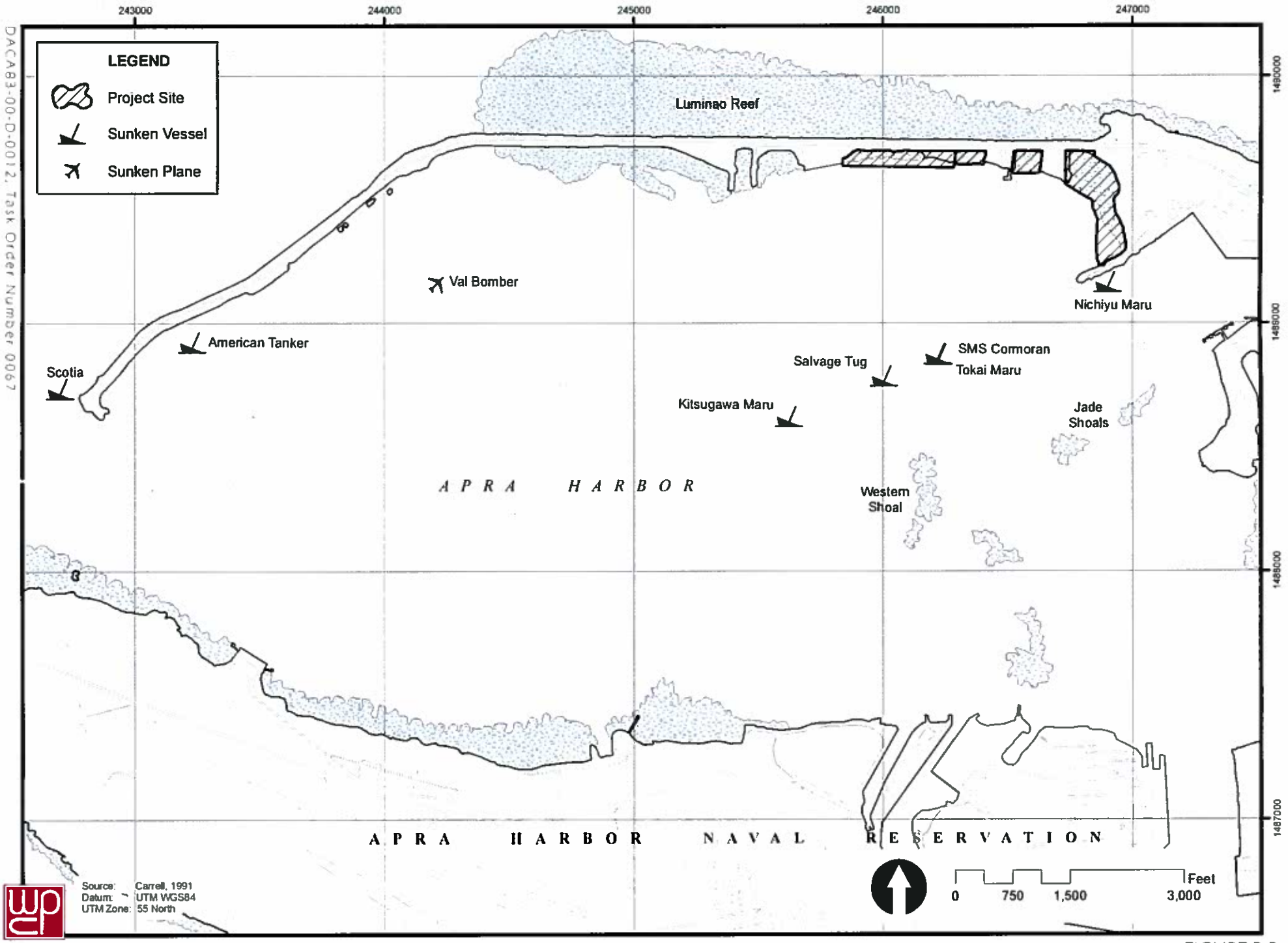


PROJECT VICINITY

FIGURE 2-2

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



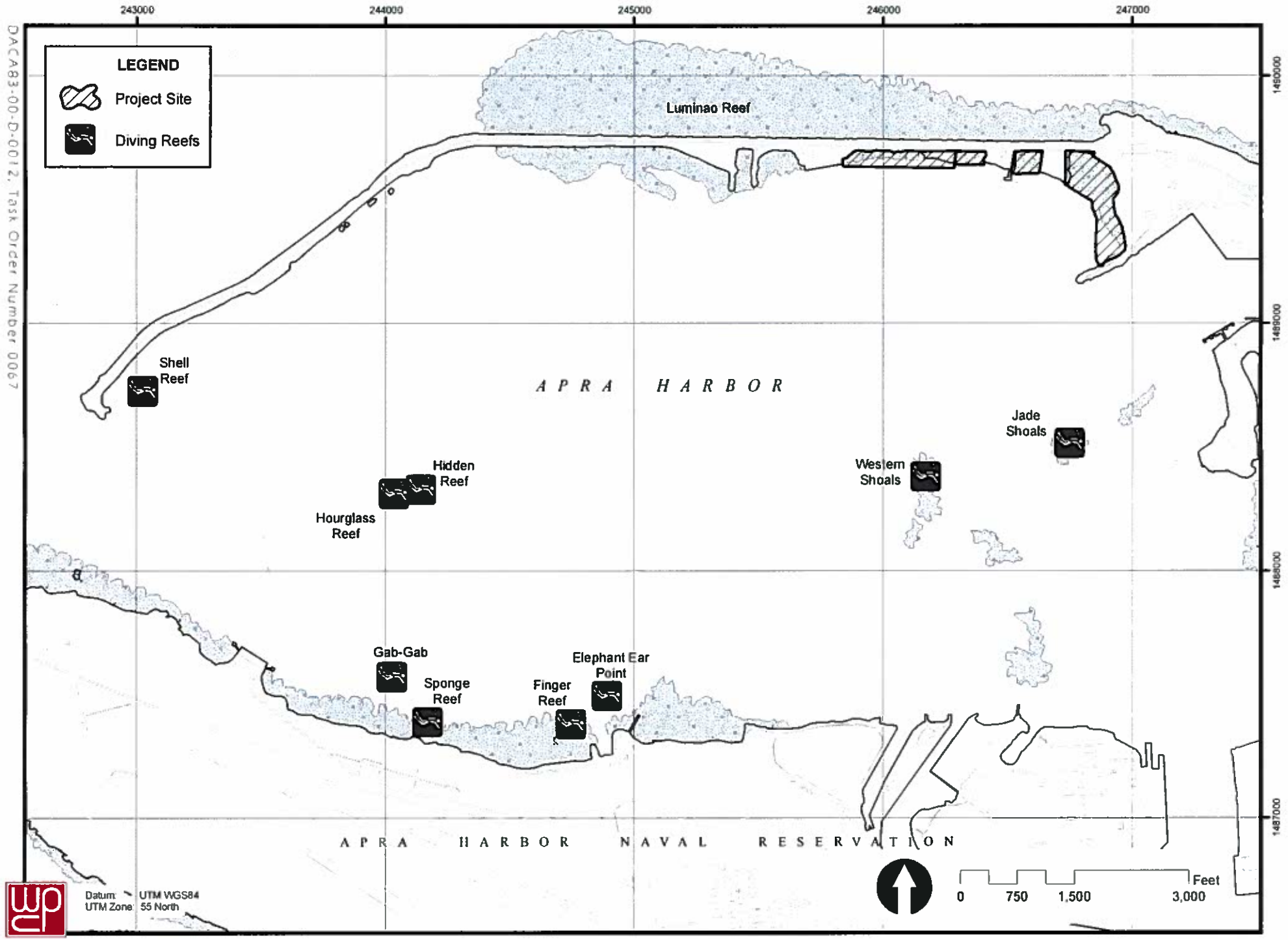
DACA83-00-D-0012, Task Order Number 0067

SUBMERGED HISTORIC RESOURCES

FIGURE 3-3

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



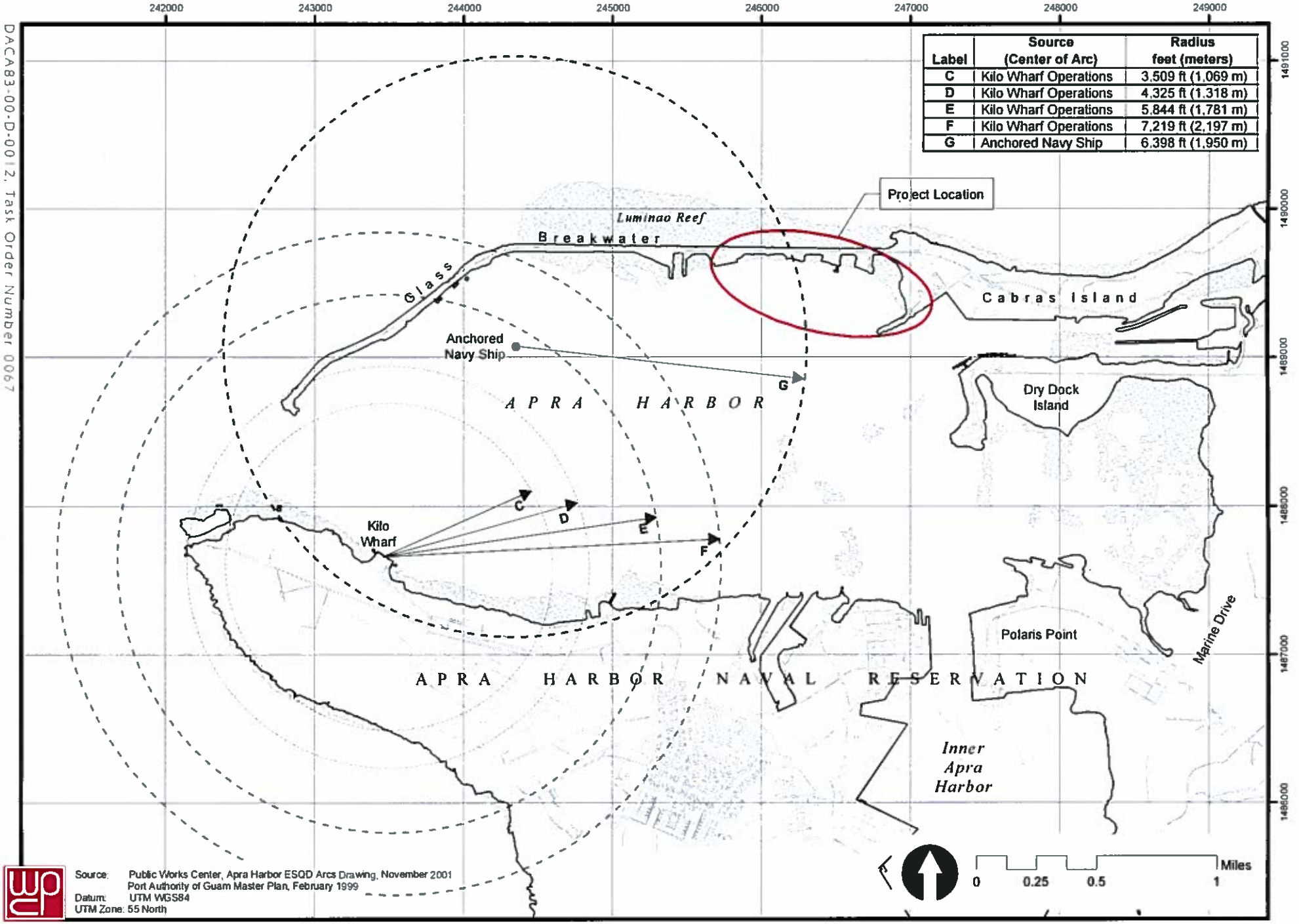
DACA83-00-D-0012, Task Order Number 0067

RECREATIONAL DIVE SITES - REEFS

FIGURE 3-4

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



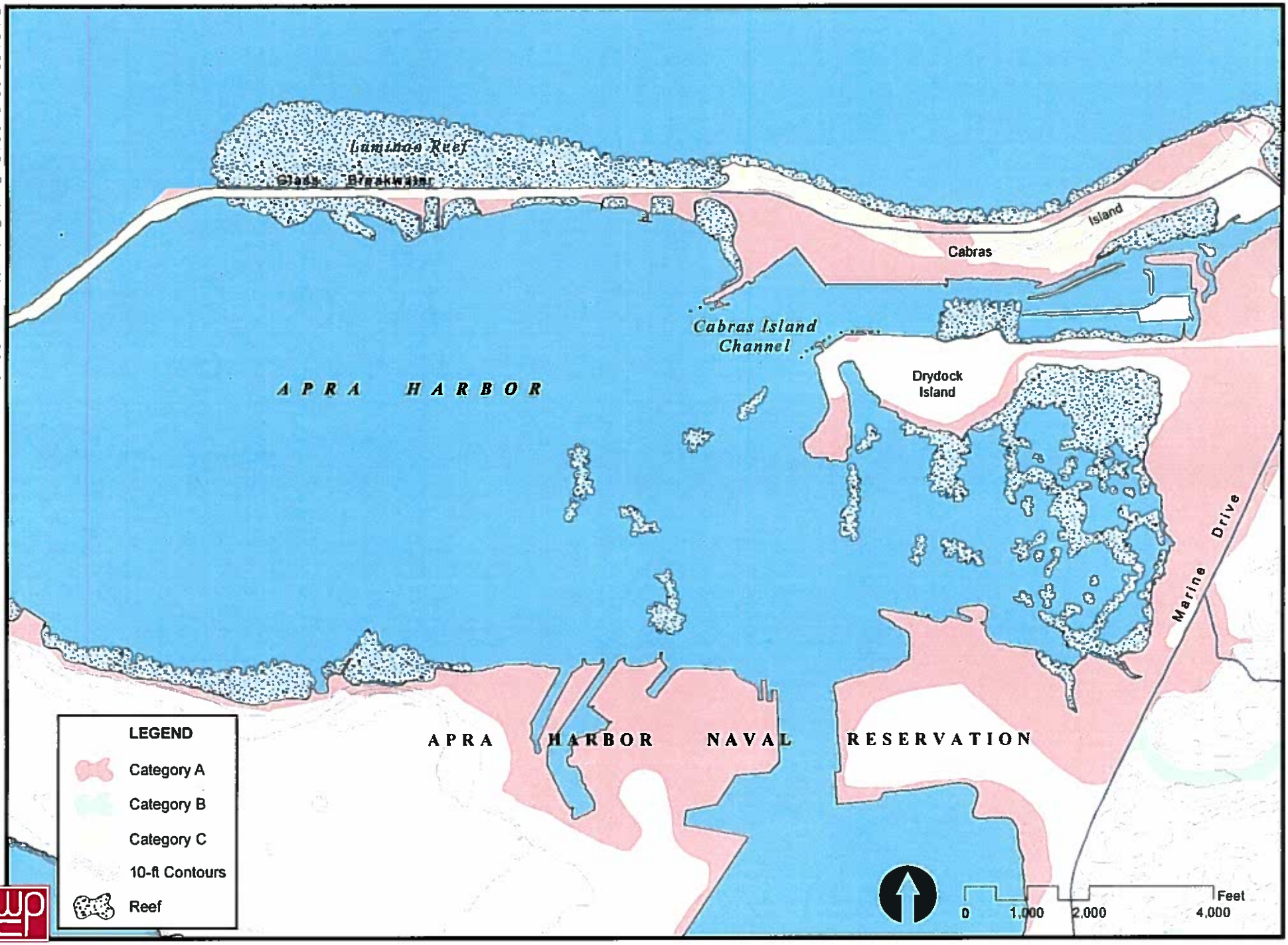
EXPLOSIVE SAFETY QUANTITY DISTANCE (ESQD) ARCS

FIGURE 3-5

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067

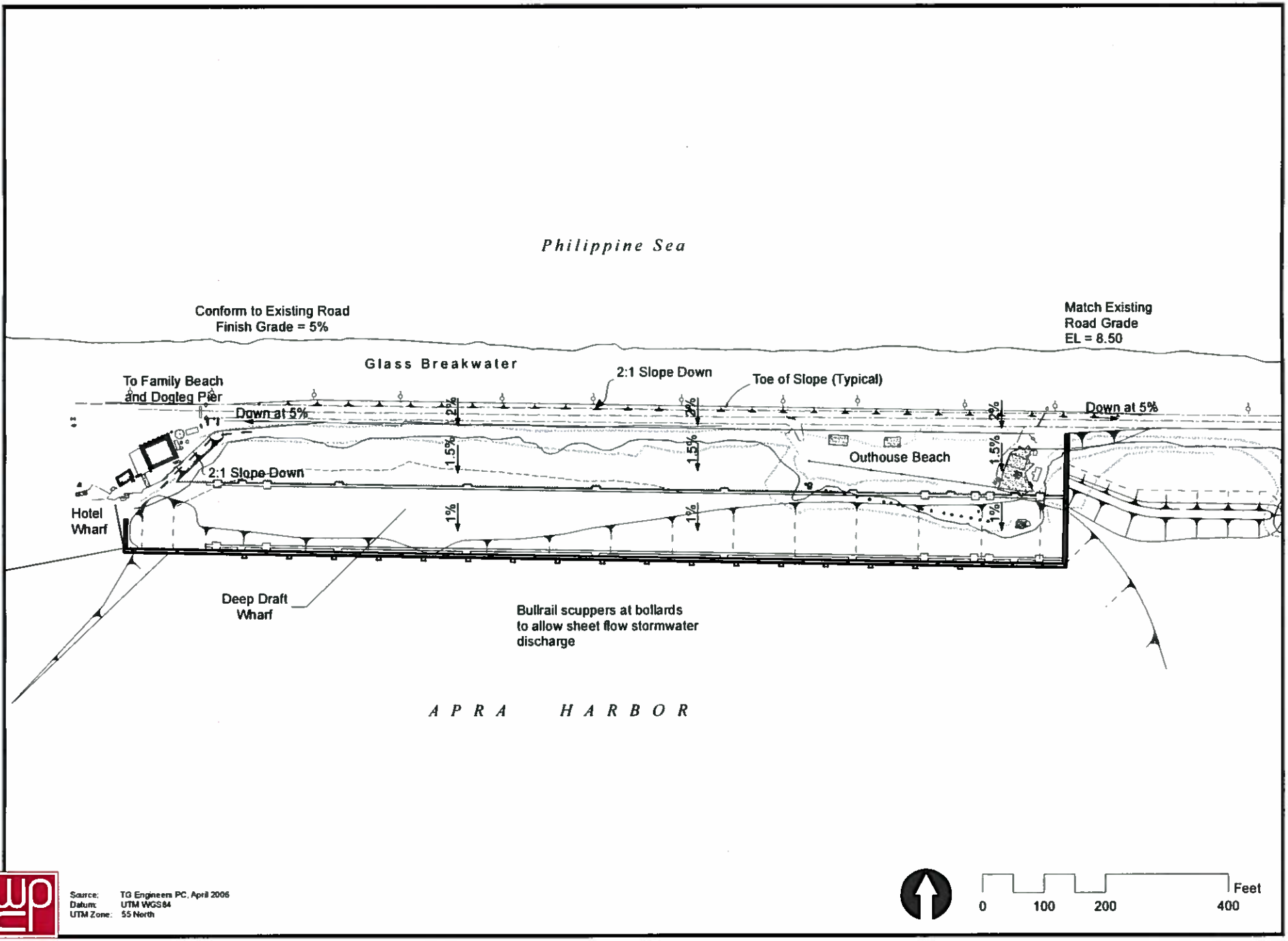


FLOOD ZONE MAP

FIGURE 3-6

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

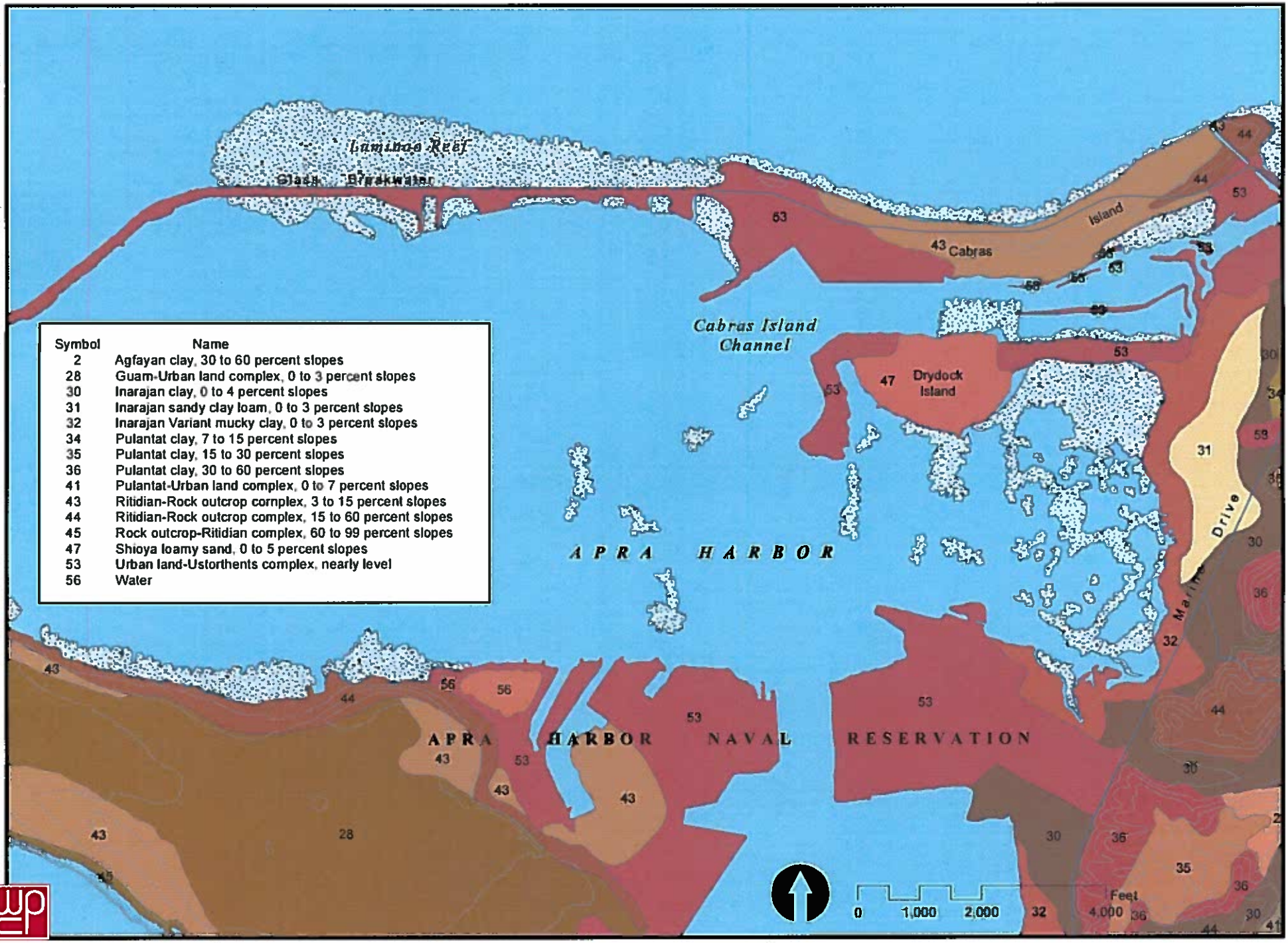


PREFERRED ALTERNATIVE - DRAINAGE PLAN

FIGURE 3-7

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



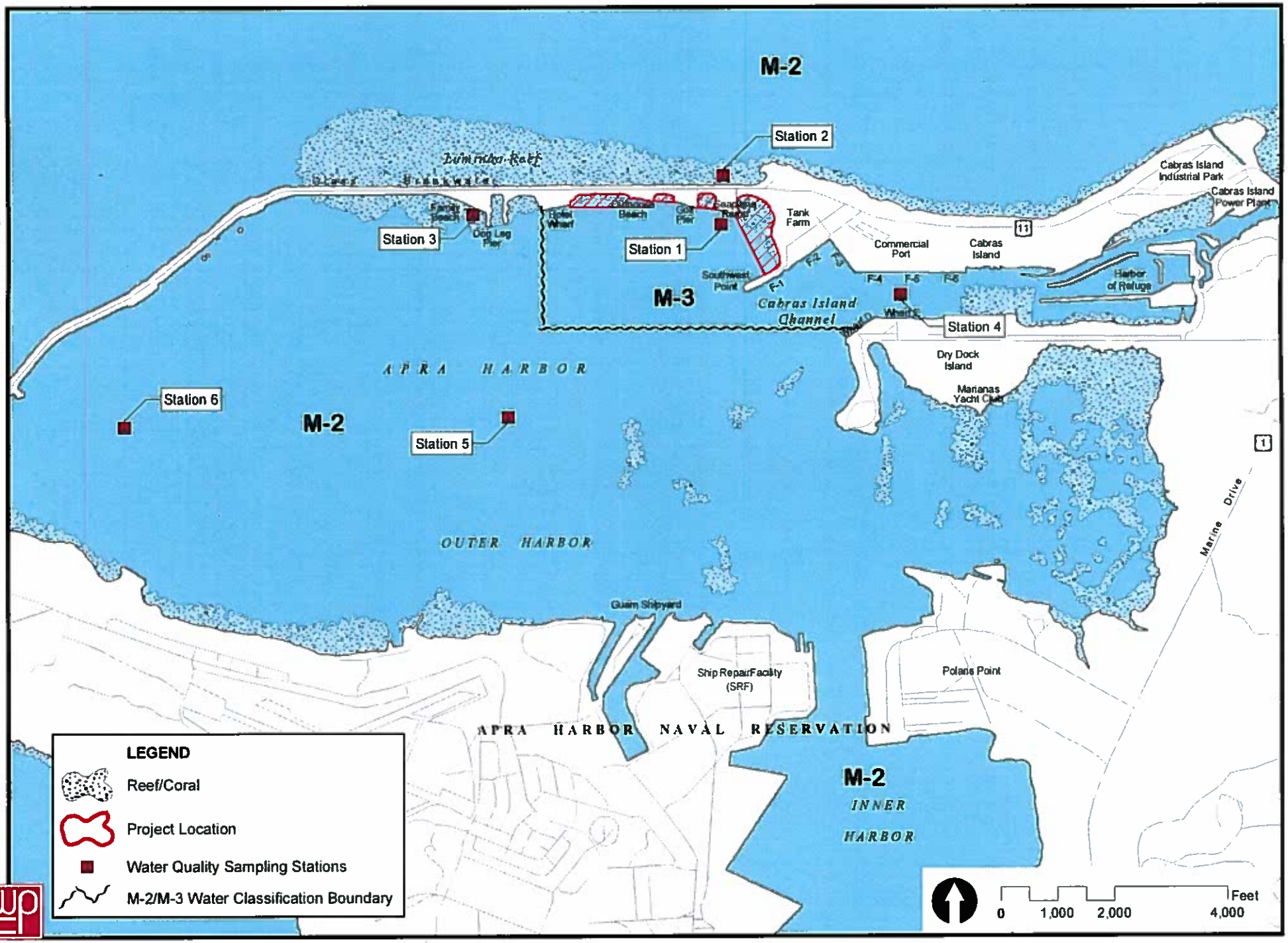
SOILS MAP

FIGURE 3-8

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067

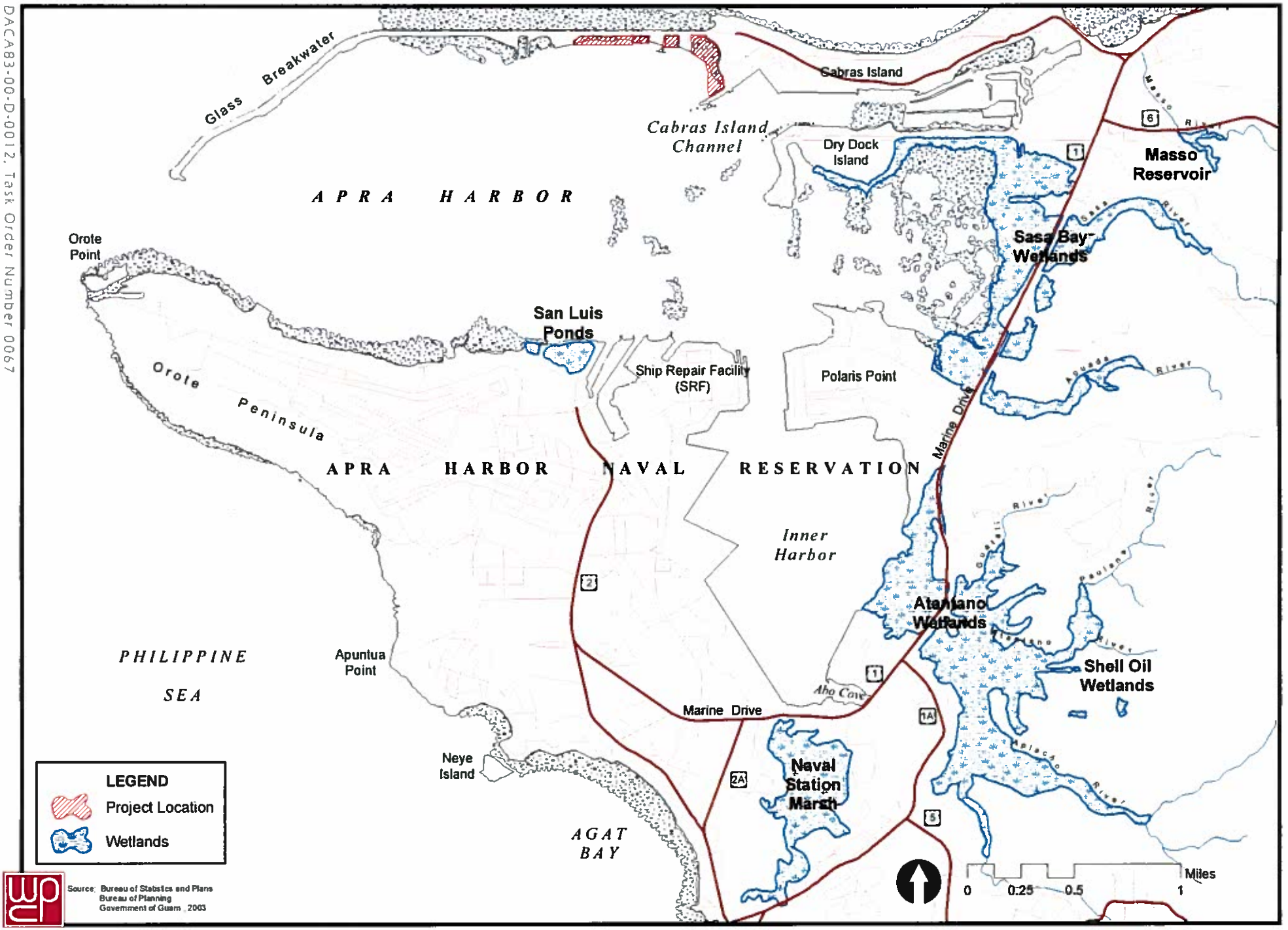


WATER QUALITY CLASSIFICATION AND SAMPLING STATIONS

FIGURE 3-9

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

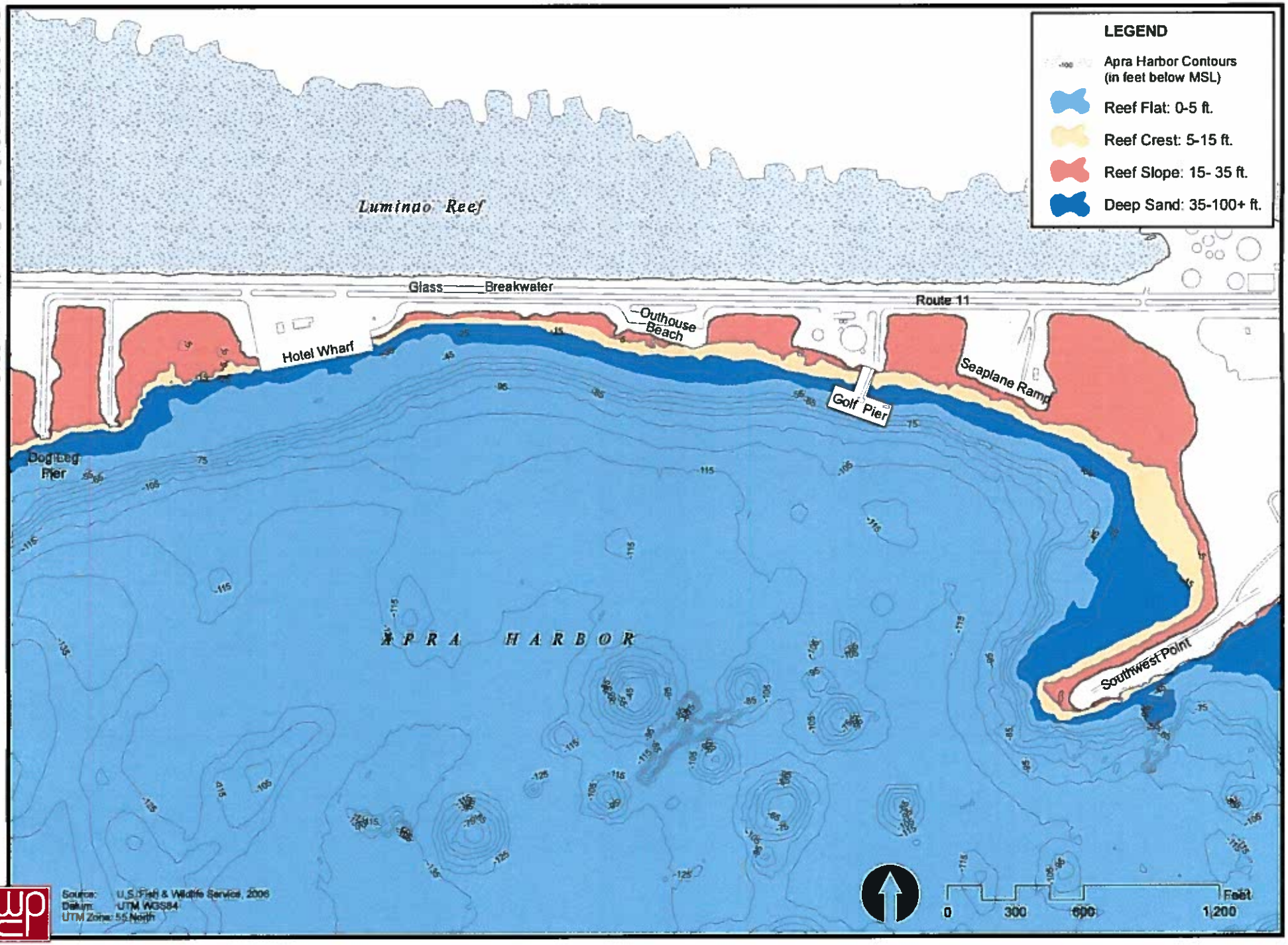


WETLANDS

Figure 3-10

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

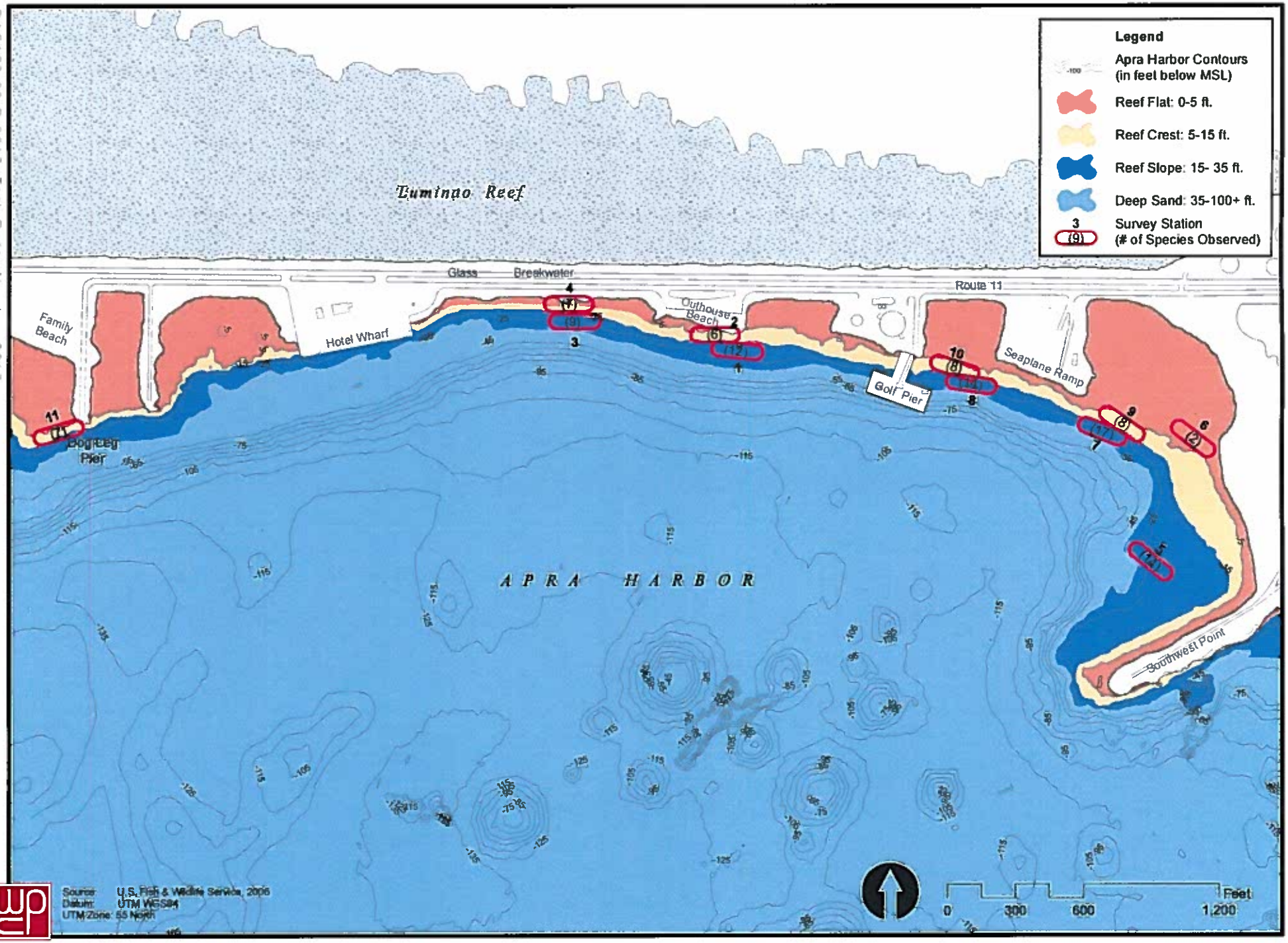


BENTHIC HABITAT - PROJECT VICINITY

FIGURE 3-11

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

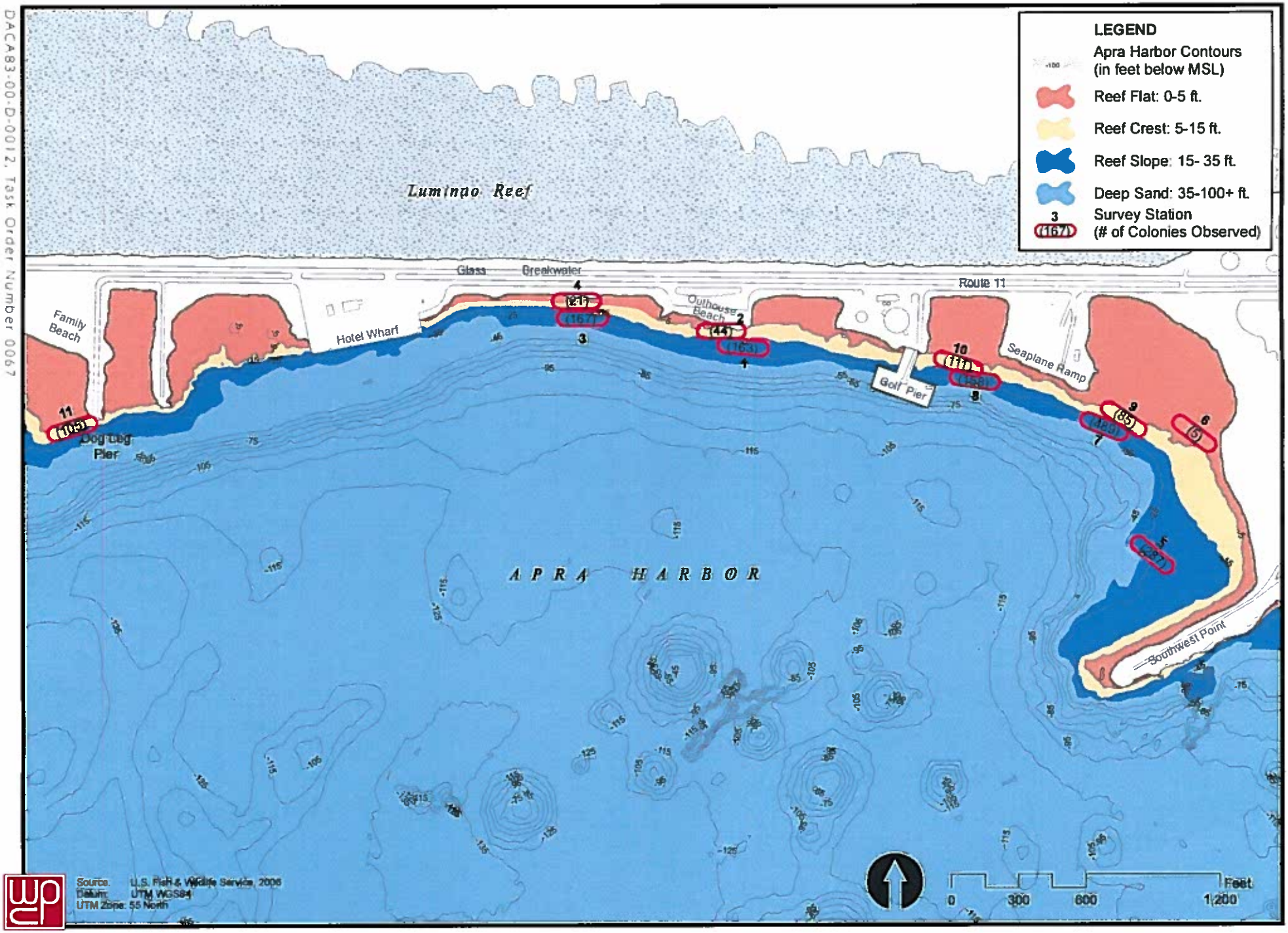


CORAL SPECIES ABUNDANCE IN PROJECT AREA

FIGURE 3-12

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

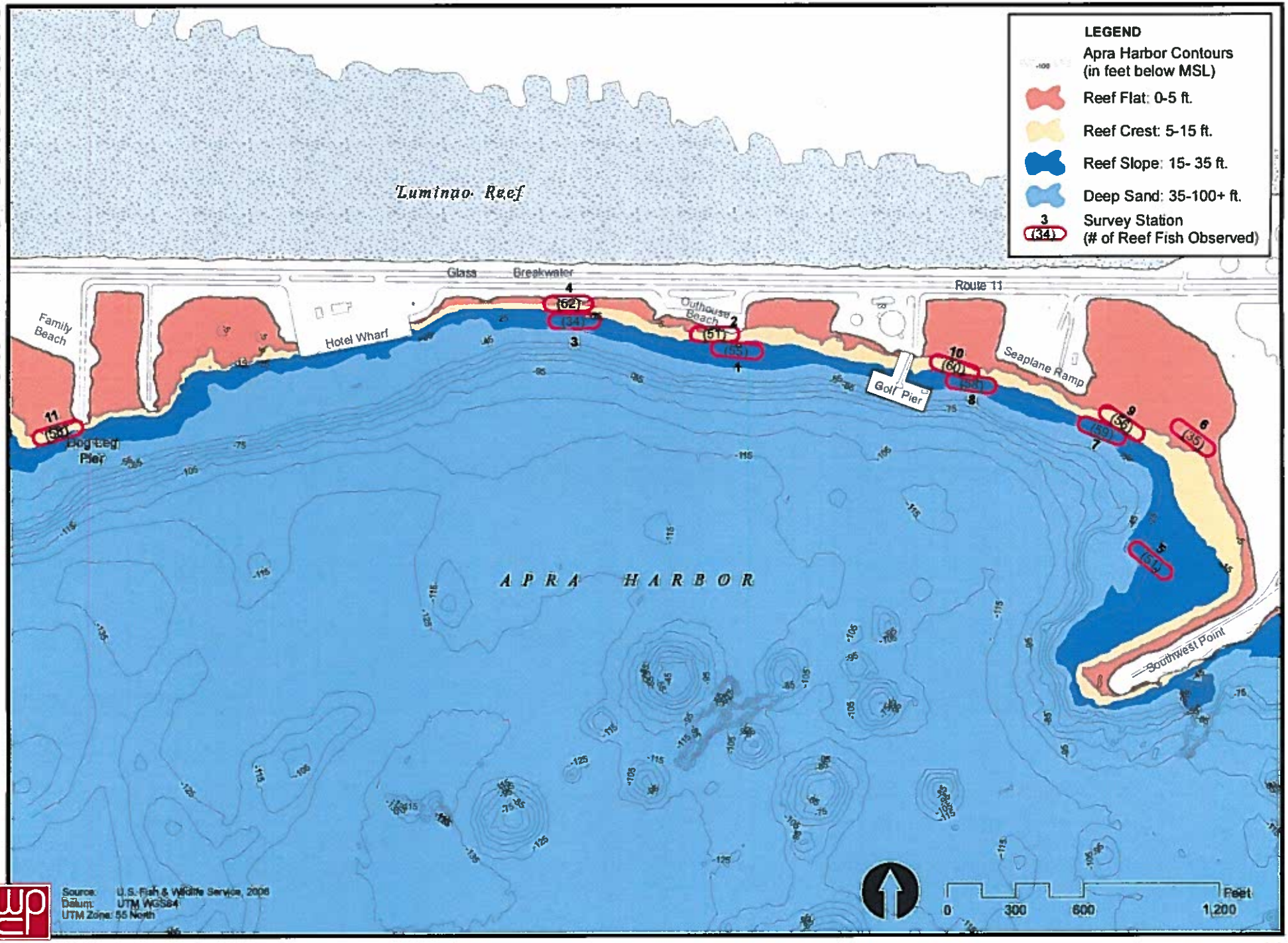


CORAL COLONY ABUNDANCE IN PROJECT AREA

FIGURE 3-13

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



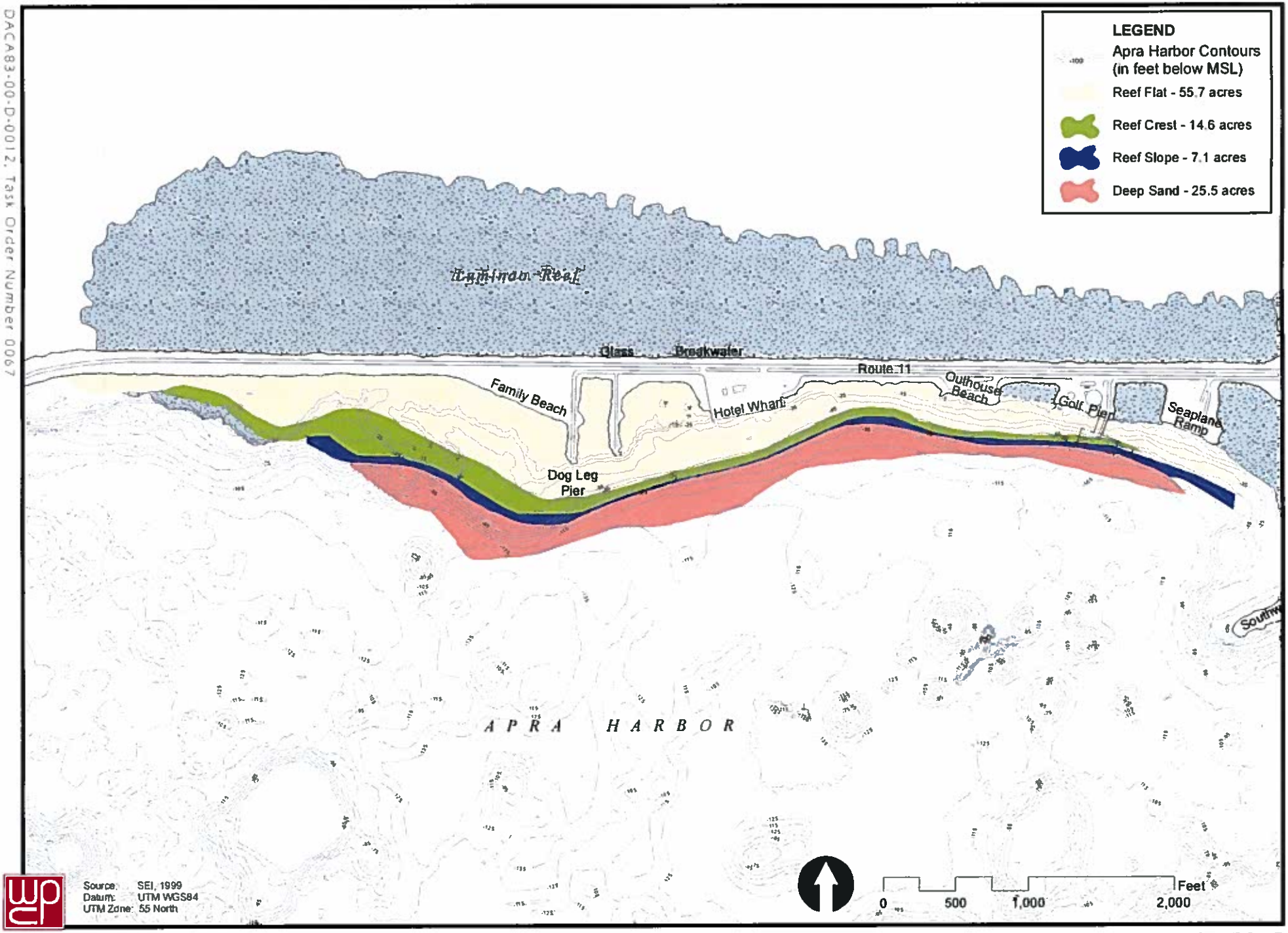
REEF FISH ABUNDANCE IN PROJECT AREA

FIGURE 3-14

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067



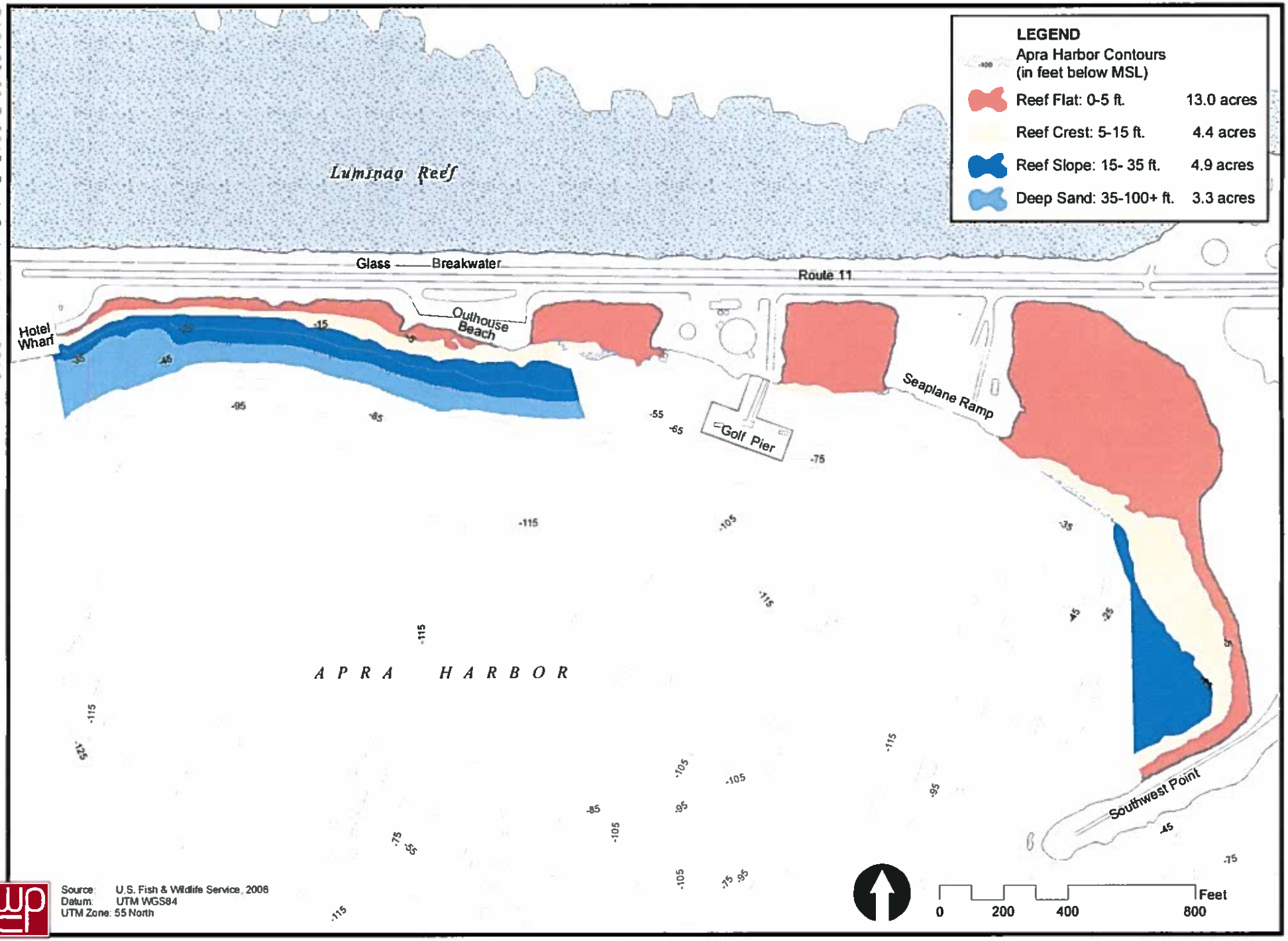
ESTIMATED IMPACT AREA DUE TO SUSPENSION AND RESUSPENSION OF SEDIMENT

FIGURE 3-15

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067



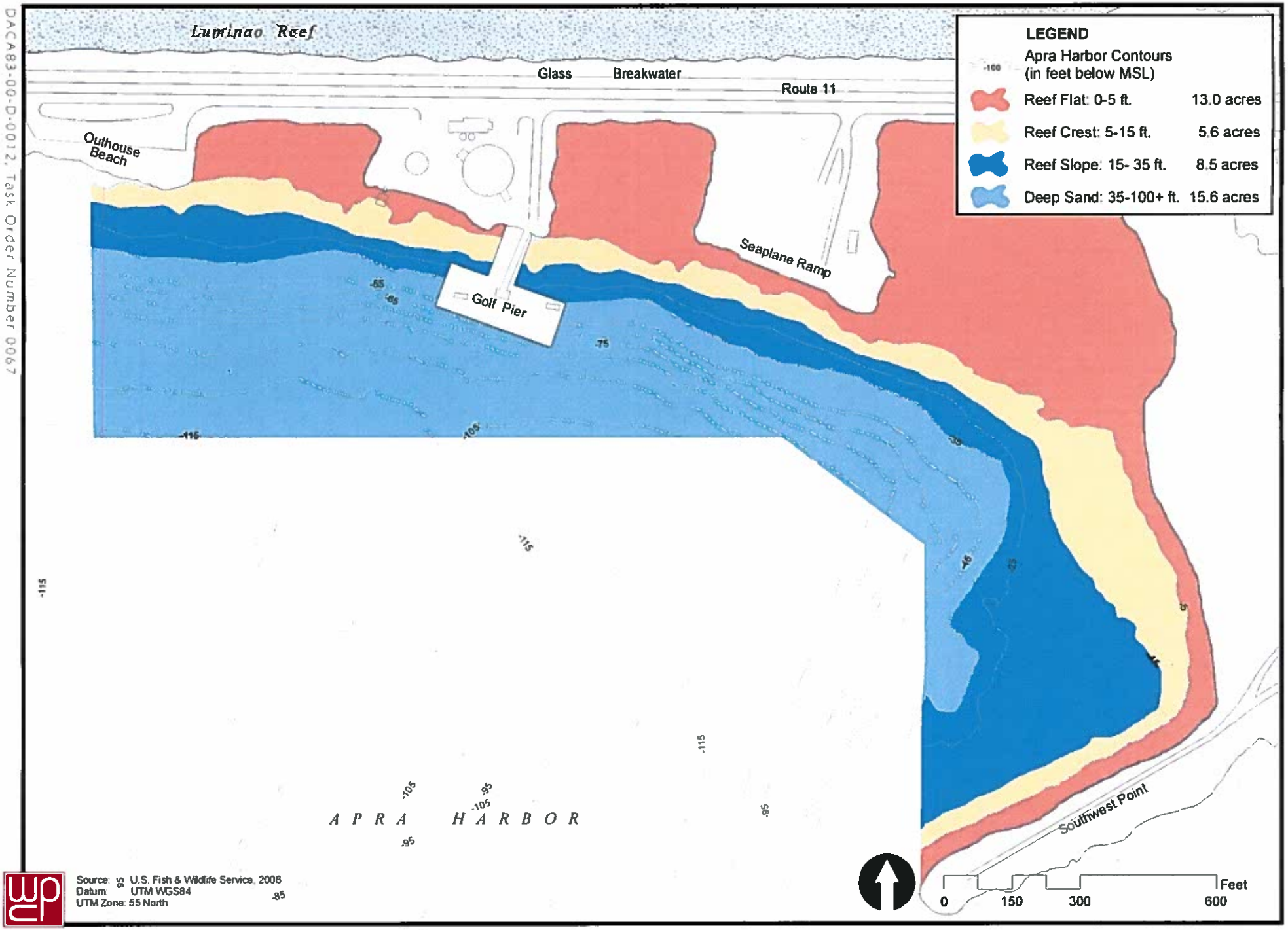
BENTHIC HABITAT IMPACTED (in acres) - Preferred Alternative and Alternative 2

FIGURE 3-16

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

DACA83-00-D-0012, Task Order Number 0067

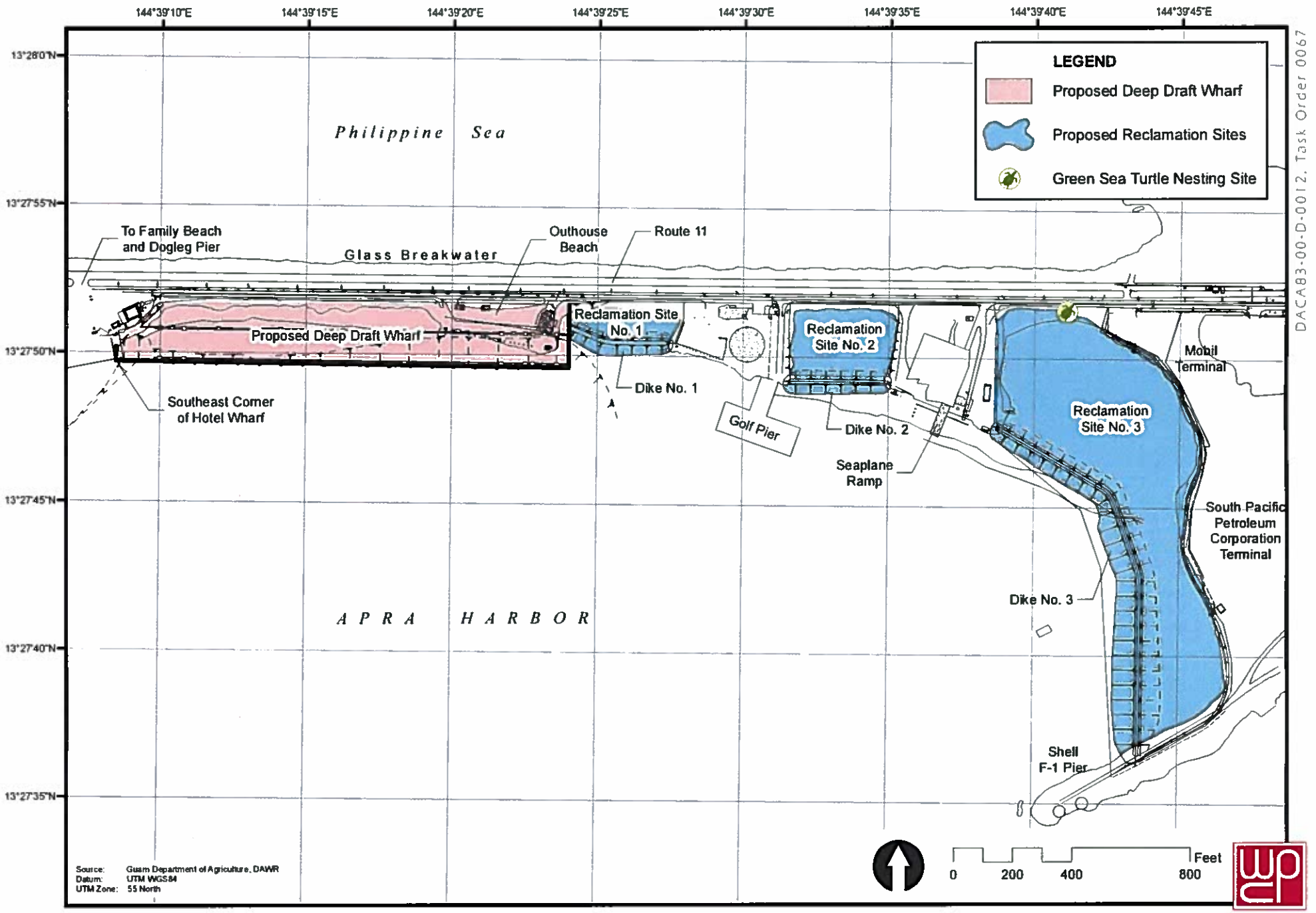


BENTHIC HABITAT IMPACTED (in acres) - Alternative 3

FIGURE 3-17

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

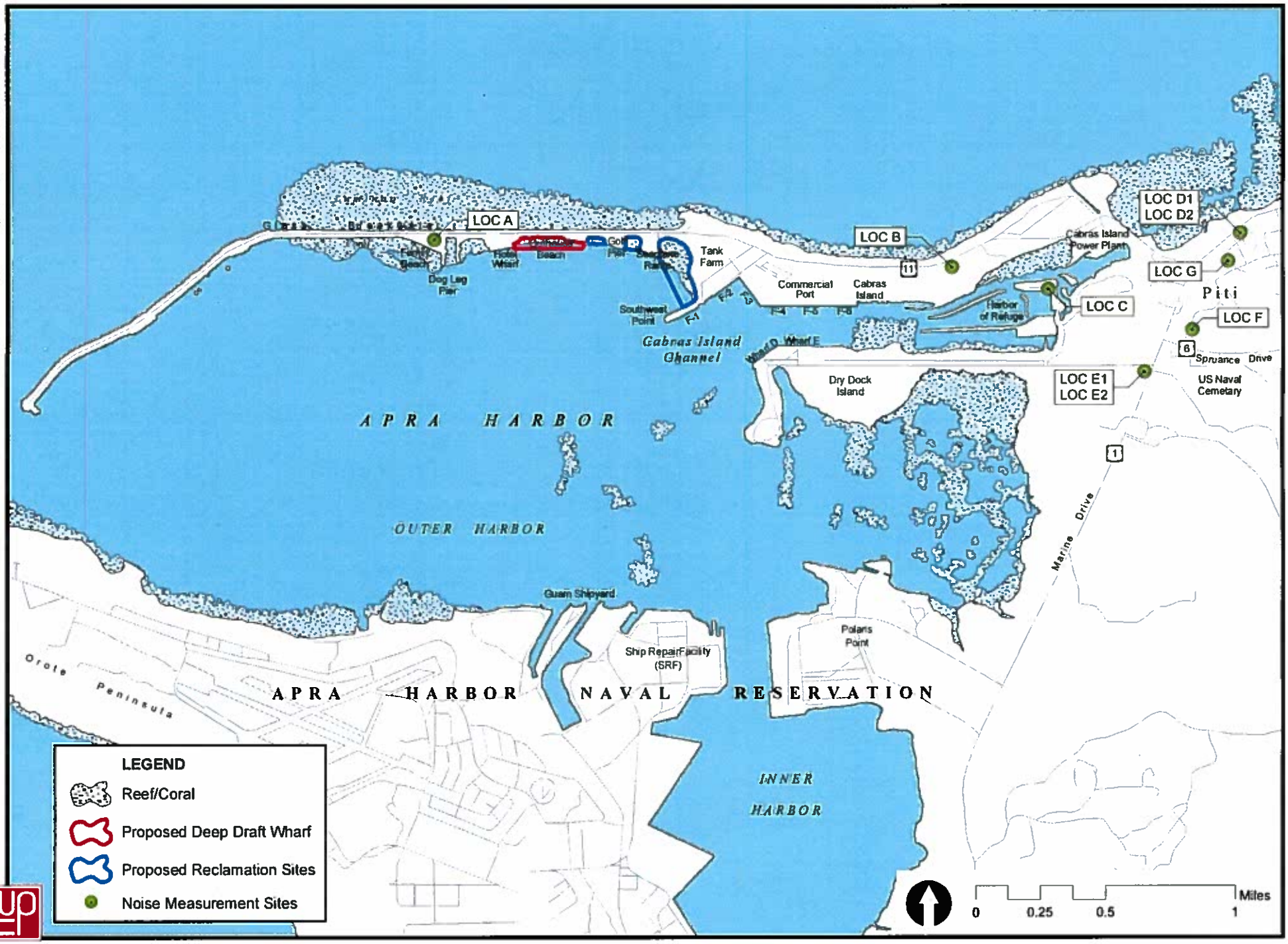


GREEN SEA TURTLE NESTING SITE

FIGURE 3-18

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

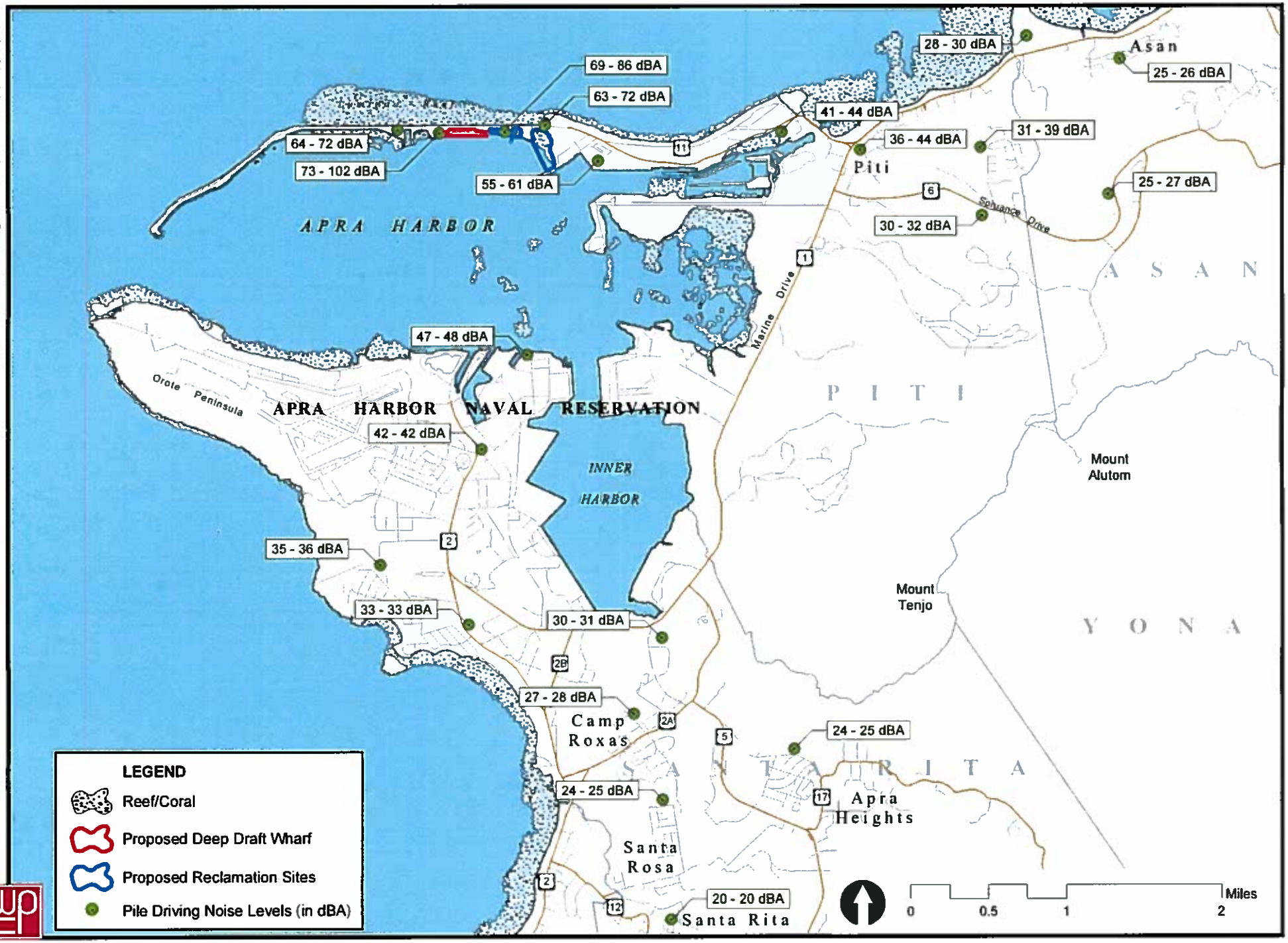


NOISE MEASUREMENT SITE LOCATIONS

FIGURE 3-19

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam



PILE DRIVING NOISE LEVELS IN PROJECT VICINITY

FIGURE 3-20

Deep Draft Wharf Improvements and Fill Environmental Impact Statement

Apra Harbor, Piti, Guam

APPENDIX G

Coastal Engineering Study

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enclosed systems such as the lagoon of Apra Harbor. Due to the lagoon's unusual features, primarily its deep waters, there are many native species that occur in Apra Harbor and perhaps nowhere else in Guam. The majority of marine alien species in Apra Harbor are restricted to man-made structures such as bulkheads and mooring buoys, not naturally occurring habitats in the harbor (Paulay et al., 2002). Competition between alien and native marine species is reduced by this separation of habitats.

The pilings and bulkheads associated with this project could eventually host alien marine species. One such species is the snowflake coral (*Carijoa*) which has become invasive in other areas of the tropical Pacific, especially shaded areas beneath piers and wharves. Post construction surveys of pier pilings may need to be undertaken by regulatory agencies to monitor for invasive species.

Impacts Assessment

Potential environmental impacts associated with proposed construction of a deep-draft wharf and multiple container yards in Apra Harbor, Guam include: degradation of water quality, loss of coral reef habitat, loss of potential turtle habitat, introduction of marine alien species, and loss of other marine biota. Direct burial of coral colonies in shallow inlets, direct mechanical disturbance as well as indirect impacts such as sedimentation and coral smothering due to increased suspended sediments could all occur as a result of project activities.

Following approved Best Management Practices for dredging operations and landside construction activities and forming a coral reef habitat mitigation plan should substantially reduce the potential impacts related to this project. Possible landside BMPs include silt curtains, siltation basins, soil stabilization, storm drain inlet protection and drainage swales. Possible in-water BMPs include in-water silt curtains, gunderbooms, and dredging operational controls.

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Biota

Coral Reef Habitat Loss and Mitigation — The actual coral acreage expected to be lost due to construction of the deep-draft wharf and storage container yards is not known at this time. The coral acreage lost would be greatly reduced by implementing Alternative No. 2 or No. 3, both of which require substantially less fill material than Alternative No. 1.

Mitigation is recommended to compensate for unavoidable loss of coral reef habitat due to direct and indirect project impacts. Under guidelines resulting from Federal Executive Order No. 13089 on coral reef protection, one of the objectives is to reduce habitat destruction as described in the Coral Reef Task Force Action Plan (USCRTF, 2002):

> Strengthen, improve and better integrate federal and state permitting and management programs for coastal development activities that impact coral reef habitats by developing long-needed technical guidance, impact thresholds and policy directives designed to minimize or avoid adverse impacts to reefs.

Actual loss acreage will need to be determined prior to creation of a mitigation plan and will depend on project design—either pier and pile or cellular sheet piles. Coral transplanting and the creation of marine protected areas (MPAs) are established methods of compensation for unavoidable coral reef habitat losses (Bentivoglio, 2003). Coral transplanting is a potential mitigation method that could be included within a broader mitigation plan (Bentivoglio, 2003). The 2003 US Fish and Wildlife Service document, "Compensatory mitigation for coral reefs in Pacific Islands" is included in this report as an Appendix.

The best available methods for transplanting corals should be determined and a suitable site to receive the corals, appropriate coral species, and time of year to transplant. The receiving site should have similar environmental conditions (depth, water clarity, temperature, and salinity) and be protected from high energy waves that could break off newly transplanted corals. A 1996 Kawaihae, Hawaii transplant project lost the majority of transplanted corals within six months due to storm waves alone (Jokiel, et al., 1999). Of the corals present in the project area, lobate *Porites* species would be good candidates for transplanting. In a study conducted in nearby Tepungan Channel, Piti, Guam, Kolinski (2002) reports successful transplantation and low mortality rates for *Porites lutea* a year after transplanting, but poor results for *Pocillopora damicornis*.

Post-transplant surveys are often not conducted long enough after transplantation, resulting in reports of far better survival than is eventually the case (Bentivoglio,

2003). Coral transplants have been found to have high survival rates within the first several months of transplanting and, in some cases, survival decreases drastically after the first year of transplanting (Bentivoglio, 2003). Initial monitoring should be undertaken within the first month after transplantation to ascertain effects of the transplanting methodology. Follow-up monitoring should be undertaken annually for up to 5 years after transplantation to determine if the transplanted corals survive the new location for an ecologically meaningful period of time.

The efficacy of coral transplanting is not only dependent on the methodology employed, but also on naturally occurring environmental conditions such as water quality, storm waves, and factors like competition with and predation by other reef inhabitants (Duenas and Associates, 1994). All of these naturally occurring factors can decrease the effectiveness of this form of coral reef mitigation and their negative impact on transplanted coral survival must be factored in when designing a mitigation plan.

Possible transplant receiving sites are the submerged lands to the west of the project area and Dog Leg Reef. These areas have similar depths, water flow, and exhibit existing healthy coral populations.

Sea Turtles — Rare and/or listed species of plants and animals such as sea turtles, whales, dolphins, and the Guam Rail were not observed during the present survey. Two sea turtles are native to the waters of Guam: the green sea turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*), both of which are federally listed threatened species. According to nine years (1995 to 2004) of Division of Aquatic and Wildlife Resources (DAWR) aerial sea turtle surveys, only 10% of the turtles sighted in all of Apra Harbor were sighted in the vicinity of proposed wharf construction. The project area shoreline is not conducive for turtle nesting due to the narrow and mostly rocky shore. The primary diet of the green sea turtle is marine algae and seagrasses (Russel and Balazs, 2000) found in shallow reef areas, while the hawksbill primarily forages on sponges (Balazs, 1978). Very little seagrass was sighted in the project area and although algae and sponges are common to the project area, it is unclear if the species present are commonly foraged by hawksbill turtles. Sea turtles present in the area during construction should not be approached, harmed, or harassed in any way. Their presence should lead to a cessation of construction activities if the are sighted in the immediate construction area and work should not recommence until after the individual has exited the area on their own volition.

Introduced species — It is important to take into consideration the need to prevent marine alien species introductions during construction and as a result of the wharf project. Marine alien species are considered especially deleterious to

of concern in the outer harbor area and that water quality is generally excellent in the project area.

Table 8. A comparison between selected Guam water quality standards and parameters measured in present Apra Harbor water quality survey.

Parameter	M-1 Ranges or Not to exceed values	M-2 Ranges or Not to exceed values	M-3 Ranges or Not to exceed values	Survey Mean Values*	Survey Ranges
Temp (°C)	+/- 1 ambient			28.5	28 - 30
Salinity (ppt)	+/- 10% ambient			34.28	34 - 34.36
DO sat (%)	minimum 75			94	84 - 115
TSS (mg/l)	5 mg/l	20 mg/l	40 mg/l	5.1 mg/l	3 - 7.6
pH	6.5 - 8.5			8.2	8.14 - 8.24
Nitrate+Nitrite (mg/l)	0.100	0.200	0.500	0.001	<0.001 - 0.002
Turbidity (NTU)	0.5 above ambient	1.0 above ambient	1.0 above ambient	0.67	0.46 - 1.28

*Arithmetic means are calculated for pH, salinity, and temperature. Geometric means are calculated for Nitrate+Nitrite, TSS, and turbidity.

Based upon the several turbidity measurements made during the present survey, typical levels appear to range from about 0.45 to 0.68 NTU (Figure 8). Higher turbidity levels were associated with increased chlorophyll α concentrations and a resulting correlation coefficient (r-value) of 0.79 (r-squared value of 0.62) indicating that 62 percent of the variation in turbidity can be explained by changes in chlorophyll concentration. The fact that increased chlorophyll concentrations were not associated with increased levels of nitrate+nitrite indicates that inorganic nitrogen may be limiting to marine plant productivity (algae/phytoplankton) in these waters.

Water quality conditions within the outer harbor are representative of open coastal waters and indicate that these waters are well mixed (as shown by little spatial variation in temperature, salinity, and pH) with little influence from terrestrial runoff (as shown by the low nutrient concentrations and particulate levels).

Turbidity demonstrated the greatest range of variation of any water quality parameter measured during the present survey.

High turbidity and TSS levels caused by dredge and fill operations during construction are a concern. High levels of suspended sediment in the water column may cause siltation-induced stresses to corals and filter feeding invertebrates in the outer harbor. The species-rich reef slope surrounding Southwest Point and the species rich coral reef community at Jade Shoals are vulnerable to siltation impacts; however, because flow direction is generally to the west, suspended sediments from dredge and fill activities are not likely to reach either the reef slope of Southwest Point or Jade Shoals. Because of the westward current flow, there is some potential for project-generated silt plumes to flow towards Dog Leg Reef, an area with 50 to 75% coral cover, but the extent of damage would be dependent on quantity of silt and duration of the event.

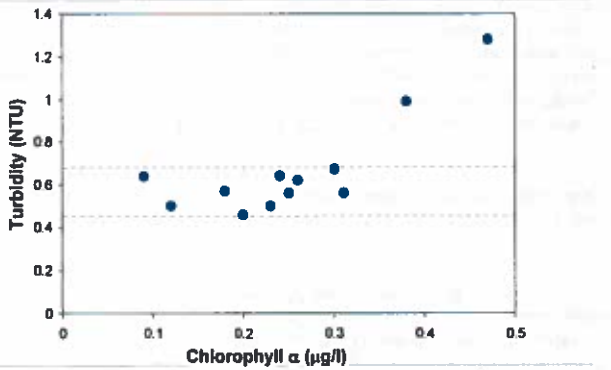


Figure 9. Comparison of chlorophyll α and turbidity concentrations in Apra Harbor. Dashed lines indicate range of typical conditions.

In general, construction activities are not likely to influence water quality parameters except turbidity and TSS; therefore, turbidity should be the primary water quality monitoring parameter measured prior to, during, and after construction. Following best management practices (BMPs) for land side construction and dredging operations should greatly reduce the likelihood of generating adverse turbidity plumes.

Table 7 (continued).

MONOCOTYLEDONAE			
ARECACEAE			
Cocos nucifera L.	*niyok*, coconut palm	Ind.	O
CYPERACEAE			
Cyperus ligularis L.	---	Nat.	U
Cyperus polystachyos Rott.	---	Nat.	C
indet.	---		
POACEAE (GRAMINEAE)			
Cenchrus echinatus L.	sandbur	Nat.	U
Chloris radiata (L.) Sw.	radiate finger grass	Nat.	
Cynodon dactylon Kuntze	Bermuda grass	Nat.	
Dactyloctenium aegyptium (L.) Willd.	beach wiregrass	Nat.	

Status = distributional status
End. = endemic; native to the Mariana Islands and found naturally nowhere else.
Ind. = indigenous; native to the Mariana Islands, but not unique to the Marina Islands.
Nat. = naturalized, exotic, plant introduced and well-established outside of cultivation.
Orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).

Abundance = occurrence ratings for plants by area on April 10, 2005
R = Rare - only one or two plants seen.
U = Uncommon - several to a dozen plants observed.
O = Occasional - found regularly, but not abundant anywhere.
C = Common - considered an important part of the vegetation and observed numerous times.
A = Abundant - found in large numbers; may be locally dominant.
AA = Abundant - abundant and dominant; defining vegetation type.
P = Present - noted just outside of study area; abundance not recorded.

Notes:
(1) Observed especially along the highway r-o-w or other ruderal places.
(2) Observed mostly in field areas, but also in survey area.
(3) Observed plant(s) lacked flowers or fruit; identification uncertain.

The common coastal plants and ruderal weeds found within the project area will most likely be eliminated by proposed construction, as will the sandy shorelines of the four project areas.

DISCUSSION

Water Quality

The Guam Environmental Protection Agency (GEPA) has defined marine waters in Section 5102B of the Guam Water Quality Standards 2001 Revision to include all "coastal waters off-shore from the high water mark, including estuarine waters, lagoons and bays, brackish areas, wetlands and other special aquatic sites, and other inland waters that are subject to ebb and flow of the tides" (GEPA, 2001).

These marine waters are further defined in Section 5102B of the standards as:

1) **Category M-1 Excellent** - high water quality to protect for whole body contact recreation, and to ensure the preservation and protection of marine life, and enable the pursuit of scientific research as well as aesthetic enjoyment. These waters shall remain substantially free from various types of pollution which can reduce the water's quality;

2) **Category M-2 Good** - must be of sufficient quality to allow for propagation and survival of marine organisms, aesthetic enjoyment, and whole body contact recreation;

3) **Category M-3 Fair** - intended for general, commercial, and industrial use, while allowing for protection of marine life, aesthetic enjoyment, and limited body contact recreation.

Most of the waters in Apra Harbor are classified as M-2 (our Stations 2, 3, 5 and 6). Stations 1 and 4 near the eastern end of Glass Breakwater are in waters designated Category M-3.

A summary of the Guam water quality standards for specific parameters measured during this survey are presented in Table 8 along with mean values and ranges recorded in Apra Harbor. The outer harbor area of Apra Harbor is characterized by little variation in temperature, salinity, pH and nutrients, while particulates (TSS, turbidity, and chlorophyll) were somewhat more variable.

All of the water quality parameters measured during the present survey are in compliance with M-2 and M-3 water quality standards. Also, with the exception of TSS and one value for turbidity, all measured water quality parameters were in compliance with M-1 standards. In fact, recorded nitrate-nitrite concentrations were two orders of magnitude lower than M-1 standards and often present in undetectable amounts. This demonstrates that nutrient-enrichment is not an issue

Fishing grounds used by local fisherman will not necessarily be lost as pier pilings may act to aggregate fishes near the piers and could locally enhance fish stocks of some species.

Terrestrial Plants

The landscape in the project area is that of a highly disturbed nature (Fig. 8) being originally created as man-made fill, and perhaps regularly cleared of much vegetation by overwash of typhoon waves. Thus, the area is colonized by salt-tolerant, fast-growing species most of which are less than 2 m in height with the exception of ironwoods (*Casaurina equisetifolia*) and coconut palms (*Cocos nucifera*). The plants are all common coastal plants and ruderal weeds, equipped to deal with environmental conditions associated with this harsh environment. The fast lands of the project area are dominated by Indian fleabane (*Pluchea indica*), beach morning glory or *alahai tasi* (*Ipomoea pes-caprae* subsp. *brasiliensis*), *tangan tangan* (*Leucaena leucocephula*), and *nanaso* (*Scaevola sericea*) (Table 7). A total of twenty-two different plant species were observed, nine of which are considered native (indigenous species) to the Mariana Islands, however no endangered or endemic (unique to the Mariana Islands and found naturally nowhere else) plants were identified.



Figure 8. Coastal strand habitat along Glass Breakwater.

Table 7. Listing of plants (flora) observed along Glass Breakwater near pier improvement sites on April 10, 2005 at Apra Harbor, Guam

FAMILY *Genus species*	*Chamorro name,* common name	Status	Local Abundance
	FLOWERING PLANTS DICOTYLEDONAE		
ASTERACEAE (COMPOSITAE)			
Bidens alba (L.) DC	—	Nat.	C
Bidens pilosa Kunth.	—	Nat.	C
indet.	—	—	O
BORAGINACEAE			
Heliotropium procumbans Mill.	—	Nat.	O
Tournefortia argentea L. fil.	*hunek*, tree heliotrope	Ind.	R
CASUARINACEAE			
Casuarina equisetifolia L.	*gago*, ironwood	Nat.	C
COMBRETACEAE			
Terminalia catappa L.	*talisai*, tropical almond	Ind.	R
CONVOLVULACEAE			
Ipomoea pes-caprae (L.) R. Br.	*alahaitasi*	Ind.	A
CUSCUTACEAE			
Cuscuta campestris Yuncker	dodder	Nat.	U
EUPHORBIACEAE			
Chamaesyce hirta (L.) Millsp.	garden spurge	Nat.	U
Euphorbia cyathophora Murray	dwarf poinsettia	Nat.	U
Euphorbia sp.	—	Nat.	R
FABACEAE			
Leucaena leucocephala (Lam.) deWit	*tangan tangan*	Nat.	A
Macroptilium atropurpureum (DC) Urb.	—	Nat.	U
GOODENIACEAE			
Scaevola sericea Vahl	*nonasu*	Ind.	C
LAURACEAE			
Cassytha filiformis L.	false dodder	Nat.	U
LYTHRACEAE			
Pemphis acidula	*nigas*	Ind.	U
MALVACEAE			
Hibiscus tiliaceus L.	*pago*	Ind.	C
Thespesia populnea L.	*banalo, kilulu*	Ind.	O
RHAMNACEAE			
Colubrina asiatica (L.) Lam.	*gasoso*	Ind.	A
SCROPHULARIACEAE			
Bacopa procumbans (Miller) Greenman	—	Nat.	U
VERBENACEAE			
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	Nat.	

Table 5 (continued).

Species Name	Common name	Feeding preference	Number
Caranx i e (sexfasciatus?)	(*Ee*)	carnivore	123
Selar crumenophthalmus	bigeye scad (*atulai*)	carnivore	117
Lethrinus harak	blackspot emperor (*mafute'*)	carnivore	85
Total number			17,744

Data obtained from fisherman catch surveys represent useful information about fishery resources but are not actual numbers of fishes living in the harbor, indicative at best of perhaps relative abundance when compared with similar catch data from elsewhere on the island. Catch data also reflect effort: the number of fishermen attempting to catch fish and the types and efficiency of methods used in a given area. According to DAWR data, more fish (4.8 times as much) are caught within the project area (17,744; DAWR-Location 20), than the area immediately to the west, between Family Beach and Spanish Rocks (4,694; DAWR-Location 19). However, most of these fish are small abundant planktivores like the anchovy and sardine. If fish catch is considered by weight instead of numbers, the catch is five and a half times higher within the project area (166 kg; DAWR-Location 20) than the area to the west (30 kg; DAWR-Location 19).

It appears that the wharf project area yields greater fisherman catches by numbers and biomass than the nearby waters to the west. Suggesting the area is an important area for fisherman as compared to the nearby waters to the west. Again, these numbers could reflect more fishermen utilizing the area rather than more fishes being present. DAWR fish catch data demonstrate the interesting result that within the project area, eight of the top ten species (by weight) are carnivores, whereas the catch to the west is dominated by herbivores and omnivores with only three carnivores making the top ten list.

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Sea turtles are reported from Apra Harbor. The average number of sea turtles observed in the wharf project area was 3 turtles per year, while an average of 31 turtles per year were observed for the entirety of Apra Harbor (data calculated from monthly aerial surveys between 1995 and 2004 and provided by Guam DAWR).

Table 6. Top ten fisheries species as average weight caught in the project area (DAWR-Location 19) and west of the project area (DAWR-Location 20), 1990-2004; Data provided by Guam DAWR).

DAWR-Location 19 (west of wharf project area)			
Species Name	**Common name**	**Feeding preference**	**Weight (kg)**
Cheilinus trilobatus	tripletail wrasse (*a'aga*)	carnivore	6.25
Naso lituratus	orange-spine unicornfish (*hangun*)	herbivore	5.082
Chlorurus microrhinos	gibbous parrotfish (*palakse* or *lagua*)	herbivore/omnivore	3.628
Abudefduf sexfasciatus	scissortail sergeant (*fomho*)	herbivore	3.339
Stolephorus indicus	Indian anchovy	herbivore/omnivore	3.150
Naso unicornis	bluespine unicornfish (*tatuga*)	herbivore	2.780
Lethrinus olivaceous	longface emperor	carnivore	1.845
Acanthurus xanthopterus	yellowfin surgeonfish (*hugupao*)	herbivore/omnivore	1.626
Siganus spinus	scribbled rabbitfish (*hiteng* or *sesyon*)	herbivore	1.293
Epinephelus merra	honeycomb grouper (*gadao*)	carnivore	1.279
Total			30.272
DAWR-Location 20 (wharf project area)			
Decapterus macrosoma	shortfin scad	carnivore	40.259
Lethrinus harak	blackspot emperor (*mafute'*)	carnivore	25.774
Selar crumenophthalmus	bigeye scad (*atulai*)	carnivore	22.345
Acanthurus xanthopterus	yellowfin surgeonfish (*hugupao*)	herbivore/omnivore	19.165
Caranx melampygus	bluefin trevally (*tarakitu*)	carnivore	11.465
Triaenodon obesus	white tip reef shark	carnivore	10.562
Lethrinus olivaceus	longnose emperor (*mafute'* or *lililok*)	carnivore	10.497
Octopus sp.		carnivore	9.853
Octopus ornatus		carnivore	8.870
Dussumieria sp. B	sardine	herbivore/omnivore	7.500
Total weight			166.29

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: Project Area	Location: Control Areas	Location: Lagoon Floor
Chaetodon ulietensis	Pacific doublesaddle butterflyfish	1, DB	HW, DLP	
Heniochus chrysostomus	pennant bannerfish		DLR	
POMOCENTRIDAE	damselfishes			
Dascyllus aruanus	humbug dascyllus	2B	DLP	
Abudefduf sexfasciatus	scissortail sergeant		DLP, DLR	
Chrysiptera cyanea	blue devil	1		
LABRIDAE	wrasses			
Halichoeres trimaculatus	threespot wrasse	1		
Cheilinus sp.			HW	
SCARIDAE	parrotfishes			
Chlorurus sordidus	bullethead parrotfish	DB, SPR	HW, PP, DLR, DLP	
GOBIIDAE				
Amblygobius phalaena	brown-barred goby	2B		
indet.,	Alphaeid shrimp symbiont			X
MICRODESMIDAE	dartfishes			
Ptereleotris evides	blackfin darter		DLR	
ZANCLIDAE	Moorish idols			
Zanclus cornutus	Moorish idol	SPR	HW	
ACANTHURIDAE	surgeonfishes and unicornfishes			
Acanthurus blochii	ringtail surgeonfish		HW, DLP	
Naso lituratus	orangespine unicornfish		HW	
BALLISTIDAE	triggerfishes			
Rhinecanthus aculeatus	Picassofish	DB	DLP	

Project Areas:
- 1 – Project Area 1, between Hotel Wharf and Outhouse Beach, site of proposed deep-draft wharf
- DB – Outhouse Beach area
- 2A – Project Area 2A, between Outhouse Beach and Gulf Pier, site of proposed storage container yard
- GP – Gulf Pier area
- 2B – Project Area 2B, between Gulf Pier and Sea Plane Ramp, site of proposed storage container yard
- SPR – Sea Plane Ramp area
- 2C – Project Area 2C, between Sea Plane Ramp and Southwest Point (Southwest Point), site of proposed storage container yard

Control Areas:
- DLR – Dog Leg Reef
- DLP – Dog Leg Pier area
- PP – Southwest Point area, not inside project Area 2C

Lagoon Floor: Silty sand bottom areas between 10 and 15 m (30 and 50 ft) depth.

QC: All species were observed in the field by the biologist on April 10, 2005. No specimens were collected for later identification in the laboratory or saved as voucher specimens.

(between the west end of Cabras Island and the west end of Family Beach). The top 10 fish species caught by fisherman in the vicinity of the proposed project area (DAWR-Location 20) and the area immediately west of the project area (DAWR-Location 19) between 1990 and 2004 are listed by number of fish caught and by weight of fish in Table 5 and 6, respectively (DAWR, 2005)

Table 5. Top ten fisheries species as average number caught in the project area (DAWR-Location 19) and west of the project area (DAWR-Location 20), 1990-2004; Data provided by Guam-DAWR).

Species Name	Common name	Feeding preference	Number
DAWR-Location 19 (west of wharf project area)			
Stolephorus indicus	Indian anchovy	herbivore/omnivore	4500
Abudefduf sexfasciatus	scissortail sergeant (*fomho*)	herbivore	63
Naso lituratus	orange-spine unicornfish (*hangun*)	herbivore	50
Cheilinus trilobatus	tripletail wrasse (*a'agu*)	carnivore	20
Siganus spinus	scribbled rabbitfish (*hiteng* or *sesyon*)	herbivore	13
Mulloidichthys flavolineatus	yellowstripe goatfish (*satmoneten pento*)	carnivore	11
Chlorurus sordidus	multicolored parrotfish (*lagua or palakse'*)	herbivore	11
Epinephelus merra	honeycomb grouper (*gadao*)	carnivore	10
Acanthurus triostegus	convict surgeonfish (*kichu*)	herbivore	9
Abudefduf septemfasciatus	banded sergeant (*fomho*)	herbivore	7
Total number			4,694
DAWR-Location 20 (wharf project general area)			
Atherinomorus lacunosus	hardyhead silverside	herbivore/omnivore	8500
Spratelloides delicatulus	delicate round herring	herbivore/omnivore	3425
Dussumieria sp. B	sardine	herbivore/omnivore	2500
Encrasicholina punctifer	buccaneer anchovy	herbivore/omnivore	2250
Encrasicholina heterolobus	shorthead anchovy	herbivore/omnivore	300
Decapterus macrosoma	shortfin scad	carnivore	244
Nerita polita (mollusca)	polite nerite		200

Table 4. Checklist of aquatic biota observed on video and photographic surveys, northeastern inner margin of Apra Harbor, Guam, April 10, 2005.

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: Project Area	Location: Control Areas	Location: Lagoon Floor
	ALGAE			
CHLOROPHYTA	green algae			
Caulerpa serrulata		2B		
Halimeda micronesica		2B		
Turbinaria ornata		2B		
PHAEOPHYTA	brown algae			
Padina japonica		all	all	
RHODOPHYTA	red algae			
Dictyota divaricata		2B		
Dictyota bartayresii		2B		
Galaxaura marginata		2B		
Gracilaria salicornia		2B		
	PLANTS			
CHLOROPHYTA, MONOCOTYLEDON, HELOBIAE, HYDROCHARITACEAE				
Enhalus acoroides	sea grass	2B		
	INVERTEBRATES			
PORIFERA, DEMOSPONGIAE, HAPLOSCLERIDA, PETROSIIDAE	**SPONGES**			
Xestospongia exigua		GP		
CNIDARIA, ANTHOZOA, SCLERACTINIA,	**CORALS**			
POCILLOPORIDAE				
Pocillopora damicornis	lace coral	2B, GP	DLP	
Pocillopora meandrina		2A		
ACROPORIDAE				
Acropora sp.			DLR	
PORITIDAE				
Porites lutea		1, 2A, 2B, 2C, SPR, GP	DLR	
Porites lobata (?)		2B		
Porites antennuata		2B		
Porites rus		2B	PP, DLP, DLR	
MUSSIDAE				
Lobophyllia sp.			PP	
FAVIIDAE				
Platygyra sp.		2B		
Indet.		2B		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: Project Area	Location: Control Areas	Location: Lagoon Floor
CNIDARIA, ANTHOZOA, ALCYONACEA, ALCYONIIDAE				
Sinularia sp. 1		2B	PP	
Sinularia sp. 2		2B		
CNIDARIA, ANTHOZOA, HELIOPORACEA, HELIOPORIDAE				
Heliopora coerulea	blue coral	2B		
CNIDARIA, HYDROZOA, MILLEPORINA, MILLEPORIDAE				
Millepora sp.	fire coral	2B		
MOLLUSCA, GASTROPODA, PROSOBRANCHIA, STROMBIDAE	**MOLLUSCS**			
Lambis lambis	spider conch	2B		
PECTINIDAE				
Pedum spondyloideum	coral clam	2B		
VERMETIDAE				
Serpulorbis sp.	worm snail	2B		
ECHINODERMATA, HOLOTHUROIDEA, STICHOPODIDAE	**SEA CUCUMBERS**			
Thelonata anax				X
ARTHROPODA, MALACOSTRACA, DECAPODA, ALPHEIDAE	**CRABS AND SHRIMP**			
Alpheus sp.	goby shrimp			X
	VERTEBRATES			
CHORDATA, ACTINOPTERYGII, PERCIFORMES,	**FISHES**			
CAESIONIDAE	Fusiliers			
Pterocaesio tile	bluestreak fusilier		DLP	
NEMIPTERIDAE	spinecheeks			
Scolopsis lineata	lined spinecheek		DLP	
CHAETODONTIDAE	butterflyfishes			
Chaetodon auriga	threadfin butterflyfish	1	PP, DLP, DLR	
Chaetodon ephippium	saddled butterflyfish		HW	
Chaetodon lunula	racoon butterflyfish		DLR	
Chaetodon trifasciatus	redfin butterflyfish	2B		

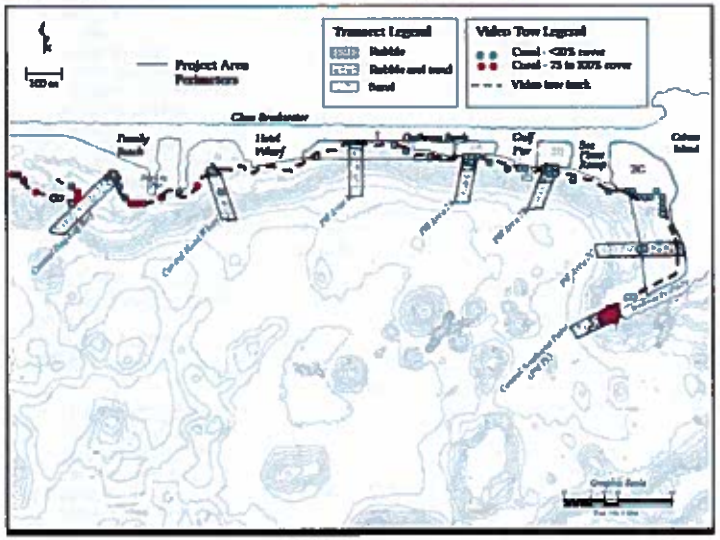


Figure 6. Substrate type and coral cover along the seven transects and depth contour transect within and adjacent to the project area. See text for explanation.

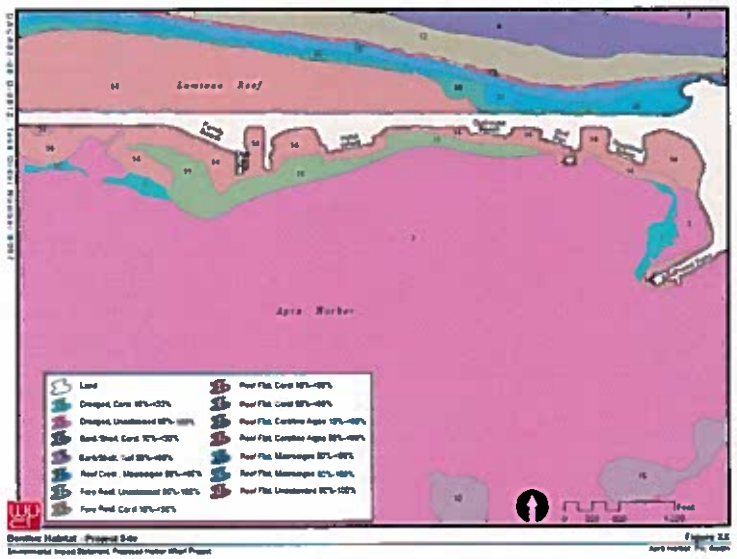


Figure 7. Substrate type and coral cover for the project site and surrounding reef and dredged areas as developed by NCCOS (undated). See text for explanation.

(*Chaetodon trifasciatus*), all of which were observed associated with coral colonies in Area 2B.

Reef Margin — The tow video footage collected along the reef margin provides additional biotic information which the transect data alone did not provide. The live video feed from the submerged video camera was monitored during the tow to ensure that areas of greatest coral cover (accessible by the survey vessel) were encountered during the tow.

Outside of the proposed project area the tow video footage captured a biologically rich, although physically very narrow, swath of reef margin and demonstrated the presence of several areas of particularly high (75-100%) coral cover (Table 4). The areas with highest coral cover observed during this survey were in the control areas, Dog Leg Reef and Piti Point. Within the proposed project area coral cover was mostly limited to scattered colonies of *Porites lutea* with coverage generally less than 10% of the bottom.

The most commonly seen, identifiable reef fishes in this zone were the Pacific double-saddle butterflyfish (*Chaetodon ulietensis*) and the bullet head parrot fish (*Chlorurus sordidus*). Numerous schools of small unidentified clupeid-like fish were also observed throughout the surveyed area. Planktivores become most common west of Hotel Wharf and include humbug fish (*Dascyllus aruanus*), schooling clupeid-like fishes, scissortail sergeant (*Abudefduf saxfasciatus*), and blue-streak fusilier (*Pterocaesio tile*). The most diverse genus represented is the butterflyfishes with at least six species observed. The area of greatest fish diversity is the inlet between Hotel Wharf and Dog Leg Pier (Control – Hotel Wharf), with 14 species identified.

It proved difficult to identify all of the coral species encountered on video footage; however, the dominant identifiable corals were the massive *Porites* sp. and *Porites rus*. Other corals identified along the reef margin include *Lobophyllia* sp. at Piti Point, *Pocillopora damicornis*, *Poc. meandrina* at Area 2A, and *Acropora* spp. at Dog Leg Reef.

Reef Slope — The reef slope environment generally begins between 3 and 5 m (10 and 15 ft) depth with an upper slope of rubble on sand and a lower slope comprised of sand only. The reef slope ends at the deep sand bottom of the lagoon at about 32 m (105 ft) depth. Practically the entire reef slope was devoid of hard bottom outcrops and live coral.

Lagoon floor — The lagoon floor (10 to 15 m or 30 to 50 ft deep) along the transects was often occupied by numerous bioturbation mounds, burrows of unidentified alpheid shrimp and goblid fish symbionts, black sprawling sponges

Clathria cf. *reinwardti*, and a large holothuroidean, *Thelenota anax*. Metal debris was a common sight on the lagoon floor near the project areas.

Figure 6 summarizes in graphical form the general results of the video surveys. Live coral assemblages are denoted by circles; sparse coral cover by pale blue circles and coral cover approaching 100% by red circles. Along transects, areas of rubble with no live coral are denoted by a honeycomb pattern, areas of rubble and sand by sparse honeycomb pattern, and sand bottom by stippling.

Reproduced herein as Figure 7 is a benthic habitat map prepared by NOAA (NCCOS, undated) of the project area and vicinity. This effort was based on remote sensing data, with a habitat classification scheme developed by NCCOS then applied to the images after ground-truthing of selected areas (Piti Bay and Cocos Lagoon on Guam; Piti Bay is adjacent on the north to Apra Harbor). In many ways this approach provides a more useful map of important marine communities than our constrained field effort, although the categories used by NCCOS are necessarily rather broadly encompassing of, for example, coral cover in particular areas. It is clearly the case, however, that both Fig.s 6 and 7 show minimal conflict in interpretation if one allows that an area designated by NCCOS as "Reef Flat, Coral 10%-<50%" is inclusive of our characterization of "coral <20% cover." In categories 3, 11, and 24, the term "uncolonized" appears to mean no or low densities of hermatypic coral, macroalgae, calcareous algae, and sea grass.

Not surprisingly, our somewhat closer look did reveal some areas of higher coral cover than allowed by the NCCOS categorization. Southwest Point and Dog Leg Reef appeared to be the most biologically diverse areas studied, with the greatest coral cover and most abundant fish populations. Coral coverage was between 75 and 100% at Southwest Point, coral species composition may be somewhat similar to that found at nearby Jade Shoals (about 500 m to the south). A 1977 study of Jade Shoals, Sasa Bay, and Piti Channel reported that Jade Shoals was the most species diverse of the three areas studied with nearly 100 coral species documented (UOG 1977a). The other area of high coral cover is located at Dog Leg Reef (DLR), a finger of reef that runs roughly parallel to the nearby shoreline of Family Beach. Coral cover was more variable at DLR than at Southwest Point, with about 75% coral cover in one prominent area.

Guam Department of Aquatic and Wildlife Resources (DAWR) provided unpublished data from fisherman catch surveys and aerial turtle surveys for Apra Harbor. We present (Tables 5 and 6) fish and mollusk catch data for two survey areas: DAWR-Location 19 and DAWR-Location 20. Location 19 refers to the area west of the project area out to the west end of Glass Breakwater. Location 20 corresponds to the general area proposed for wharf construction and fill plus Family Beach

The zones are partly delineated by depth and will be discussed from the shoreline out to greater depths. The shallow reef zone, generally less than 2 m (5 ft) deep, is characterized by a sand bottom with algae covered rubble, and scattered coral colonies (Fig. 5D). The reef margin occurs at a depth of about 5 m (15 ft) throughout our survey area and represents a distinct transitional zone between shallow consolidated reef and reef slope. The reef slope is characterized by sand with scattered coral rubble and small boulders on a sloping surface. The lagoon floor, in the vicinity of the project, ranges in depth from 35 to 38 m (105 to 115 ft) and is characterized by a substratum of silty sand.

Although common species were identified from video footage, rare, elusive, and/or nocturnal species were very likely missed and results presented herein can not be representative of actual biological diversity present in Apra Harbor. Video footage and photographs will be retained by *AECOS* and will be available for viewing if it is determined that further species identifications are necessary.

Shallow reef zone -- The results of the photographic survey conducted in project Area 2B (the shallow inlet between Gulf Pier and the Seaplane Ramp) indicate the general nature of the marine community present in the shallow water areas proposed for wharf construction (Table 4). The shallow reef community in Area 2B is characterized primarily by both soft and hard coral colonies on sand with a water depth of about 2 m (5 ft) (Figure 5). A similar assemblage was recorded in the shallows of Area 2C and is likely to be found in the other project areas with similar physiography.

The corals in project Area 2B are dominated by massive *Porites* sp. (most likely *Porites lutea*), *Porites rus*, and numerous soft corals of the genus, *Sinularia* (Table 4, Figure 5B). A 0.5 m (1.5 ft) diameter *Astreopora* sp. colony was observed here as well. A yellow finger coral, *Porites antennuata* (Fig. 5C), and the blue coral, (*Heliopora coerulea*) are other common inhabitants. Video footage from the shallows of Area 2A (between Gulf Pier and Outhouse Beach) and Area 2C (between Sea Plane Ramp and Cabras Island) revealed many small *Porites* colonies; in addition Area 2C also has many large *Porites* colonies, up to about 1 m (3 ft) in diameter.

A total of eight algal species were recorded, however the brown alga, *Padina* was the dominant species throughout the survey area and was found on most submerged hard surfaces not occupied by living coral colonies. Seagrass was represented by a single clump (about 0.25 m dia.) of *Enhalus acoroides* observed in Area 2B. An individual spider conch (*Lambis lambis)* was observed amongst *Padina* thalli in Area 2B as well.

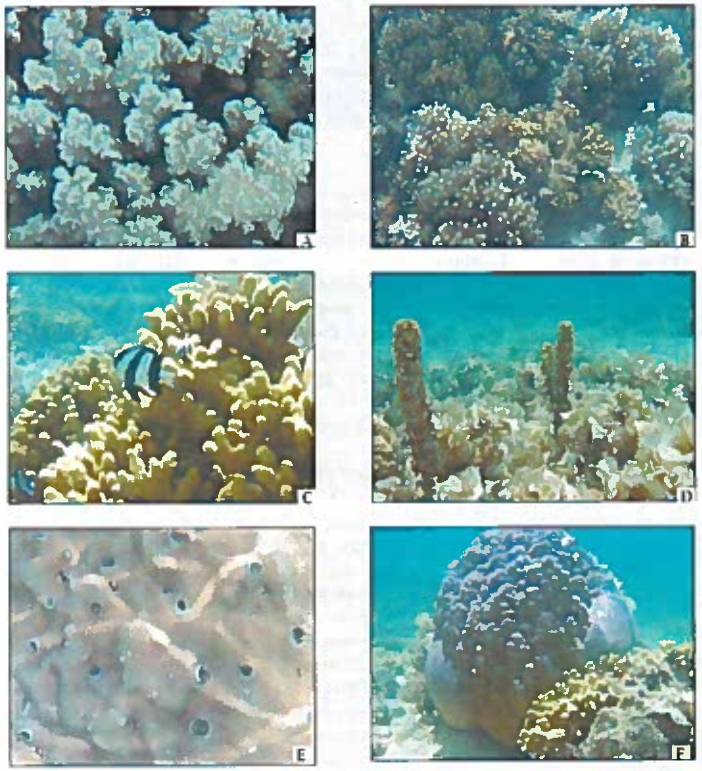


Figure 5. Common shallow reef organisms of northeastern Apra Harbor: A) *Porites rus*, B) *Sinularia* sp., C) *Porites antennuata* (unknown) and *Dascylus aruanus*, D) *Padina* and *Turbinaria*, E) *Porites* sp. with Vermetid mollusks, and F) *Porites lutea* and *Porites antennuata*.

The Shallow Reef Zone is not especially rich in fishes. Several small, reef-dwelling species were recorded, including the banded goby (*Amblygobius phalaena*), white tail dascyllus or humbug fish (*Dascyllus aruanus*, Fig. 5C), and oval butterfly fish

RESULTS

Water Quality

The analytical results of the water quality data collected in Apra Harbor on April 9, 2005 (high tide) and April 11, 2005 (low tide) are presented in Table 2a and 2b and discussed here.

Table 2a. Water quality characteristics during high tide on April 9, 2004 and low tide on April 11, 2005 in Apra Harbor, Guam.

Water Quality Station - Tide	Time Sampled	Temp. (°C)	Salinity (ppt)	DO (mg/l)	DO (% Sat.)	TSS (mg/l)	pH (pH units)
1 - High	0927	28.1	34.312	5.58	86	4.7	8.20
1 - Low	1326	28.3	34.302	5.44	84	7.6	8.18
Sta. 1 avg.	--	**28.2**	**34.31**	**5.51**	**85**	**6.2**	**8.19**
2 – High	0938	28.0	34.363	6.68	103	5.1	8.24
2 – Low	1339	29.2	34.236	7.28	115	4.9	8.30
Sta. 2 avg.	--	**28.6**	**34.30**	**6.98**	**109**	**5.0**	**8.27**
3 – High	1011	28.3	34*	6.15	96	4.4	8.24
3 – Low	1402	28.6	34.301	6.30	98	6.5	8.21
Sta. 3 avg.	--	**28.5**	**34.30**	**6.23**	**97**	**5.5**	**8.23**
4 – High	0916	28.2	34.304	6.40	99	5.3	8.14
4 – Low	1319	30.0	34.270	5.60	89	6.3	8.12
Sta. 4 avg.	--	**29.1**	**34.29**	**6.00**	**94**	**5.8**	**8.13**
5 – High	0952	28.2	34.310	5.82	90	3.7	8.21
5 – Low	1450	28.3	34.292	5.55	86	5.2	8.20
Sta. 5 avg.	--	**28.3**	**34.30**	**5.69**	**88**	**4.5**	**8.21**
6 – High	1000	28.4	34.312	5.76	90	4.2	8.20
6 – Low	1416	28.4	34.300	5.60	87	3.0	8.20
Sta. 6 avg.	--	**28.4**	**34.31**	**5.68**	**89**	**3.6**	**8.20**
Overall Avg.	--	***28.5***	***34.30***	***6.00***	***94***	***5.1***	***8.20***

*Lab sample lost; value reported here reflects measurement taken in field using a YSI 85.

Water temperature ranged from 28.0 to 30.0 °C. Low tide temperatures were always above high tide temperatures except at Sta. 6 in the Outer Harbor which had the same temperature at both high and low tide sampling events. Salinity values were typical for marine waters with minimal freshwater influence (34 ppt) and very little variability. Dissolved oxygen (DO) was high at all stations and Sta. 2, situated on the ocean side of Glass Breakwater, was supersaturated with respect to oxygen.

There was little variability in pH with a range of 8.12 to 8.30, a result expected for highly buffered marine waters. Turbidity levels for all stations except Sta. 4 were between 0.46 and 0.64 ntu. In general, chlorophyll-α levels were low and ranged from 0.09 to 0.47 µg/l.

Table 2b. Water quality characteristics during high tide on April 9, 2004 and low tide on April 11, 2005 in Apra Harbor, Guam.

Water Quality Station – Tide	Time sampled	Ammonia (µg N/l)	Nitrate + nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Chl α (µg /l)	Turbidity (ntu)
1 – High	0927	<1	<1	91	11	0.09	0.64
1 – Low	1326	<1	2	138	16	0.24	0.64
Sta. 1 avg.	--	**<1**	**2.0**	**115**	**14**	**0.17**	**0.64**
2 – High	0938	<1	2	107	8	0.25	0.56
2 – Low	1339	<1	1	111	14	0.12	0.50
Sta. 2 avg.	--	**<1**	**1.5**	**109**	**11**	**0.19**	**0.53**
3 – High	1011	<1	2	136	8	0.30	0.67
3 – Low	1402	<1	1	106	15	0.26	0.62
Sta. 3 avg.	--	**<1**	**1.5**	**121**	**12**	**0.28**	**0.65**
4 – High	0916	<1	<1	106	8	0.38	0.99
4 – Low	1319	<1	<1	115	13	0.47	1.28
Sta. 4 avg.	--	**<1**	**<1**	**111**	**11**	**0.43**	**1.14**
5 – High	0952	<1	<1	114	9	0.20	0.46
5 – Low	1450	<1	<1	94	11	0.31	0.56
Sta. 5 avg.	--	**<1**	**<1**	**104**	**10**	**0.26**	**0.51**
6 – High	1000	<1	<1	121	9	0.18	0.57
6 – Low	1416	<1	<1	106	11	0.23	0.50
Sta. 6 avg.	--	**<1**	**<1**	**114**	**10**	**0.21**	**0.54**
Overall Avg.	--	***<1***		***112***	***11***	***0.25***	***0.67***

All averages in this table are calculated as geometric means.

The amount of inorganic nitrogen was low in all samples; the concentration of ammonia was <1 µg/l (not detected) and the concentration of nitrate + nitrite was 2 µg N/l or less. Total nitrogen ranged from 91 to 138 µg N/l, (highest and lowest values recorded at Sta. 1) with an overall mean of 112 µg N/l. Average total phosphorus was highest at shallow nearshore Sta. 1 (13.5 µg P/l) and lowest at deepwater Sta. 5 and Sta. 6 (10.0 µg P/l). Overall, nutrient levels are low and fairly uniform throughout the sampling area.

Water quality at Sta. 4 is indicative of the waters flowing out of Piti Channel from the shallow basin where power plant effluent waters are discharged and daily boat traffic resuspends fine bottom sediments. On average, Sta. 4 had twice the turbidity (1.14 NTU) of other stations (0.67 ntu), elevated TSS (5.8 mg/l), the highest average chlorophyll-α concentration (0.43 µg/l), the highest average temperature (29.1 °C), and the lowest average pH (8.13).

Marine Biota

In general, the submerged lands within the project area fall into one of four zones: shallow reef flat, reef margin, reef slope, and lagoon floor. The transect data give a clear picture of biological distribution patterns characteristic of these four zones, with each area having distinct, representative biota.

mouth of Piti Channel (Figure 4). The transect camera drops began as close to shore as allowed by vessel draft, usually about 2 m (5 ft). All transects were at least 150 m (500 ft) long and extended past the transition between reef slope and deep sand bottom.

Digital video footage was collected using a *SeaViewer Sea-Drop*™ Camera with LED lighting and 110 m (330 ft) cable connected to an on-board Sony digital camcorder and on-board computer with HYPACK® survey software. A stand-alone *Leica* global positioning system (GPS) with an accuracy of 30 ft allowed determination of video footage location. Time (GMT, Greenwich mean time) and latitude/longitude (decimal degrees) stamps were produced on the visual field throughout the video survey. The *SeaViewer* was mounted to a polyvinyl chloride (pvc) frame with a visual field of 100 cm x 60 cm for the transect footage. The system was towed alongside the boat and lowered to the bottom at approximately 25 m (30 yd) intervals. Substrate types (live coral, rubble, or sand) were determined from this footage. Video footage is in digital format and preserved on compact disc.

Video footage was also collected between the 5 and 15 ft depth contours from the east end of the project area at Southwest Point to past the west end of the project area to Dog Leg Reef by Family Beach; this is referred to as the video tow. The reef margin where the shallow reef transitions to reef slope appeared to have the greatest coral cover and therefore the greatest chance for construction activities to impact live coral cover. Therefore, this swath of submerged lands was chosen for additional exploration by longitudinal transect. The video camera, minus the pvc frame, was towed alongside the boat at depth and manually "fished" (lowered up and down) along the reef contour to capture footage of reef inhabitants (fish, corals, algae, and other invertebrates) and substrate characteristics. The on-board GPS integrated with our shipboard computer allowed us to obtain location of collected video footage.

A photographic survey was also conducted in project Area 2B on April 10, 2005 to identify representative marine biota of the shallow inlets proposed for filling. A Canon S300 digital camera in an underwater housing was used for photographic surveys. Two field guides were very useful resources aiding in the identification of marine biota presented here, *Micronesian Reef Fishes* (Allen and Steene, 2002) and *Indo-Pacific Coral Reef Field Guide* (Myers, 1999). The on-line resource, *FishBase* (Froese and Pauly, 2002) was also a useful aide in identifying fish species.

A survey of terrestrial plants was conducted by walking above the shoreline along Glass Breakwater and recording all common plants observed in the project area. Photographs were taken of unknown plants observed and these were identified by the authors using various references, including Stone (1970), Whistler (1992), and an on-line resource, *Plants of Guam* (Moore, 2002).

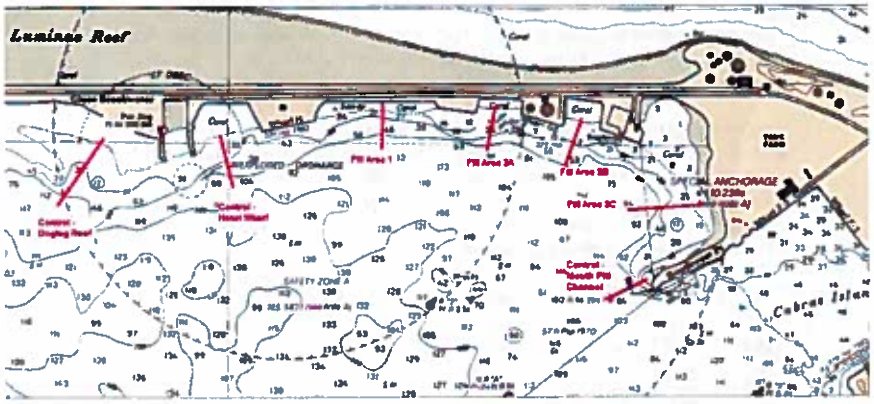


Figure 4. Video transects extending from proposed project areas and nearby control areas.

Santiago on Orote Point. Some parameters were measured by field meter at the stations, and others from water samples collected in appropriate containers. Samples were cooled on ice after collection and refrigerated until transport by cooler to the *AECOS* laboratory in Kane`ohe, Hawai`i (laboratory Log No. 20197). Table 1 lists field instruments and analytical methods used to analyze these samples.

Water sampling was conducted on April 9 and April 11, 2005, during Guam's dry season (January to May). Weather conditions were not unusual, with winds of 5-15 kts (6-18 mph) from the northeast and a temperature range between 24 and 31 °C (75 and 88 °F) and average of 28 °C (83 °F). Although no rainfall was recorded during the dates of sampling (April 9 to April 11), rainfall totaled 1.6 cm (0.62 in) during the 7-day period prior to water quality sampling. Weather data are from the Guam International Airport weather station (COOP ID, 914226), located 10 km (6 miles) to the northeast of Apra Harbor (NCDC, 2005).



Figure 3. Water quality (WQ) sampling stations in Apra Harbor.

The tide was ebbing at the start of the "low tide" survey on April 9, 2005 (13:19-14:50) with a predicted morning high tide (higher high water or HHW) of 0.8 m (2.5 ft) to occur at 07:44 and a predicted afternoon low tide of 0.3 m (0.1 ft) (lower low water, LLW) at 14:18 (NOAA/NOS, 2005). The tide was also ebbing at the beginning of the "high tide" survey on April 11, 2005 (09:16-10:11) with a predicted morning high tide of 0.7 m (2.4 ft) at 08:34 and a predicted low tide of -0.06 m (-0.2 ft) at 15:34.

Table 1. Analytical methods and instruments used for the April 9 and 11, 2005 water quality sampling at Apra Harbor, Guam.

Analysis	Method	Reference	Instrument
Ammonia	alkaline phenol	Karoleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Chlorophyll α	10200 H	Standard Methods, 18th Edition (1992)	Turner Model 112 fluorometer
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 550 DO meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
pH	EPA 150.1	EPA (1993)	Hannah pocket pH meter
Salinity	bench salinometer	Grasshoff in Grasshoff et al. (1986)	AGE Model 2100 salinometer
Temperature	Thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 550 DO meter
Total Nitrogen	persulfate digestion/EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion/EPA 365.1	Karoleff in Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540D (EPA 160.2)	Standard Methods 18th Edition (1992); EPA (1993)	Mettler H31 balance
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992); EPA (1993)	Hach 2100N Turbidimeter

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.
EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.
EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.
EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement 1. EPA/600/R-94/111. May 1994.
Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.
Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. 1992. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

Biology

Underwater video and photo surveys were conducted to characterize the marine environments and biological community within and adjacent to the project area. Video footage was collected along seven transects beginning at the 5 ft (2 m) depth contour: one from each of the four Areas (1, 2A, 2B, and 2C) and another three transects located outside of the project area (controls). The latter "control" transects were located as follows: one extending perpendicular from Family Beach, another from the inlet west of Hotel Wharf, and the last from Southwest Point at the

Project Description

The areas proposed for new wharf and container yard space (Figure 2, above) lie immediately to the west of the existing commercial port and make up the former back reef portion of Luminao Reef (the lagoon's northern barrier reef), which is now separated from the open ocean and the majority of the reef flat by Glass Breakwater. The shallow areas proposed for wharf construction and fill are remnants of the back reef flat and reef slope that remained after construction of various wharves, piers, and fingers of fill. Thus, each of what are now small, shallow inlets is bordered by artificial fill of rocks and boulders, with a beach deposit formed along the backshore and a shallow reef flat extending out to a back reef slope that descends steeply into deeper water and the soft bottom sediments of the Harbor (Paulay et al., 2004). There exists limited information on the biology of these shallow inlets proposed for the project construction activities. Navigation charts indicate inlet depths are generally less than 2 m (6 ft).

Area "1" — Area 1 is located between the eastern end of the concrete bulkhead of Hotel Wharf and the consolidated sand and rock outcropping to the west of project Area 2A. Area 1 is proposed for the location of the deep-draft wharf and includes a narrow shallow near shore area which slopes to a depth of 14 m (45 ft) within 50 m of shore.

Area "2A" — Area 2A is located between Outhouse Beach and Gulf Pier and has an area of 0.41 hectare (1.0 acre). The shoreline is made up of boulder revetment at the far ends with a rocky area off Outhouse Beach parking area, and a mixture of boulder revetment and sand in the northeast quadrant.

Area "2B" — Area 2B is located between Gulf Pier and the Seaplane Ramp and has an area of 0.77 hectares (1.9 acres) with a rocky shoreline except for a small sand beach in the northeast quadrant bordering the breakwater.

Area "2C" — Area 2C is located at the western end of Cabras Island between the Seaplane Ramp and Southwest Point (Piti Point) and has an area of 6.2 hectares (15.2 acres). It has a sand shoreline bordering the northern perimeter and boulder revetment bordering the east perimeter.

Areas 2A, 2B, and 2C are proposed for the location of container storage yards. Areas 2A and 2B are shallow throughout, while Area 2C is shallow only in the northern portion that borders Glass Breakwater as well as a narrow near shore strip along the southern portion that borders Cabras Island. The southern portion of Area 2C is generally less than 10 m (30 ft), but also encompasses reef slope that drops to a maximum depth of 15 m (50 ft) at a distance of 110 m from shore.

The original construction proposal was for 950,000 cubic yards (726,000 cubic meters) of fill to be placed in Area 1, the deep draft wharf site, and 500,000 cubic yards (382,000 cubic meters) of fill behind boulder revetment for Areas 2A, 2B, and 2C. However, two alternative wharf designs are under consideration. Alternative No. 1 would use concrete caisson structures for the foundation of the wharves, with the wharf essentially supported on fill. Alternative No. 1 would reduce the amount of fill required by the project, but would require dredging and possible blasting to obtain depth requirements for placement of concrete caissons. Alternative No. 2 would support wharf structures on pilings and would greatly reduce the amount of fill required for both the deep draft wharf and the container yards from 950,000 cubic yards to 100,000 cubic yards and from 500,000 cubic yards to 200,000 cubic yards, respectively. Presently, the preferred alternative is No. 2, a pier on pilings design, requiring much less fill material.

METHODS

Water sampling and biotic surveys were conducted in Apra Harbor, Guam between April 8 and April 11, 2005 by *AECOS* biologist, Katie Laing. Sea Engineering, Inc. provided logistic support. Surface water samples were collected during high and low tide periods (2 events) at a total of six stations. Four stations were located along shore and two were located in deeper water. The purpose of the water quality sampling was to characterize marine water quality in the project area and vicinity. Video and photographic surveys were conducted to characterize the biological community and environments present in the proposed project areas. Video footage was collected along one contour depth across the entire study area and along seven transects run perpendicular to the shore: four within the proposed project area and three in similar environments outside of the proposed project area. A photographic survey of shallow water marine biota was conducted within Area 2B. And lastly, a survey of terrestrial plants was conducted above the shoreline in the areas of proposed harbor improvements.

Water Quality

Water samples were collected from six stations, four just off the shoreline and two in outer Apra Harbor. Each station was sampled at a high and a low tide (Figure 3). Station 1 was within the project area between Areas 2B and 2C. Station 2 is representative of outer reef conditions as it was located on the ocean (north) side of Glass Breakwater opposite Station 1. Station 3 was located west of the project area at Family Beach just off the harbor shoreline. Station 4 is representative of waters entering the project area from Piti Channel and was located at the mouth of Piti Channel between Wharf E and Wharf F-3. Station 5 was located in the central portion of the outer harbor, well offshore of Family Beach in the outer harbor. Station 6 was located in the outer harbor near the harbor entrance, offshore of Fort

15 m (50 ft). Currently, no such deep water docking facilities exist on Guam, nor is there sufficient yard space for container storage of this quantity.

The Port Authority of Guam (PAG), which administers the commercial port facilities at Apra Harbor, proposes construction of a new deep draft wharf to accommodate both Nimitz Class aircraft carriers (on a contingency basis) and post-Panamax container vessels. They also plan to increase container yard space through land reclamation within three existing small inlets. Both the wharf and container yard space will be located along the east end of Glass Breakwater adjacent to existing port facilities on Cabras Island (Figure 1).

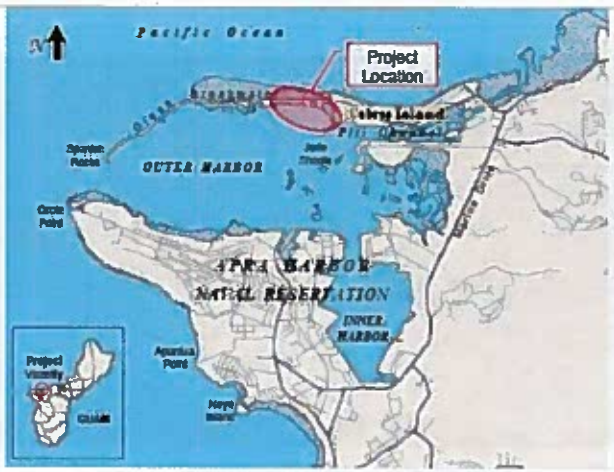


Figure 1. Apra Harbor, Guam with proposed wharf project area circled along the east end of Glass Breakwater adjacent to existing port facilities (Map provided by Wil Chee Planning).

Site Description

Apra Harbor is a natural deep-water lagoon on the west coast of Guam that has been extensively altered for use as a shipping harbor. The harbor is protected to the north by Cabras Island (the site of the Commercial Port of Guam facilities) and Glass Breakwater (a very long breakwater structure) and to the south by Orote Peninsula (Figure 1, above). Glass Breakwater was built upon the natural barrier reef that originally defined the north side of the lagoon between Spanish Rocks and

Cabras Island. Additionally, extensive dredge and fill projects post World War II substantially reduced oceanic water flow into the lagoon to the narrow harbor entrance channel between Spanish Rocks and Orote Point (UOG, 1977).

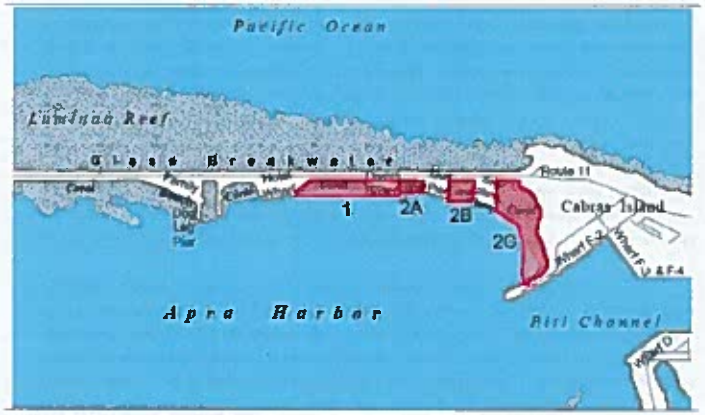


Figure 2. Proposed new wharf Areas 1, 2A, 2B, and 2C located at the eastern end of Glass Breakwater, Apra Harbor (Map provided by Army Corps of Engineers).

Presently, the harbor is utilized by a diverse set of user groups including SCUBA diving operators, charter fishing boat operators, tourist watercraft, and the US Navy. Outhouse Beach, located at the east end of Fill Area 1, provides adequate parking and a safe nearshore environment for SCUBA diving instruction.

From the natural and man-made shorelines that surround Apra Harbor, the bottom slopes gently away, then abruptly more steeply, descending to depths that throughout much of the lagoon exceed 33 m (100 ft) with a lagoon floor consisting of accumulated clay, silt, sand, and coral-algal-mollusk rubble (UOG, 1977). Freshwater input comes from rainfall, surface runoff, and brackish groundwater influx. Surface runoff waters filter through freshwater marshes and mangroves along the eastern shoreline (USACE, 1977) before reaching lagoon waters. Currents in the lagoon consistently flow in an east to west direction driven by the consistent north-northeast trade winds (Sea Engineering, Inc., 2005). Tidal forces have minimal impact on flow direction, but can dampen/decrease the flow rate during flooding tidal periods and increase the flow rate during ebbing tidal periods (UOG, 1977).

AECOS No. 1074

Marine biological and water quality surveys for a proposed wharf expansion in Apra Harbor, Piti, Guam



Apra Harbor aerial view from the west. Photo credit: U.S. Navy

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March 1, 2006

Marine biological and water quality surveys for proposed wharf expansion in Apra Harbor, Piti, Guam[1]

March 1, 2006 *AECOS* No. 1074

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Introduction

Situated in the western Pacific Ocean, the United States Territory of Guam is about three-quarters of the way from Hawai'i to the Philippines and is part of the Mariana Islands archipelago. The islands are part of an oceanic mountain range, of volcanic origin, which arches southward from Japan and is bordered by the Marianas Trench, where the greatest ocean depths on the planet are to be found. The island of Guam is the largest, 50 km (30 miles) long, and most populated island in the Mariana Islands chain and is home to Apra Harbor, the largest port in the Marianas. Apra Harbor is a natural deep water lagoon about 5 km by 2 km (3 miles by 1.5 miles) in dimension and located on the southwestern coast of Guam, approximately 10 km (6 miles) west-southwest of Guam's capital city, Agana (*Hagatña*). Apra Harbor enables Guam to act as a regional hub for shipping, travel, and military.

In the mid-1940's, Apra Harbor was a thriving military port with some 1,700 vessels standing in and out of the harbor each month. Since then, only minimal port expansion has been conducted and no wharf line expansions have been undertaken in the last 30 years. Port expansion was prohibited until the nearby munitions wharf was relocated to Orote Peninsula and building restrictions associated with the Explosives Safety Quantity Distance (ESQD) alleviated (DOA, 1983). Port of Guam facility needs have increased since the port's early military heyday and currently Apra Harbor is unable to accommodate many new generation cargo ships known as "post-Panamax" vessels. Harbors around the globe are upgrading facilities to accommodate these larger vessels capable of transporting an equivalent of 6,000 standard twenty foot containers and requiring minimum water depths of

[1] Report prepared for Wil Chee Planning for an EIS entitled, "Proposed Harbor Wharf Project, Apra Harbor, Guam" (U.S. Army Corps of Engineers Contract No. DACA83-00-D-0012, Task Order No. 0067). This report will become part of the public record.

APPENDIX H

Marine Biological and Water Quality Survey

DRAFT
COASTAL ENGINEERING ASSESSMENT
FOR THE
APRA HARBOR WHARF IMPROVEMENTS
ENVIRONMENTAL IMPACT STATEMENT

June 2005

Prepared for:

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#5-11

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 GENERAL OCEANOGRAPHIC CONDITIONS 4
2.1 Introduction 4
2.2 Winds 4
2.3 Water Levels 8
2.4 Currents 9
2.5 Storms and Typhoons 11
2.5.1 Characteristics and Frequency 11
2.5.2 Typhoon Parameters 12
2.5.3 Typhoon Pressure Drop 15
2.5.4 Still Water Level Rise 15
2.6 Waves 16
3.0 SHORELINE DESCRIPTION 18
4.0 CURRENT MEASUREMENTS 27
4.1 Current Meter Measurements 27
4.2 Current Drogue Measurements 28
5.0 NUMERICAL MODEL 54
5.1 Description 54
5.2 Model Domain and Grid 55
5.3 Model Flow Forcings 55
5.4 Dredge Plume Characterization 56
5.5 Model Verification 59
6.0 MODEL RESULTS 65
6.1 Case 1 – Moderate trade winds, 0.45% release rate 66
6.2 Case 2 – Moderate trade winds, 4% release rate 67
6.3 Case 3 – April 8 to 11 trade winds, 4% release rate 68
6.4 Spill Impacts 68
7.0 CONCLUSIONS 90
REFERENCES 92

LIST OF FIGURES

Figure 1-1. Project Site, Guam. 2
Figure 1-2. Vicinity Map 3
Figure 2-1. January and September wind roses showing seasonal strong trades vs. variable conditions. 5
Figure 2-2. Comparison of predicted and observed tides in Apra Harbor 9
Figure 2-3. Typhoon tracks for one year (1997) in the western Pacific 12
Figure 2-4. Distribution of extreme pressure values at Guam. 15
Figure 3-1. Project Shoreline. 20
Figure 3-2. East end of Fill Area 2C 21
Figure 3-3. Sand beach in Fill Area 2C 21
Figure 3-4. Small boat ramp 22

FIGURE 3-5. FILL AREA 2B 22
FIGURE 3-6. GULF PIER 23
FIGURE 3-7. REVETMENTS AND GRAVEL BEACH IN FILL AREA 2A 23
FIGURE 3-8. DIVERS BEACH 24
FIGURE 3-9. HOTEL WHARF (VIEW FROM THE WEST, LOOKING EAST) 24
FIGURE 3-10. HOTEL WHARF BEACH 25
FIGURE 3-11. DOG LEG PIER COVE 25
FIGURE 3-12. FAMILY BEACH 26
FIGURE 4-1. CURRENT TIME SERIES FOR DEPTH LAYER 1 TO 9 FEET 30
FIGURE 4-2. CURRENT TIME SERIES FOR DEPTH LAYER 15 TO 23 FEET 31
FIGURE 4-3. CURRENT TIME SERIES FOR DEPTH LAYER 22 TO 30 FEET 32
FIGURE 4-4. CURRENT TIME SERIES FOR DEPTH LAYER 28 TO 36 FEET 33
FIGURE 4-5. 24-HOUR AVERAGE TIME SERIES FOR DEPTH LAYER 1 TO 9 FEET 34
FIGURE 4-6. 24-HOUR AVERAGE TIME SERIES FOR DEPTH LAYER 15 TO 23 FEET 35
FIGURE 4-7. 24-HOUR AVERAGE TIME SERIES FOR DEPTH LAYER 22 TO 30 FEET 36
FIGURE 4-8. 24-HOUR AVERAGE TIME SERIES FOR DEPTH LAYER 28 TO 36 FEET 37
FIGURE 4-9. CURRENT ROSES FOR DEPTH LAYER 1 TO 9 FEET 42
FIGURE 4-10. CURRENT ROSES FOR DEPTH LAYER 15 TO 23 FEET 43
FIGURE 4-11. CURRENT ROSES FOR DEPTH LAYER 22 TO 30 FEET 44
FIGURE 4-12. CURRENT ROSES FOR DEPTH LAYER 28 TO 36 FEET 45
FIGURE 4-13. DROGUE PLOTS FOR FRIDAY (4-08-05) 46
FIGURE 4-14. DROGUE PLOTS FOR SATURDAY (4-09-05) 48
FIGURE 4-15. DROGUE PLOTS FOR SUNDAY (4-10-05) 50
FIGURE 4-16. DROGUE PLOTS FOR MONDAY (4-11-05) 52
FIGURE 5-1. MODEL GRID WITH 7331 CELLS 60
FIGURE 5-2. COLOR-CODED MODEL BATHYMETRY (IN METERS) OVERLAIN ON THE MODEL GRID 61
FIGURE 5-3. VERTICAL LAYERS IN THE MODEL 62
FIGURE 5-4. APRIL 8 TO 11 TIDES APPLIED AT MODEL OPEN BOUNDARY 63
FIGURE 5-5. APRIL 4 TO 11, 2005 WIND INPUT CONDITION 64
FIGURE 6-1A. MODEL GRID SHOWING SURFACE LAYER CURRENTS DURING MODERATE, STEADY TRADE WINDS 70
FIGURE 6-1B. MODEL GRID SHOWING BOTTOM LAYER CURRENTS DURING MODERATE, STEADY TRADE WINDS 71
FIGURE 6-1C. SURFACE LAYER SUSPENDED SEDIMENT CONCENTRATION 72
FIGURE 6-1D. BOTTOM LAYER SUSPENDED SEDIMENT CONCENTRATION 73
FIGURE 6-1E. SURFACE LAYER TSS TIME SERIES AT THE DREDGE SITE AND 100 METERS DOWN DRIFT OF THE DREDGE SITE 74
FIGURE 6-1F. BOTTOM LAYER TSS TIME SERIES AT THE DREDGE SITE AND 100 METERS DOWN DRIFT OF THE DREDGE SITE 75
FIGURE 6-1G. SEDIMENT THICKNESS IN MM 76
FIGURE 6-2A. SURFACE LAYER SUSPENDED SEDIMENT CONCENTRATION 77
FIGURE 6-2B. BOTTOM LAYER SUSPENDED SEDIMENT CONCENTRATION 78
FIGURE 6-2C. SURFACE LAYER TSS TIME SERIES AT THE DREDGE SITE AND 200 METERS DOWN DRIFT OF THE DREDGE SITE 79
FIGURE 6-2D. BOTTOM LAYER TSS TIME SERIES AT THE DREDGE SITE AND 100 METERS DOWN DRIFT OF THE DREDGE SITE 80

FIGURE 6-2E. SEDIMENT THICKNESS IN MM 81
FIGURE 6-3A. SURFACE LAYER SUSPENDED SEDIMENT CONCENTRATION AT 6PM 82
FIGURE 6-3B. SURFACE LAYER SUSPENDED SEDIMENT CONCENTRATION AT 5:00 A.M. 83
FIGURE 6-3C. BOTTOM LAYER SUSPENDED SEDIMENT CONCENTRATION AT 6PM 84
FIGURE 6-3D. BOTTOM LAYER SUSPENDED SEDIMENT CONCENTRATION AT 5:00 A.M. 85
FIGURE 6-3E. SURFACE LAYER TSS TIME SERIES AT THE DREDGE SITE AND 200 METERS DOWN DRIFT OF THE DREDGE SITE 86
FIGURE 6-3F. BOTTOM LAYER TSS TIME SERIES AT THE DREDGE SITE AND 100 METERS DOWN DRIFT OF THE DREDGE SITE 87
FIGURE 6-3G. SEDIMENT THICKNESS IN MM 88
FIGURE 6-4. DRIFTER TRANSPORT PATHS 89

LIST OF TABLES

TABLE 2-1. ANNUAL PERCENT OCCURRENCE OF WINDS AT GUAM (AGANA NAVAL AIR STATION) 6
TABLE 2-2. THE ANNUAL MAXIMUM SUSTAINED WIND SPEED AND DIRECTION AT GUAM 7
TABLE 2-3. PREDICTED WIND SPEED AT GUAM AS A FUNCTION OF RETURN PERIOD 8
TABLE 2-4. TIDE ELEVATIONS IN APRA HARBOR (FEET, REFERENCED TO MSL) 8
TABLE 2-5. ANNUAL WORST STORMS AFFECTING GUAM 14
TABLE 2-6. RETURN PERIOD OF TYPHOON PRESSURES AT GUAM 15
TABLE 2-7. TYPHOON PRESSURE SETUP 16
TABLE 2-8. PREDICTED FETCH-LIMITED STORM WAVES AT THE PROJECT SITE 17
TABLE 4-1. HISTOGRAM FOR CURRENT VELOCITIES AND DIRECTION FOR DEPTH LAYER 1 TO 9 FEET 38
TABLE 4-2. HISTOGRAM FOR CURRENT VELOCITIES AND DIRECTION FOR DEPTH LAYER 15 TO 23 FEET 39
TABLE 4-3. HISTOGRAM FOR CURRENT VELOCITIES AND DIRECTION FOR DEPTH LAYER 22 TO 30 FEET 40
TABLE 4-4. HISTOGRAM FOR CURRENT VELOCITIES AND DIRECTION FOR DEPTH LAYER 28 TO 36 FEET 41
TABLE 4-5. DROGUE DETAIL FOR FRIDAY (4-08-05) 47
TABLE 4-6. DROGUE DETAIL FOR SATURDAY (4-09-05) 49
TABLE 4-7. DROGUE DETAIL FOR SUNDAY (4-10-05) 51
TABLE 4-8. DROGUE DETAIL FOR MONDAY (4-11-05) 53
TABLE 5-1. TSS LOAD RATES 58
TABLE 5-2. SUSPENDED SEDIMENT GRAIN SIZE DISTRIBUTION 58
TABLE 5-3. WATER COLUMN TSS RELEASE DISTRIBUTION 59
TABLE 6-1. MODEL CASES 66

1.0 INTRODUCTION

The Port Authority of Guam is proposing improvements to Apra Harbor for the purpose of improving shipping access and services to the island of Guam. The improvements are planned for the Commercial Port area, in the northeast part of the harbor, adjacent to Cabras Island and Piti Channel (Figures 1-1 and 1-2). Figure 1-2 shows the specific location of the proposed modifications. The project has three primary components:

- Construction of a 1,500 x 230-foot wharf to the east of Hotel Wharf (Site 1 in Figure 1-2). The primary purpose of the wharf is to accommodate Post-Panamax container vessels and Nimitz Class aircraft carriers. The likely preferred design for the wharf is a concrete deck on piles driven into the subsurface. An alternative design is solid fill caissons.
- Placement of 500,000 cubic yards of fill material to create fast-land area in three inlets between Divers Beach and Cabras Island (Sites 2A, 2B and 2C in Figure 1-2). The fill area is to provide additional cargo container storage space and berthing facilities.
- Dredging the seafloor to a depth of 55 feet in the vicinity of the proposed 1,500-foot long wharf (Site 1 in Figure 1-2).

In support of the Environmental Impact Statement being prepared for the proposed project, Sea Engineering was contracted to conduct a physical marine environmental assessment and impacts evaluation for the proposed project. Work tasks included the following:

- Description of the Marine Environmental Setting – Based on existing information, a detailed description of the marine environmental setting in the project site, including winds, tides, waves, the shoreline, currents, the seafloor, bathymetry, and storms and typhoons.
- Field Current Study – A study of currents at the project site, including deployment of a current meter at the project site, and measurement of current drift drogues. The current meter was placed in water depths of 40 feet, immediately offshore of the wharf location. Drift drogues were deployed for four days to supplement the current meter data.
- Turbidity Model – The possible impact of turbidity resulting from the fill and dredging associated with the project was evaluated using a numerical model. The model used, EFDC (Environmental Fluid Dynamics Code), is an EPA approved, state-of-the-art, three dimensional hydrodynamic model developed at the Virginia Institute of Marine Science by John Hamrick (1996) for the EPA to simulate hydrodynamics and water quality in rivers, lakes, estuaries, and coastal regions. The EPA describes the model as "one of the most widely used and technically defensible hydrodynamic models in the world." The model was calibrated using the current meter data recorded at the site, and calculated turbidity plume dispersion and transport throughout the project area.
- Spill Impacts – The EFDC model was also used to analyze possible spill impacts. The model, combined with the current data measured during the field current study was utilized to determine likely transport paths of any spills (such as oil) that may occur during construction or future operation of the wharf.
- Marine Biological Towed Camera Video Survey – To support the marine biological assessment of the project site, Sea Engineering conducted a towed camera video survey of the project site. An underwater camera, equipped with lights and a surface monitor was towed above the seafloor at selected transects across the project site. GPS position and time were recorded on the video.

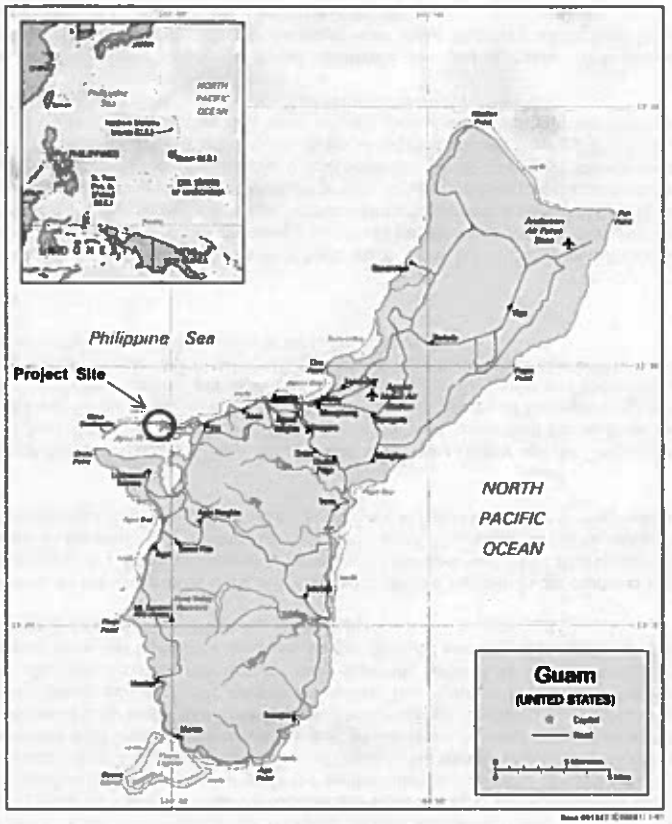


Figure 1-1. Project Site, Guam.

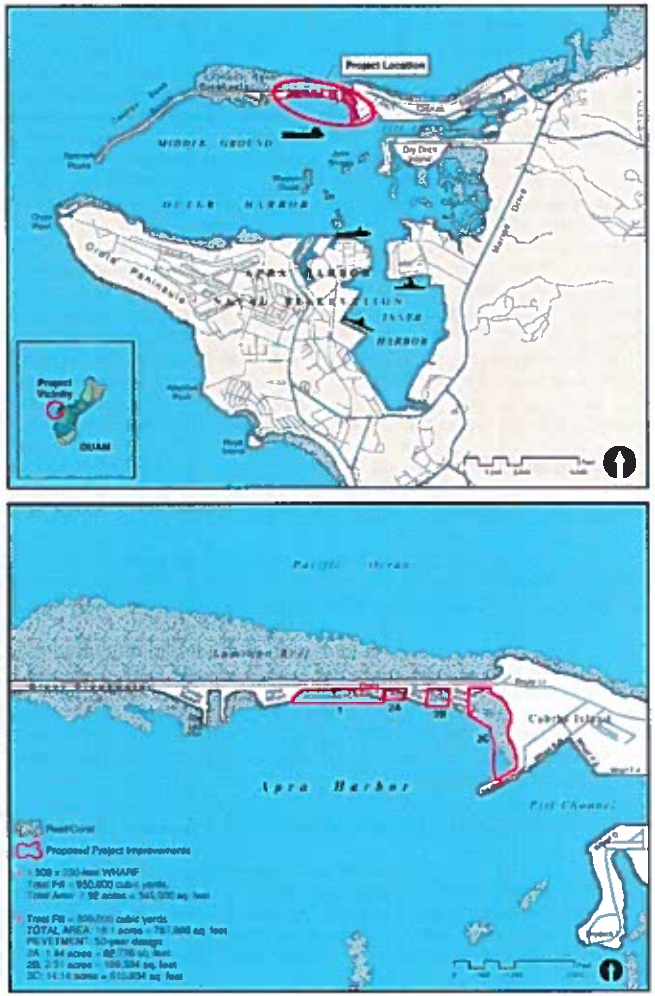


Figure 1-2. Vicinity Map.

2.0 GENERAL OCEANOGRAPHIC CONDITIONS

2.1 Introduction

Guam is the largest and southernmost island in the Marian Archipelago. It lies about 1,700 miles south of Japan, 3,500 miles west of the Hawaiian Islands, and about 1,500 miles from the Phillipines (Figure 1-1). The island has two distinct geological regions. The northern half of the island is a coralline limestone plateau, while the southern half is composed of rolling hills of mostly volcanic origin. The geographic location of Guam in the western tropical Pacific Ocean implies generally mild wind and sea conditions most of the time. Like many tropical areas, the weather consists of a dry season and a rainy season. The dry season runs from December to June, and the rainy season runs from July through November. This region is also known to spawn western Pacific tropical storms, typhoons and super-typhoons, some of the strongest storms on Earth. Tropical storm and typhoon occurrences can punctuate the normally mild conditions with periods of extreme weather with intense winds and high waves.

Apra Harbor is on the west central coast of Guam and is about 6 miles from the capital city of Agana. The harbor is a deepwater lagoon protected by 15,000-foot-long Glass Breakwater and Cabras Island on the north, and by Orote Peninsula on the south. The eastern part of the lagoon is bordered by hilly land and by coastal lowland. The entrance to Apra Harbor is at the west side of the lagoon.

The harbor is further divided into Outer Apra Harbor, Inner Apra Harbor and the Commercial Port. Outer Apra Harbor is about 3 miles long by 1.5 miles wide and is used primarily for the mooring of Navy vessels. Inner Apra Harbor is at the southeast portion of the lagoon and it is used as the Navy's repair facility and submarine base. The Commercial Port is on Cabras Island, at the northeast end of outer Apra Harbor. The project site is located between Hotel Wharf and Cabras Island in the Commercial Port area of the harbor (Figure 1-2).

2.2 Winds

The dominant winds on Guam are the easterly trade winds. There is a distinct seasonality to the wind conditions in Guam. The trades are stronger and steadier in the winter (January to April), and light and variable winds periodically interrupt the trades during the summer typhoon season (July to October). The spring and fall months are transition periods. Figure 2-1 shows rose diagrams of data for January and September that show the two distinct wind patterns. The data were collected over the 30-year period from 1961 to 1991 (U.S. Dept. of Agriculture, www.wcc.nrcs.usda.gov/climate/windrose.html). The January data show strongly directional winds from the northeast, while the September data show lighter winds from many different directions.

Table 2-1 is a histogram showing the annual occurrence of winds at Agana Naval Station, Guam. Winds from east-northeast through southeast occur about 70 percent of the time. Wind speeds greater than 21 knots occur only 0.4 percent of the time.

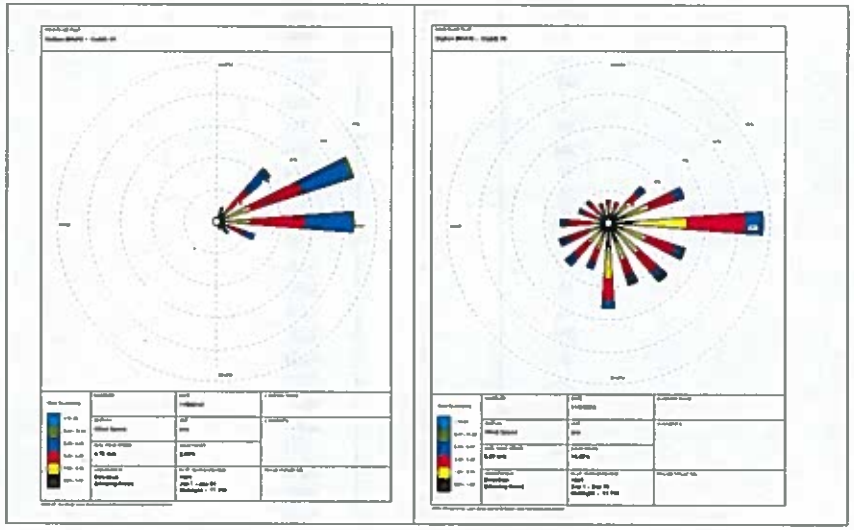


Figure 2-1. January and September wind roses showing seasonal strong trades vs. variable conditions.

Table 2-1. Annual percent occurrence of winds at Guam.
(Agana Naval Air Station)

Wind Direction	Wind Speed (knots)				
	3-7	8-12	13-20	21-30	Total
N	0.7	0.3	-	-	1.1
NNE	0.8	0.5	0.1	-	1.5
NE	3.6	2.3	0.6	-	6.5
ENE	7.6	7.1	2.1	-	16.7
E	9.6	12.1	4.5	0.1	26.4
ESE	5.7	9.3	4.2	0.1	19.2
SE	3.2	3.6	1.2	0.1	8.0
SSE	1.4	1.3	0.4	0.1	3.2
S	1.5	0.8	0.2	-	2.6
SSW	0.5	0.3	0.1	-	1.0
SW	0.4	0.2	0.1	-	0.7
WSW	0.2	0.2	-	-	0.4
W	0.3	0.2	0.1	-	0.5
WNW	0.3	0.2	-	-	0.5
NW	0.4	0.2	-	-	0.6
NNW	0.4	0.2	-	-	0.6
CALM					10.5
Total	36.7	38.5	13.8	0.4	100.0

Table 2-2 shows the annual fastest sustained wind speed data (1-minute average surface wind), based on a 33-year record from 1958 to 1990. The data were recorded at Tyan National Weather Service office (NWS), Guam, and reported by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The table also includes the maximum sustained wind during Typhoon Paka in 1997, which struck the Island of Guam and caused severe damage. During Typhoon Paka, the wind sensor at Commercial Port NWS, Commercial Port, Apra Harbor, failed after recording a sustained/peak gust of 100/149 knots. Based on wind information from the weather stations on the island during Typhoon Paka, the Joint Typhoon Warning Center assessed a peak gust of 160 knots at Apra Harbor. Based on the peak gust, we estimate a sustained wind speed of 107 knots (123 mph) at Apra Harbor, which is included in Table 2-2. The Tyan NWS wind sensor also failed due to a power loss after recording a peak gust of 108 mph from the northwest during the typhoon.

Table 2-2. The annual maximum sustained wind speed and direction at Guam (NOAA data 1958-1990, & 1997).

Year	Sustained Wind Speed	
	Speed (mph)	Direction (°TN)
1958	26	NE
1959	30	E
1960	30	NE
1961	34	NE
1962	80	NE
1963	64	SW
1964	33	E
1965	29	E
1966	28	E
1967	40	SW
1968	44	W
1969	29	E
1970	30	SE
1971	47	E
1972	29	NE
1973	29	E
1974	32	W
1975	34	SE
1976	76	NE
1977	33	NE
1978	38	SE
1979	43	SE
1980	37	NE
1981	31	SE
1982	40	E
1983	28	SE
1984	60	E
1985	35	E
1986	34	SW
1987	33	W
1988	64	W
1989	47	NE
1990	67	NE
1997	123 (est. at Apra Harbor)	n/a

During the period from 1958 to 1990, the strongest wind speed recorded at Tyan NWS was a sustained wind of 80 mph. Only in two years, 1962 and 1976, did the recorded sustained wind speeds have typhoon intensities, with a speed of 75 mph or more. This indicates that, although

Guam is affected by one or more typhoons almost every year, they often do not pass directly over Guam, or that high winds can be very localized. Data records can also be limited by failure of the measurement equipment during high winds. Typhoon Pamela in 1976, with sustained winds of 120 knots, stalled off the west coast of Guam for several days, resulting in extensive damage to coastal facilities, including Glass Breakwater. Typhoon Paka in 1997 was an exceptional case, with an estimated maximum sustained wind speed of 123 mph at Apra Harbor. The highest percentage of strong winds come from the northeast.

The data in Table 2-2 were analyzed using Gumbel's first asymptotic distribution to determine the frequency of extreme wind speed as a function of return occurrence. The results, shown in Table 2-3, show the predicted wind speed versus return period. For simplicity, the data are assumed to be independent of wind direction; i.e., an equal probability of occurrence from any direction is assumed. Sustained winds are defined as 1-minute averages. Also shown in Table 2-3 are the equivalent 10-minute average wind speeds. The estimated 50-year sustained wind speed is 104 mph. The wind speed recorded during Typhoon Paka slightly exceeded the 100-year wind speed of 118 mph.

Table 2-3. Predicted wind speed at Guam as a function of return period.

Return Period (years)	Sustained Wind Speed (mph)	Corresponding 10-minute Wind Speed (mph)
5	56	47
10	71	60
25	90	75
50	104	87
100	118	99

2.3 Water Levels

The tides in Guam are semi-diurnal with pronounced diurnal inequalities. Tide tables based on tide data from the US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey. Tables for 2004, show that the mean tide range is 1.6 feet and the diurnal range is 2.4 feet. The extreme tides observed in Apra Harbor are a high tide of 2.95 feet and a low tide of -3.74 feet (http://tidesonline.nos.noaa.gov). The highest observed tide of 2.95 feet occurred during the passage of Hurricane Omar. Tidal data for Apra Harbor are as follows:

Table 2-4. Tide elevations in Apra Harbor (feet, referenced to MSL).

Highest tide observed	2.95 (8-28-92)
Mean higher high water	1.0
Mean high water	0.8
Mean tide level (MSL)	0.0
Mean low water	-0.8
Mean lower low water	-1.4
Lowest tide observed	-3.74 (10-24-72)

In the course of conducting bathymetric harbor surveys in Guam, SEI has collected tide data that show significant variation from the predicted tide elevations. Measured tides are often on the order of 0.3 to 0.5 feet above or below the predicted tide levels. This anomaly is shown in Figure 2.1, a plot of recent observed heights and predicted heights from Apra Harbor. This plot was obtained from the National Ocean Service website (http://tidesonline.nos.noaa.gov). SEI compiled tidal variation at high and low tides on the first day of the month for the period of 6/01/2002 to 5/1/2004. The measured tide was higher than the predicted tide for 67% of the readings. Measured tide was lower than predicted tide for 23% of the readings. The maximum difference occurred on 7/1/02, when the observed tide was 0.8 ft higher than the predicted tide. No explanation for this anomaly is available at present.

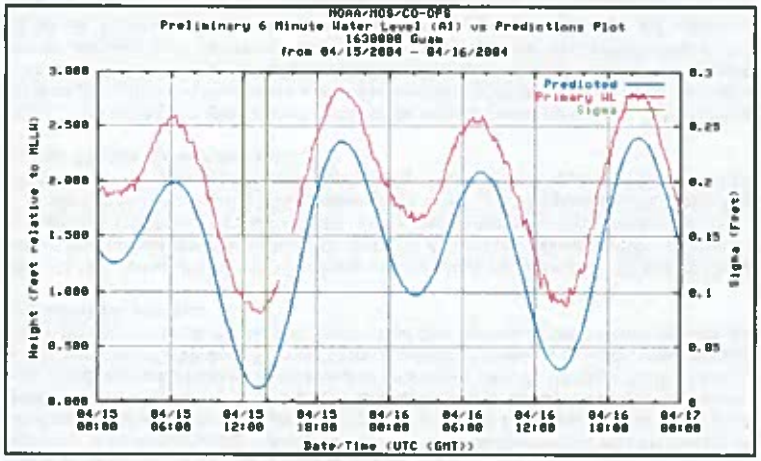


Figure 2-2. Comparison of predicted and observed tides in Apra Harbor

2.4 Currents

Coastal current patterns around Guam are poorly known, except at specific locations where project-related studies have been conducted. The North Equatorial Current, caused by the northeast trade winds, generally sets in a westerly direction near Guam, with speeds of 0.5 to 1.0 knots. According to Emery (1962) the North Equatorial Current diverges off Pati Point on the northeast side of the island. The two separate components then move down the northwest and southeast coasts of Guam, converging in the vicinity of Orote Point.

Sea Engineering, Inc. (1981) conducted current studies at Apra Harbor in 1980 that consisted of drogue studies inside the harbor and a current meter on Calalan Bank just offshore of the harbor entrance in 50 ft of water depth. The current meter data showed that currents outside the harbor

flowed to the south (SSE through WSW) 75% of the time during ebb tide conditions, and 52% of the time during flood tide conditions. North flowing currents (WNW through NE) occurred 15% of the time during ebb tide conditions, and 33% of the time during flood tide condition. This seems to indicate that the flow off Apra Harbor is predominately to the south, but that flow reversals to the north sometimes occur, and that they are correlated with the tide. Semi-reversing flows like this are indicative of tidal forcing within a regional flow; with the tidal reversing pattern becoming predominant as the background flow weakens. This type of flow pattern also occurs in areas where regional flows converge, as indicated for this location in Emery (1962).

SEI drogue measurements were done over the course of three days in November, 1980, during strong trade wind conditions. Three drogue depths were used: 5 feet, 30 feet, and 55 feet. It was found that that the surface and mid-depth drogues moved to the west, toward the harbor entrance, regardless of tide stage, and that the deep drogues moved east, into the harbor, regardless of tide stage.

Surface currents in the drogue studies ranged from 2 cm/second to 16 cm/second. Mid-level current speeds were approximately one half of the surface current values. Deep level current speeds were about the same as the mid-level currents, but in a direction approximately opposite, indicating significant shear between the 30 and 55-foot depths.

Guam tides are semi-diurnal with a diurnal inequality. This means that there are two unequal high tides and two unequal low tides each day. The mean tide range is 1.6 feet, with a maximum diurnal range of 2.3 feet. With the relatively small tide range, a resulting small tidal prism inside the harbor, and the large cross-sectional area of the entrance channel and outer harbor, the tidal influence could be expected to be weak. A 1976 study (C.E. Maguire and R.M. Towill, 1976) estimated the maximum tidal current in the entrance channel to be 5 cm/second, with weaker currents in the wider inner harbor areas.

Current studies in the Commercial Port area were conducted by University of Guam Marine Laboratory (1977) using drogues at three depths (3 feet, 20 feet and 40 feet) in December 1976 and January 1977. Drogues at the 3-foot and 20-foot depths were strongly influenced by the prevailing wind, which was from the east at 10-15 knots. Directions of the 3-foot drogues were approximately the same as wind direction; the wind carried these drogues toward Western Shoals. There was no evidence of a tidal effect on the directions of movement of the 3-foot drogues. The observations indicated a continuously strong outward (westward) flow of surface waters.

The 20-foot drogues moved generally in the direction of the wind, but patterns were more variable and complex than for the 3-foot drogues. As the drogues passed from the confines of the narrow docking area into the wider stretch of water just east of Gorco Pier, they tended to veer either north or south. The movement was more uniform outside (west) of the pier. The changes in the direction of drogue movement during rising tides suggest a reversal of subsurface flows or possibly a complex system at the 20-foot depth.

The 40-foot drogues moved outward directly toward Western Shoals and showed no changes in direction of movement with tidal changes. Speeds of the drogues ranged from 0.10 to 1.1 ft/sec (3 to 33 cm/sec) for the 3-foot sets, 0.10 to 0.33 ft/sec (3 to 10 cm/sec) for the 2.0-foot sets, and

0.07 to 0.23 ft/sec (2 to 7 cm/sec) for the 40-foot. The 3-foot drogues showed no definite pattern of change with tidal changes, but the 20-foot and 40-foot drogues moved significantly slower on rising tides than on falling tides.

SEI (1981) postulated that the currents in the harbor are primarily wind driven during trade wind conditions, and characterized by an opposing two-layer flow pattern. The two-layer flow results from the movement of the surface layer out of the harbor being balanced by an inward moving deeper layer.

2.5 Storms and Typhoons

2.5.1 Characteristics and Frequency

Guam is subject to strong winds associated with tropical storms and typhoons. Due to its proximity to typhoon breeding grounds, the island is threatened year-round with the passage of developing tropical storms and typhoons. Typhoons are defined as storms with sustained wind speeds equal to or greater than 65 knots, while tropical storms are defined as having sustained wind speeds between 34 and 64 knots. Based on information from the US Fleet Weather Central, Guam (now the Joint Typhoon Warning Center), at least 19 typhoons typically occur annually across the western North Pacific and South China Sea. Several of these storms threaten the Mariana Islands each year.

For a 44-year period, 1946-1989, 126 tropical cyclones were tracked within 180 n.m. of Guam with at least tropical storm strength. Of these storms, 49 were of typhoon intensity, yielding an average of 1.1 typhoons per year (EKNA, 1990). Recent typhoons, Typhoon Russ in 1990, Typhoon Yuri in 1991, Omar in 1992, Typhoon Paka in 1997, and Pongsana in 2002 approached within 30 n.m. of Guam and affected Guam severely. These data indicate a great likelihood of a typhoon threatening Guam each year.

Figure 2-3 is a chart of tropical cyclone tracks in the western Pacific for the year 1997. Tropical cyclones generally move from east to west and pass north or south of Guam. However, the tracks often curve so that the typhoon can move south to north and even double back in a retrograde manner and move from west to east. Nine storms between 1946 and 2002 virtually passed over the island. Typhoon Pamela in 1976 stalled west of Guam for several days and caused an extended period of high waves on the west coast. Typhoon Paka in 1997 passed directly over the north end of the island, generating waves that damaged Guam's shoreline, including various sites in Apra Harbor. Typhoon tracks shown in Figure 2-3 show that the east coast Guam is at most risk from typhoon onslaught.

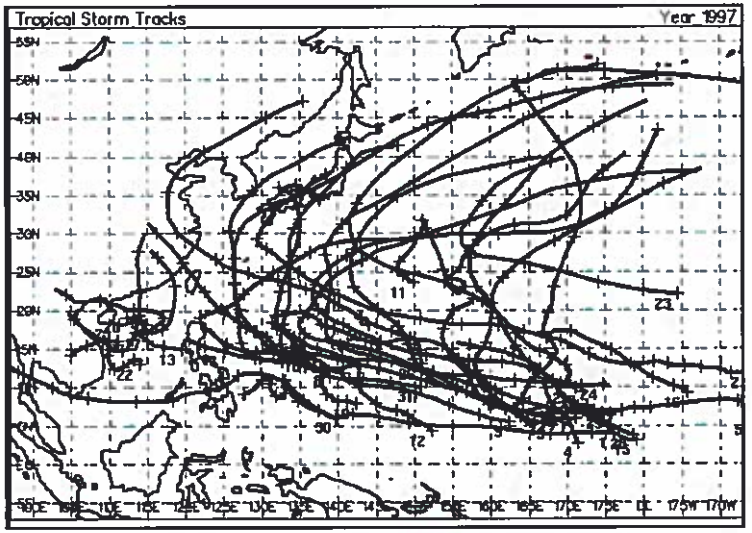


Figure 2-3. Typhoon tracks for one year (1997) in the western Pacific.

The most violent part of a typhoon is the section where the winds are in the same direction as the storm movement. Not only do winds have increased intensity, but wave heights are larger because the effective fetch for wave generation is increased. As storm winds circulate counter-clockwise around the storm center in the northern hemisphere, the most dangerous section of the storm is to the right of the center in the direction of travel. The most severe winds and waves will therefore generally occur north of the landfall point or closest point of approach of a typhoon traveling east to west.

Since it is located on the west coast of Guam, Apra Harbor is protected from the worst typhoon wave conditions. However, damaging waves from the northwest and north can occur from typhoons passing north of the harbor, such as typhoons Paka and Pongsana, or those, such as Pamela, that stall offshore.

2.5.2 Typhoon Parameters

Table 2-5 shows the characteristics of the most severe annual storms which have affected Guam between 1946 and 1990 (Holliday, 1975; Joint Typhoon Warning Center), and some of the more recent typhoons. The wind speeds in the table are the maximum sustained wind speeds for the typhoons at their closest point of approach to Guam, not necessarily the winds that affected

Guam. Among the storms listed in the table, typhoons Karen (1962), Pamela (1976), Russ (1990), Omar (1992), Paka (1997, and Pongsana (2002) caused significant damage on Guam.

The parameters listed in Table 2-5 are a combination of measured data and estimates using empirical calculations. The radius of maximum wind is estimated using the following equation from Brestschneider (1984):

$$R = R^{*} + AV_F - k_1B + k_2C$$

where,

- R = radius of maximum wind
- R^{*} = 18 n.m.
- V_F = typhoon forward speed
- K_1 = 22
- k_2 = 6
- A = 0.7
- B = $\tanh[3.17(\sin 35° - \sin\varphi)]$
- φ = storm latitude
- C = $\Delta P_n \exp[-\pi/4\,(\Delta Po)^2]$
- ΔP_n = central pressure reduction in inches of mercury

If the central pressure of the storm is known, the pressure at Guam can be estimated by:

$$(P - P_n)/(P_n - P_o) = e^{-(Rr)}$$

where,

- P = pressure at a distance of r
- P_n = the central pressure of the scenario typhoon
- P_n = normal atmospheric pressure (1013.3 mb)
- r = a distance from the center of the typhoon

Tropical cyclone models can be used to hindcast the effects of a typhoon if the following parameters are known or estimated: P_0 (central pressure), Rc (radius of maximum cylcostrophic winds), Vf (forward speed), and ϕ (latitude of central pressure).

Table 2-5. Annual worst storms affecting Guam.

Year	Name	Distance at CPA (nm)	Minimum Central Pressure(mbs)	Minimum Pressure at Guam (mbs)	Radius of Maximum Wind (nm)	Maximum Wave Height (ft)	Maximum Sustained Wind (kts)
1946	Unnamed	26	955	993	11	36.3	90
1948	Agnes	40	980	1003	14	31.3	60
1949	Allyn	60	909	999	9	40.3	135
1950	Doris	135	922	1008	8	39.4	120
1951	Marge	120	978	1008	17	20	65
1952	Hester	120	945	1005	16	53.6	100
1953	Nina	15	976	993	12	30.5	65
1954	Ida	180	975	1011	10	29.1	70
1957	Lola	40	900	990	9	46.6	140
1958	Viola	170	940	1009	9	21.9	105
1959		125	953	1006	15		90
1960		175	996	1012	11		40
1961	Nancy	95	910	1003	10	60.8	130
1962	Karen	10	908	939	12	53.1	135
1963	Olive	75	948	1005	10	28.6	75
1964	Sally	10	976	982	17	39.8	65
1965	Harriet	30	995	1003	9	21	35
1966	June	145	998	1008	6	25.1	45
1967	Gilda	55	945	1003	16	42	100
1968	Judy	95	935	1008	6	42.1	115
1969	Phyllis	0	1000	1000	16	29.1	35
1970	Patsy	90	987	1010	12	24.4	50
1971	Amy	90	920	1007	6	31.5	120
1972		150	985	1010	12		50
1974		105	989	1011	9		45
1975	June				N/A	43.1	
1976	Pamela	0	930	930	6	30.8	120
1977	Kim	0	980	980	14	33.2	60
1978	Rita	80	886	995	12	57.4	150
1979	Tip	30	980	1002	12	27.4	60
1980	Betty	30	972	995	17	44.1	70
1981	Irma	30	994	1007	10	19.8	40
1982	Mac	0	980	980	10	24.5	60
1983	Forrest	160	987	1011	12	26.9	50
1984	Bill	20	959	985	14	42	85
1985	Dot	120	990	1010	11	24.1	45
1986	Kim	110	910	1004	10	43.2	130
1988	Roy	40	931	996	9	38.8	110
1989	Andy	80	898	1000	9	44.2	140
1990	Russ	30	916	989	9	58.1	125
1991	Yuri	55	885		N/A	N/A	150
1992	Omar	0	940	940	11	36.7	
1997	Paka	0	935	953	20	49.7	130
2002	Pongsana	0	935	937	17	47.7	130

Note: CPA = Closest Point of Approach

2.5.3 Typhoon Pressure Drop

Values for surface pressure at Guam during the extreme typhoons listed in Table 2-5 were analyzed using Gumbel's first asymptotic distribution function to calculate recurrence values. Figure 2-4 is a plot of the pressure data as reduced by the distribution. The regression line in the figure is used to calculate the return period values in Table 2-6.

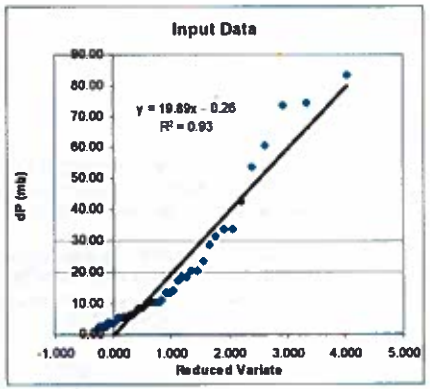


Figure 2-4. Distribution of extreme pressure values at Guam.

Table 2-6. Return Period of Typhoon Pressures at Guam

Return Period (years)	Pressure Deficit (mb)	Central Pressure (mb)
10	44.5	968.8
25	63.4	949.9
50	77.4	935.9

2.5.4 Still Water Level Rise

The astronomical tide, and storm surge are the primary factors determining the rise in still water level in the project vicinity during storm events.

Astronomical Tide: A tide level of +1.0 feet above MSL, equal to mean higher high water is considered an appropriate design tide due to its frequency of occurrence.

Storm Surge: The storm surge is a combination of the pressure setup and the wind setup. The water level rise due to reduction of atmospheric pressure associated with a storm is determined by:

$$S_p = 1.14\ \Delta P$$

where the surge (S_p) is measured in feet, and the pressure units are inches of mercury. The pressure values and water level rise calculated for the wharf for 10-year, 25-year and 50-year pressure deficit recurrences are listed Table 2-7.

Table 2-7. Typhoon pressure setup.

	10-Year Pressure	25-Year Pressure	50-Year Pressure
Pressure (mb)	968.8	949.9	935.9
Pressure Change (mb)	44.3	63.4	77.4
Pressure Change(in-Hg)	1.3	1.87	2.28
Water level rise (ft)	1.5	2.1	2.6

The rise in water level caused by winds can be estimated by:

$$\Delta S_u = 540\ K\ U^2\ \Delta x/d$$

where ΔS_u is wind setup in feet, K is 3.0×10^{-6}, U is the wind speed (10-minute average) in knots, Δx is the fetch distance, and d is the average depth in feet. Using the values of wind speed presented in Table 2-3, the calculated wind setup for 10, 25 and 50-year events are 0.08, 0.13 and 0.17 feet respectively.

The total stillwater level rise for 10, 25 and 50-year events is 2.6, 3.2 and 3.8 feet respectively.

2.6 Waves

The entrance to Apra Harbor is exposed to deepwater waves generated west of Guam. It is well protected from the easterly tradewind waves which dominate the wave regime in the Guam area. Storm waves generated from the northwest to southwest are the most critical deepwater waves affecting the Apra Harbor entrance. The proposed new wharf site is situated on the east end of the outer Apra Harbor and is well sheltered from deepwater waves. A design wave study conducted for the U.S. Navy, Bureau of Yards and Docks predicted that waves in the area of the Commercial Port will be less that 3 feet, 93 percent of the time (U.S. Army Engineer District, 1983). The project site and Commercial Port area, however, are subject to typhoon waves generated by strong winds from the south to west blowing across the harbor.

Storm waves generated by winds blowing within the harbor can be estimated using fetch limited wave generation equations presented in the Shore Protection Manual (U.S. Army, 1984). The greatest wind fetch distance for the proposed wharf site is 2.6 miles, and would occur with winds blowing from the west-southwest, from the harbor entrance to the project site. Table 2-8 presents estimated wave heights for 10, 25 and 50-year events assuming winds blowing across the

maximum fetch distance. The estimated wave heights near the wharf are 3.7 feet and 6.2 feet for the 10 and 50-year events, respectively.

Table 2-8. Predicted Fetch-Limited Storm Waves at the Project Site

Return Period	10-Year	25-Year	50-Year
Wind Speed (10min, mph)	60	75	87
Wave Height (feet)	3.74	5.15	6.2
Wave Period (s)	3.5	4.1	4.4

3.0 SHORELINE DESCRIPTION

The project site is located along the northeast shoreline of Outer Apra Harbor, immediately west of Cabras Island. The deep waters of Outer Apra Harbor were originally bounded along the northern margin by a barrier reef, known as Luminao Reef. After World War II, Glass Breakwater was built, and extensive fill placed on the reef to fully close off and protect the harbor from the open ocean. The project shoreline, from Family Beach in the west to Cabras Island and Southwest Point to the east, is therefore primarily manmade fill material, consisting of a series of fill headlands, piers and wharves bounding six small pocket beaches or coves. During prevailing conditions, this shoreline is very low energy, as the east-northeast tradewinds are directed offshore. Figure 3-1 shows the project shoreline and photograph locations. The shoreline segments, from east to west, are described below:

Fill Area 2C – The easternmost cove, between the Sea-Plane ramp and Southwest Point, is Fill Area 2C. On the eastern side of this cove there is a revetment composed of large coral boulders fronting a wire fence line (Figure 3-2). Between this revetment and the Sea-Plane ramp, the shoreline consists of a relatively flat sandy beach (Figure 3-3).

Sea Plane Ramp Headland – The Sea-Plane Ramp headland is composed of gravel to small boulder-sized fill material. A small boat ramp bounded by concrete seawalls extends from the headland into the water. The shoreline on either side of the concrete seawalls is armored with rip-rap (Figure 3-4). The shoreline is in a degraded condition with extensive debris present, and rebar is exposed in the boat ramp.

Fill Area 2B – The cove between Gulf Pier and the Sea-Plane ramp is Fill Area 2B. The head of the cove contains a small gravel and sand beach about 40 feet long. Rock revetments armor the shoreline on either side of the beach (Figure 3-5).

Gulf Pier (Mobil Pier) Headland – The headland to the east of Fill Area 2B is about 120 feet wide and contains Gulf Pier, a refueling pier extending to the south into the harbor. The shoreline of this headland consists primarily of boulders, with occasional patches of gravel and sand. On the western side of the refueling pier, a retaining wall is located landward of the boulders armoring the shoreline (Figure 3-6).

Fill Area 2A – The shoreline along Fill Area 2A, between Divers Beach and Gulf Pier, consists rock revetments on either side of a small gravel beach (Figure 3-7).

Fill Area 1 – Fill Area 1 is composed of a headland called Divers Beach and a long stretch of a rock revetment between Divers Beach and Hotel Wharf. Divers Beach consists primarily of a narrow beach of coral gravel (1/2 inch to four inches) and boulders (one foot to three feet) (Figure 3-8). The remnants of an old wharf are visible in the water, with several concrete piles extending above the water surface. The revetment is composed of large rock rip-rap. Over 50% of the revetment is damaged, with the dislodged armor rock boulders scattered along the toe. The slope of this revetment is one vertical to one horizontal (1V:1H).

Hotel Wharf – Hotel Wharf is a concrete wharf approximately 130 feet long, extending seaward from the shoreline (Figure 3-9). Water depth off of the wharf is approximately 20 feet. The wharf is actively used to dock vessels. On either side of the Hotel Wharf there are revetments composed of boulder-sized rock rip-rap with a slope of 1V:1H. Both revetments are damaged and have large pieces of corroded steel lodged between the boulders.

Hotel Wharf Beach – The cove to the west of Hotel Wharf contains a sand beach known as Hotel Wharf Beach. The beach is composed of medium grain-size sand and is actively used for recreational boating. A tourist facility operates recreational boating activities out of this cove (Figure 3-10).

Dog Leg Pier Cove – Dog Leg Pier Cove is a narrow and long cove to the east of Hotel Wharf Beach, bounded by Dog Leg Pier to the east, and the remnants of an old dock and pier to the west (Figure 3-11). The cove is about 170 feet long and 60 feet wide. The shoreline along the entire cove, from Hotel Wharf Beach to Family Beach, consists of rock rip-rap, backfilled with gravel and dirt. The western pier is used by a commercial dive tour operation called Dive City. Several steel sheet piles from an old dock still remain in the water and are severely corroded. The shoreline at the head of the cove is heavily vegetated.

Family Beach – Family Beach is a mixed sand and gravel beach extending approximately 400 feet to the west of Dog Leg Pier (Figure 3-12). The sand is primarily located above the high water mark, while gravel occurs below the high water mark. A tourist recreational boating company operates from the beach.

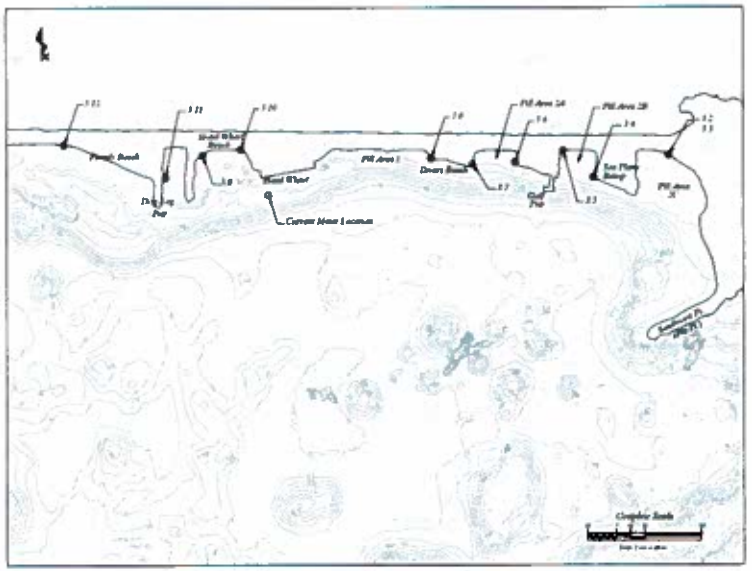


Figure 3-1. Project Shoreline.

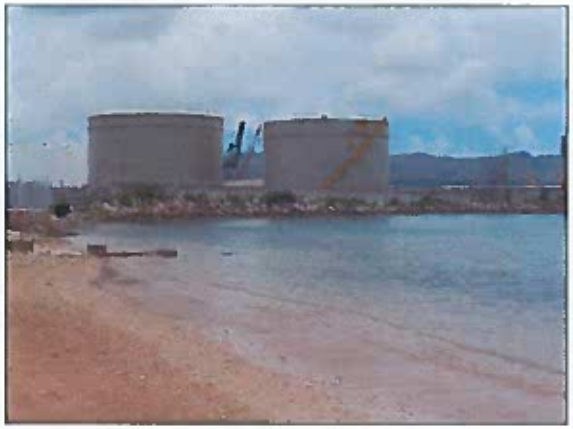


Figure 3-2. East end of Fill Area 2C.



Figure 3-3. Sand beach in Fill Area 2C.



Figure 3-4. Small boat ramp.



Figure 3-6. Fill Area 2B.

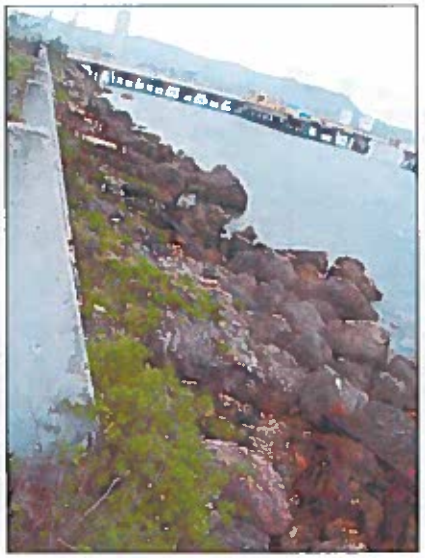


Figure 3-6. Gulf Pier.



Figure 3-7. Revetments and gravel beach in Fill Area 2A.



Figure 3-8. Divers Beach.



Figure 3-9. Hotel Wharf (view from the west, looking east).



Figure 3-10. Hotel Wharf Beach.



Figure 3-11. Dog Leg Pier Cove.



Figure 3-12. Family Beach.

4.0 CURRENT MEASUREMENTS

Currents in the project vicinity were measured by deploying an *in-situ* current meter at the site for one month and by tracking current drift drogues for four days. The current meter provides long-term information on the current characteristics at a specific location and the drogue measurements provide information on the spatial current patterns in the project area.

4.1 Current Meter Measurements

Nearshore current measurements were obtained with a bottom mounted Aanderaa DCM 12 acoustic Doppler current meter. The DCM 12 measures currents using four acoustic transducers that transmit ultrasonic pulses toward the sea surface. Particulates and organisms in the water column reflect the sound back to the transducers. The frequency of the backscattered signal is modified according to the Doppler Effect principle. The meter was deployed in a water depth of 45 feet, directly offshore of the west end of Hotel Wharf (Figure 3-1). The DCM 12 measures currents in several layers in the water column. The layer depths below the sea surface were 0 to 9 feet, 15 to 23 feet, 22 to 30 feet and 28 to 36 feet. Current measurements were obtained at 30-minute intervals, with each data point averaging a 10-minute sampling period at a sample rate of 10 seconds. The DCM 12 additionally measured the tidal water levels throughout the deployment period. The deployment period lasted from 04/08/05 to 05/05/05.

The current meter data is presented in several formats:

Time Series Plots – The current meter data obtained at half-hour intervals are plotted in a time series plot, which shows the long-term variation in current speed, current direction, and tide stage for the entire record period. The time series plots are of current speeds (cm/s) and direction (°TN). Also plotted in the time series are the tidal elevations (m). Figures 4-1 to 4-4 show the time series plots for the current meter at those specific depths listed above.

24-hour Running Average Time Series – A 24-hour running average time series of the current meter data is also presented to show longer period flow patterns. These plots are shown on Figures 4-5 through 4-8.

Histograms – The current meter data is also summarized in histograms, which show the percent frequency of occurrence of current speed and direction. Histograms were prepared for the overall record, and also for the flood and ebb tide stages. The histograms are presented in Tables 4-1 to 4-4.

Current Roses – Current roses (Figures 4-9 to 4-12) are graphical representations of the histograms, visually displaying the current speed, direction and frequency of occurrence.

The time series, current roses and histograms show that current dynamics in the area are not complex and are driven primarily by the winds. The data show that there is a decrease in the magnitude of the velocity from the surface layer to the deeper layers. The upper layer displayed average current velocities of 9.5 cm/s (0.3 ft/s). The 15 to 23-foot water layer and the 28 to 36-foot water layer displayed average current speeds of about 6 cm/s (0.2 ft/s). The current directions were primarily to the west through southwest, driven by prevailing east to northeast

trade winds. In the surface layer, currents flowed to the southwest through northwest over 80% of the time, at average speeds of approximately 10 cm/s (0.3 ft/s).

4.2 Current Drogue Measurements

Current drogues were utilized to measure currents at three different depths, the near-surface (5 feet), mid-depth (50 feet), and deep (80 feet). The current drogues are window-shade type, made of tarps 5 feet long and 6 feet wide, with a PVC pipe at the top attached to a float, and a galvanized steel pipe weighting the bottom of the tarp. The drogues were followed with a small boat, and locations of the surface floats were recorded using a GPS receiver and survey software. Drogue measurements were conducted from April 8 to 11, 2005.

Figures 4-13 to 4-16 present the results of the four days of drogue measurements. Details on the drift intervals and velocities are presented in Tables 4-5 to 4-8. The current drogue measurements show that the surface and mid-depth drogues moved primarily downwind. The deep drogue moved much more slowly, frequently to the southeast, partially against the wind. Drogue results for each day are described below:

April 8, 2005 (Figure 4-13 and Table 4-5) – Drogues were tracked from 11:52 to 15:11. High tide of 1.54 feet was at 7:24, while low tide of -0.26 was at 14:00. Northeasterly winds blew with an average wind speed of 13 knots with gusts up to 15 knots. Two sets of drogues were deployed, the first deployment south of Divers Beach at the 108-foot water depth and the second deployment south of Gulf Pier at the 111-foot water depth. During the first deployment the surface drogue moved downwind at average speeds of 13 cm/s (0.42 feet/s) with an average heading of 255°TN. The mid-depth drogue moved at average speeds of 6 cm/s (0.18 feet/s) with an average heading of 284°TN. The deep drogue moved at average speeds of 1 cm/s (0.03 feet/s) with an average heading of 130°TN. For the second deployment, the surface drogue moved downwind at average speeds of 17 cm/s (0.58 feet/s) with an average heading of 226°TN. The mid-depth drogue moved at average speeds of 5 cm/s (0.17 feet/s) with an average heading of 273°TN. The deep drogue moved at average speeds 1.5 cm/s (0.05 feet/s) with an average heading of 133°TN.

April 9, 2005 (Figure 4-14 and Table 4-6) – Drogues were tracked from 9:01 to 17:14. High tide of 1.51 feet was at 7:42, while low tide of -0.54 was at 14:18. Easterly winds blew with an average wind speed of 7 knots. Three sets of drogues were deployed, the first deployment was south of Gulf Pier at the 108-foot water depth, the second deployment was south and between Divers Beach and Gulf Pier at the 55-foot water depth and the third deployment was just south of the tip of Piti Point at the 90 foot water depth. During the first deployment the surface drogue moved downwind at average speeds of 7 cm/s (0.24 feet/s) with an average heading of 259°TN. The mid-depth drogue moved at average speeds of 0.3 cm/s (0.001 feet/s) with an average heading of 247°TN. The deep drogue was allowed to drift the entire day. In the morning between 9:01 and 12:59 the average speed was 1.5 cm/s (0.05 feet/s) with an average heading of 240°TN. In the afternoon between 14:44 and 17:03 the average speed was 1 cm/s (0.03 feet/s) with an average heading of 144°TN. For the second deployment only the surface and mid-depth drogues were deployed. The surface drogue moved downwind at average speeds of 10 cm/s (0.32 feet/s) with an average heading of 253°TN. The mid-depth drogue moved at average speeds of 4 cm/s

(0.12 feet/s) with an average heading of 228°TN. For the third deployment only the surface and mid-depth drogues were deployed. The surface drogue moved downwind at average speeds of 8 cm/s (0.25 feet/s) with an average heading of 237°TN. The mid-depth drogue moved at average speeds of 4 cm/s (0.17 feet/s) with an average heading of 218°TN.

April 10, 2005 (Figure 4-15 and Table 4-7) – Drogues were tracked from 8:42 to 12:51. High tide of 1.48 feet was at 8:24, while low tide of -0.80 was at 15:18. Northeasterly winds blew with an average wind speed of 13 knots with gusts up to 15 knots. Two sets of drogues were deployed, the first deployment was south of Divers Beach and along the centerline of the Piti Channel at the 125-foot water depth and the second deployment was south of Family Beach at the 115-foot water depth. During the first deployment the surface drogue moved downwind at average speeds of 9 cm/s (0.30 feet/s) with an average heading of 276°TN. The mid-depth drogue moved at average speeds of 6 cm/s with an average heading of 282°TN. The deep drogue moved at average speeds of 1.5 cm/s (0.05 feet/s) with an average heading of 159°TN. For the second deployment only the surface and the mid-depth drogues were deployed. The surface drogue moved downwind at average speeds of 10 cm/s (0.33 feet/s) with an average heading of 242°TN. The mid-depth drogue moved at average speeds of 7 cm/s (0.21 feet/s) with an average heading of 242°TN.

April 11, 2005 (Figure 4.16 and Table 4.8) – Drogues were tracked from 8:29 to 10:24. High tide of 1.44 feet was at 8:36, while low tide of -0.92 was at 16:00. Easterly winds blew with an average wind speed of 11 knots, with gusts up to 14 knots. The deployment location for this set of drogues was south of the Sea Plane Ramp, and north of Piti Point in 60-foot water depth. Two drogues were deployed; a surface (8 feet), and a mid-depth (50 feet). The mid-depth drogue moved at average speeds of 4 cm/s (0.147 feet/s) with an average heading of 264°TN. The surface drogue moved downwind at average speeds of 2 cm/s (0.073 feet/s) with an average heading of 295°TN.

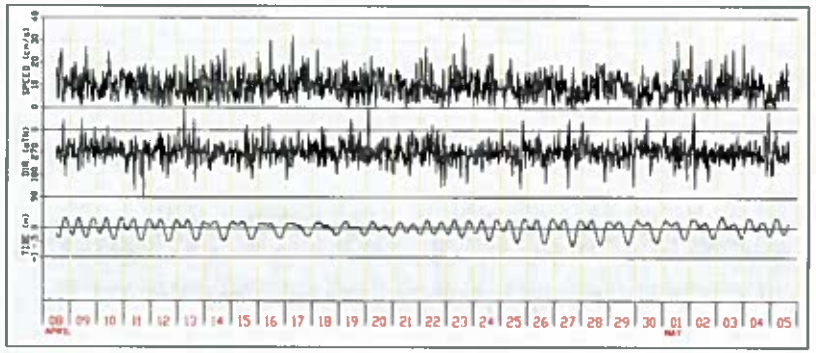


Figure 4-1. Current time series for depth layer 1 to 9 feet.

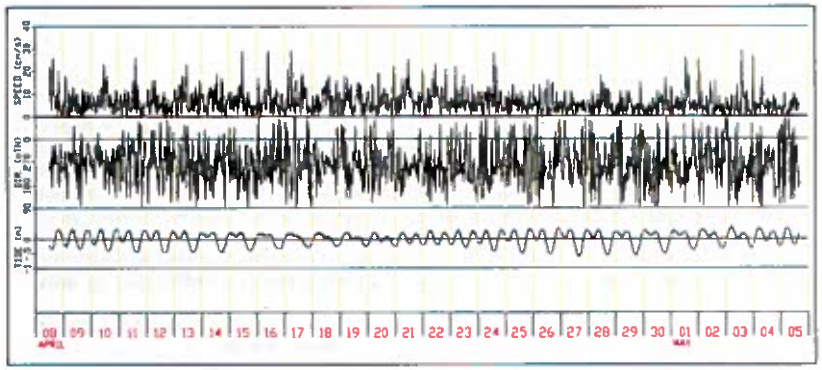


Figure 4-2. Current time series for depth layer 15 to 23 feet.

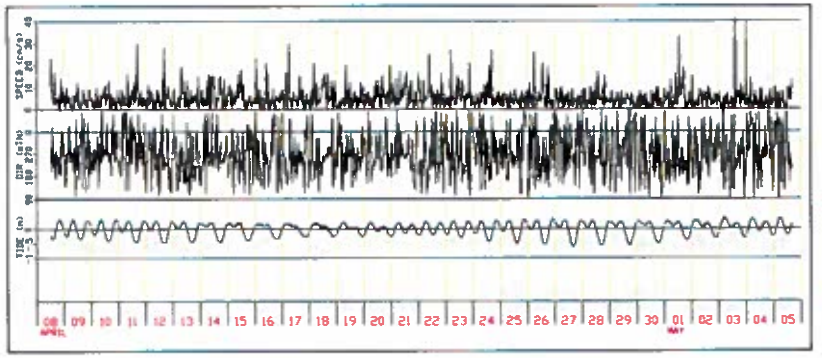


Figure 4-3. Current time series for depth layer 22 to 30 feet.

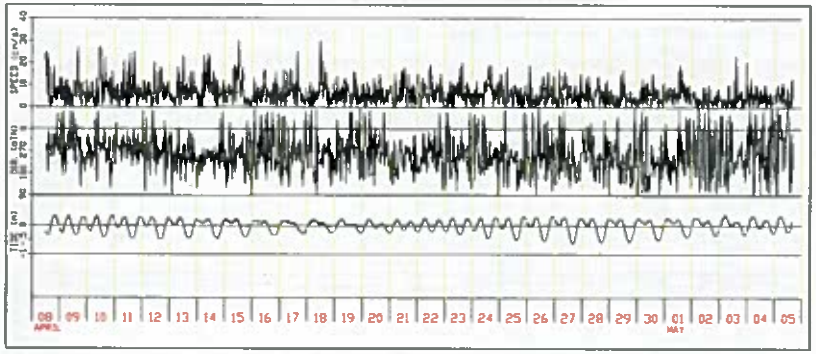


Figure 4-4. Current time series for depth layer 28 to 38 feet.

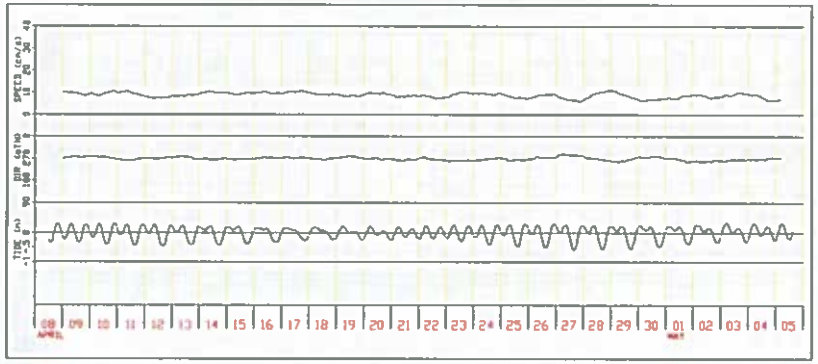


Figure 4-5. 24-Hour average time series for depth layer 1 to 9 feet.

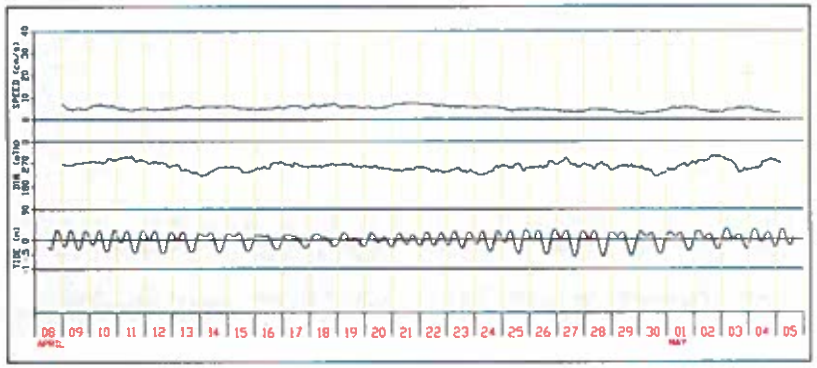


Figure 4-6. 24-Hour average time series for depth layer 15 to 23 feet.

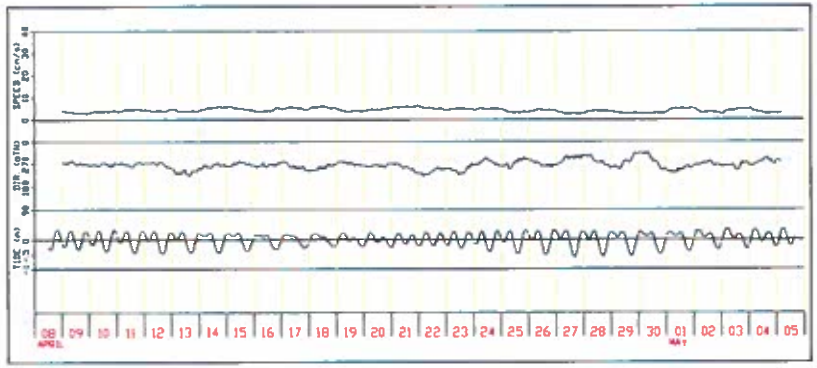


Figure 4-7. 24-Hour average time series for depth layer 22 to 30 feet.

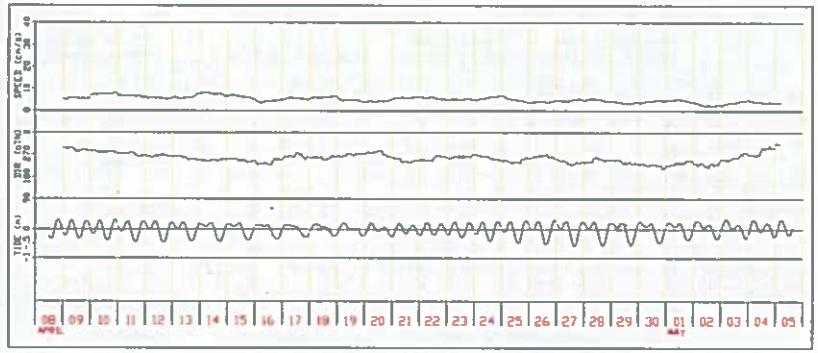


Figure 4-8. 24-Hour average time series for depth layer 28 to 38 feet.

Table 4-1. Histogram for current velocities and direction for depth layer 1 to 9 feet.

H-WHARF APRA HARBOR

Station: H-wharf — Depth: 1-9 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
OVERALL — NET TRANSPORT: 8.0 cm/s 269 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	1.7	0.9	0.4	0.5	0.2	0.2	0.1	0.3	0.5	0.5	0.9	1.1	2.4	2.8	2.8	1.2	1.7	18.2
5-9.9		0.9	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.5	1.5	3.5	6.9	10.5	7.0	4.2	1.3	37.0
10-14.9		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	2.7	6.8	7.6	7.0	2.0	0.7	27.7
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	1.2	3.1	4.4	2.9	1.1	0.2	13.2
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	1.0	0.7	0.5	0.2	0.0	2.8
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.7
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.4
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	1.7	2.0	0.5	0.7	0.2	0.2	0.1	0.5	0.7	1.3	3.4	9.1	20.5	26.2	20.4	8.7	3.8	100.0
AVE SPD		5.5	4.3	3.4	3.0	2.3	1.0	3.8	3.7	6.8	9.0	9.9	10.5	10.4	10.0	9.0	6.4	9.5
MAX SPD		13.0	9.0	8.0	3.0	4.0	1.0	6.0	8.0	22.0	33.0	30.0	32.0	33.0	25.0	22.0	18.0	33.0
STD DEV		2.9	3.1	2.0	0.0	1.5	0.0	1.7	2.0	5.1	6.9	5.6	5.3	5.0	4.0	4.5	4.2	5.3

Station: H-wharf — Depth: 1-9 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
EBB TIDE — NET TRANSPORT: 8.4 cm/s 260 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	2.0	0.9	0.3	0.6	0.2	0.0	0.2	0.5	0.2	0.6	1.4	1.2	3.0	2.6	2.7	1.1	1.4	18.6
5-9.9		1.2	0.3	0.2	0.0	0.0	0.0	0.0	0.3	0.5	1.4	3.2	6.4	10.1	6.8	3.6	1.1	34.9
10-14.9		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.3	8.2	8.0	7.9	1.5	0.3	28.9
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	1.1	3.2	5.6	2.4	0.9	0.0	13.5
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	1.2	0.6	0.8	0.2	0.0	3.2
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.6
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.3
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	2.0	2.3	0.6	0.8	0.2	0.0	0.2	0.5	0.5	1.4	3.5	8.2	22.4	27.2	20.6	7.3	2.7	100.0
AVE SPD		6.0	5.3	3.2	3.0	0.0	1.0	3.7	5.0	7.6	6.8	9.8	10.7	10.7	10.0	9.0	5.4	9.5
MAX SPD		13.0	9.0	5.0	3.0	0.0	1.0	4.0	8.0	22.0	19.0	30.0	32.0	27.0	23.0	20.0	13.0	32.0
STD DEV		2.9	3.9	1.3	0.0	0.0	0.0	0.6	3.0	4.6	3.8	5.6	5.6	5.0	4.6	4.6	3.5	5.3

Station: H-wharf — Depth: 1-9 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
FLOOD TIDE — NET TRANSPORT: 7.9 cm/s 269 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	1.4	0.9	0.5	0.5	0.2	0.5	0.0	0.2	0.8	0.5	0.5	1.1	1.7	3.0	3.0	1.4	2.0	17.9
5-9.9		0.6	0.0	0.2	0.0	0.0	0.0	0.3	0.2	0.6	1.6	3.9	7.5	10.9	7.1	4.8	1.6	39.1
10-14.9		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	3.1	5.4	7.1	6.2	2.5	1.1	26.4
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.4	3.1	3.3	3.4	1.2	0.3	12.9
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.8	0.8	0.3	0.2	0.0	2.5
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.0	0.2	0.0	0.0	0.8
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.0	0.0	0.0	0.5
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	1.4	1.7	0.5	0.6	0.2	0.5	0.0	0.5	0.9	1.2	3.4	10.1	18.6	25.2	20.2	10.1	5.0	100.0
AVE SPD		4.8	3.0	3.8	3.0	2.3	0.0	4.0	3.0	5.9	11.3	10.0	10.4	10.1	10.0	9.1	7.0	9.4
MAX SPD		13.0	4.0	8.0	3.0	4.0	0.0	6.0	8.0	10.0	33.0	20.0	26.0	33.0	25.0	22.0	18.0	33.0
STD DEV		2.9	1.7	2.9	0.0	1.5	0.0	2.6	2.7	2.6	8.6	5.6	4.8	5.0	5.1	4.5	4.5	5.3

Table 4-2. Histogram for current velocities and direction for depth layer 15 to 23 feet.

H-WHARF APRA HARBOR

Station: H-wharf — Depth: 15-23 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
OVERALL — NET TRANSPORT: 2.9 cm/s 245 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	8.3	1.5	1.6	2.3	1.5	2.1	1.4	2.1	1.8	2.7	3.6	3.2	4.1	3.9	3.7	2.5	1.9	40.2
5-9.9		1.4	1.0	1.1	0.8	0.9	0.6	0.6	1.1	2.2	2.0	4.8	4.1	4.1	3.4	2.0	2.1	32.3
10-14.9		0.3	0.2	0.5	0.3	0.1	0.2	0.0	0.8	0.8	1.1	2.5	3.0	2.5	0.9	0.6	0.4	14.1
15-19.9		0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.7	0.6	0.8	0.5	0.4	0.2	0.1	3.6
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.1	0.0	0.0	0.1	1.0
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.8
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	8.3	3.2	2.8	3.8	2.6	3.1	2.2	2.8	3.7	6.2	7.7	11.6	12.6	11.1	8.4	5.2	4.5	100.0
AVE SPD		5.3	4.4	4.4	5.2	3.6	4.3	3.4	5.8	7.0	7.5	7.9	8.0	7.0	5.8	5.4	5.9	5.9
MAX SPD		14.0	11.0	11.0	15.0	13.0	11.0	9.0	14.0	33.0	29.0	29.0	26.0	23.0	18.0	15.0	22.0	33.0
STD DEV		3.1	2.7	3.1	3.8	2.8	3.1	2.1	3.7	6.1	6.4	5.2	5.4	4.5	3.8	3.5	3.6	4.9

Station: H-wharf — Depth: 15-23 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
EBB TIDE — NET TRANSPORT: 3.6 cm/s 242 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	6.7	1.7	1.1	2.0	1.4	2.0	0.9	1.8	1.8	2.7	3.6	3.2	4.7	3.9	4.1	1.7	2.0	45.1
5-9.9		1.5	0.6	0.9	0.8	0.5	0.8	0.5	1.5	2.4	2.9	4.5	5.0	4.1	3.2	2.3	2.0	33.3
10-14.9		0.5	0.0	0.5	0.5	0.0	0.5	0.0	0.9	0.8	1.1	2.7	3.5	2.6	0.9	0.5	0.5	15.1
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	1.1	1.2	0.8	0.3	0.3	0.0	4.7
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	0.2	0.0	0.0	0.0	1.1
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.8
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	6.7	3.6	1.7	3.3	2.6	2.4	2.1	2.3	4.2	6.7	8.3	11.8	15.3	11.5	8.5	4.7	4.4	100.0
AVE SPD		5.5	3.9	4.4	5.3	2.7	5.4	3.4	6.1	7.0	7.0	8.2	8.5	7.2	5.6	5.9	5.3	6.2
MAX SPD		14.0	7.0	11.0	14.0	6.0	11.0	9.0	14.0	26.0	29.0	29.0	25.0	23.0	18.0	15.0	11.0	29.0
STD DEV		3.2	1.7	3.2	3.7	1.6	3.6	2.1	3.8	5.2	5.8	5.2	5.7	5.0	3.8	3.7	2.8	5.0

Station: H-wharf — Depth: 15-23 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
FLOOD TIDE — NET TRANSPORT: 2.7 cm/s 250 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	9.9	1.6	2.2	2.6	1.6	2.3	1.9	2.5	1.7	2.6	3.6	3.3	3.6	3.9	3.3	3.3	1.9	51.4
5-9.9		1.2	1.4	1.2	0.8	1.4	0.5	0.8	0.8	2.0	1.1	5.1	3.3	4.0	3.7	1.7	2.2	31.2
10-14.9		0.2	0.5	0.5	0.2	0.2	0.0	0.0	0.6	0.8	1.1	2.2	2.5	2.5	0.9	0.8	0.3	13.0
15-19.9		0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.9	0.2	0.3	0.3	0.5	0.0	0.2	2.5
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.2	0.9
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.8
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	9.9	2.8	4.0	4.3	2.6	3.9	2.3	3.3	3.1	5.7	7.1	11.5	9.8	10.7	8.4	5.7	4.7	100.0
AVE SPD		4.9	4.6	4.5	5.1	4.1	3.3	3.3	5.3	6.9	8.1	7.7	7.1	6.7	5.9	4.9	6.4	5.5
MAX SPD		11.0	11.0	11.0	15.0	13.0	6.0	8.0	13.0	33.0	29.0	28.0	26.0	16.0	16.0	12.0	22.0	33.0
STD DEV		2.9	3.1	3.0	4.0	3.3	2.1	2.1	3.6	7.0	7.1	5.3	4.7	4.0	3.9	3.3	4.3	4.8

Table 4-3. Histogram for current velocities and direction for depth layer 22 to 30 feet.

H-WHARF APRA HARBOR

Station: H-wharf — Depth: 22-30 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
OVERALL — NET TRANSPORT: 2.1 cm/s 245 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	10.7	2.1	2.0	2.6	2.8	1.3	1.8	2.2	2.0	2.2	3.0	3.1	4.2	4.1	3.8	3.0	3.8	54.8
5-9.9		1.8	1.5	1.2	1.1	0.8	0.5	1.5	1.9	1.9	2.7	4.1	4.6	3.3	2.3	2.6	1.9	33.7
10-14.9		0.2	0.2	0.1	0.1	0.0	0.0	0.2	0.1	0.2	0.8	1.2	1.8	1.5	0.5	0.2	0.3	7.4
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.3	1.0	0.5	0.3	0.1	0.1	0.0	2.5
20-24.9		0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.8
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.4
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2
TOTAL %	10.7	4.1	3.7	3.9	4.0	2.1	2.3	4.0	4.0	4.7	7.3	10.0	11.4	9.3	6.7	5.8	6.0	100.0
AVE SPD		4.6	4.6	3.7	3.6	4.8	3.5	4.6	4.6	5.8	7.6	7.7	6.8	6.1	4.8	4.6	4.1	5.0
MAX SPD		11.0	14.0	13.0	12.0	21.0	8.0	15.0	11.0	27.0	41.0	30.0	28.0	25.0	16.0	18.0	12.0	41.0
STD DEV		2.6	2.9	2.5	2.4	4.0	1.7	3.3	2.5	5.1	7.4	5.7	4.8	4.3	3.0	2.9	2.6	4.4

Station: H-wharf — Depth: 22-30 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
EBB TIDE — NET TRANSPORT: 2.5 cm/s 248 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	9.1	1.8	1.8	2.7	2.1	1.4	1.7	2.1	1.7	2.0	3.2	2.7	4.5	4.8	3.3	2.3	3.9	51.1
5-9.9		2.1	0.9	1.1	1.4	1.1	0.6	1.5	1.0	2.4	3.6	3.9	5.3	3.5	2.9	2.6	1.7	38.3
10-14.9		0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.5	1.1	1.1	2.1	1.7	0.6	0.2	0.6	8.3
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.1	0.9	0.2	0.2	0.0	0.0	2.9
20-24.9		0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.9
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.3
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	9.1	4.1	2.9	3.9	3.6	2.6	2.3	3.6	2.5	5.0	8.5	9.2	13.3	10.3	7.0	5.0	6.2	100.0
AVE SPD		4.9	4.4	3.8	4.0	5.5	3.3	4.3	4.6	5.7	6.8	7.7	7.2	6.0	5.4	4.8	4.3	5.2
MAX SPD		10.0	11.0	13.0	12.0	21.0	8.0	9.0	9.0	16.0	33.0	30.0	23.0	25.0	16.0	11.0	12.0	33.0
STD DEV		2.4	2.7	2.9	2.8	4.5	2.0	2.6	2.4	3.4	5.4	5.8	4.9	4.5	3.3	2.6	3.1	4.4

Station: H-wharf — Depth: 22-30 ft/45 ft — Deployment Period: 04/08/05 - 05/05/05
FLOOD TIDE — NET TRANSPORT: 2.1 cm/s 244 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	12.4	2.5	2.2	2.5	3.4	1.2	1.9	2.3	2.3	2.5	2.8	3.6	3.9	3.4	4.3	3.7	3.6	58.5
5-9.9		1.6	2.0	1.4	0.9	0.5	0.5	1.4	2.0	1.2	1.7	4.3	3.9	3.1	1.7	2.6	2.2	31.1
10-14.9		0.2	0.3	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.6	1.4	1.6	1.2	0.5	0.2	0.0	6.5
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	0.2	0.9	0.0	0.5	0.0	0.2	0.0	2.2
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.6
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.6
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	12.4	4.2	4.5	3.9	4.3	1.7	2.3	4.3	4.5	4.3	6.1	10.7	9.5	8.2	6.5	6.7	5.7	100.0
AVE SPD		4.3	4.8	3.6	3.3	3.8	3.6	4.0	4.6	5.9	8.0	7.7	6.2	6.2	4.1	4.6	3.9	4.7
MAX SPD		11.0	14.0	9.0	9.0	9.0	6.0	15.0	11.0	27.0	41.0	27.0	28.0	17.0	14.0	10.0	8.0	41.0
STD DEV		2.8	3.1	2.1	1.9	2.9	1.4	3.9	2.5	6.6	9.6	5.8	4.7	4.1	2.6	3.2	1.9	4.8

Table 4-4. Histogram for current velocities and direction for depth layer 28 to 36 feet.

H-WHARF APRA HARBOR

Station: H-wharf Depth:28-36 ft/45 ft Deployment Period: 04/08/05 - 05/05/05
OVERALL MET TRANSPORT: 3.4 cm/s 253 deg.T

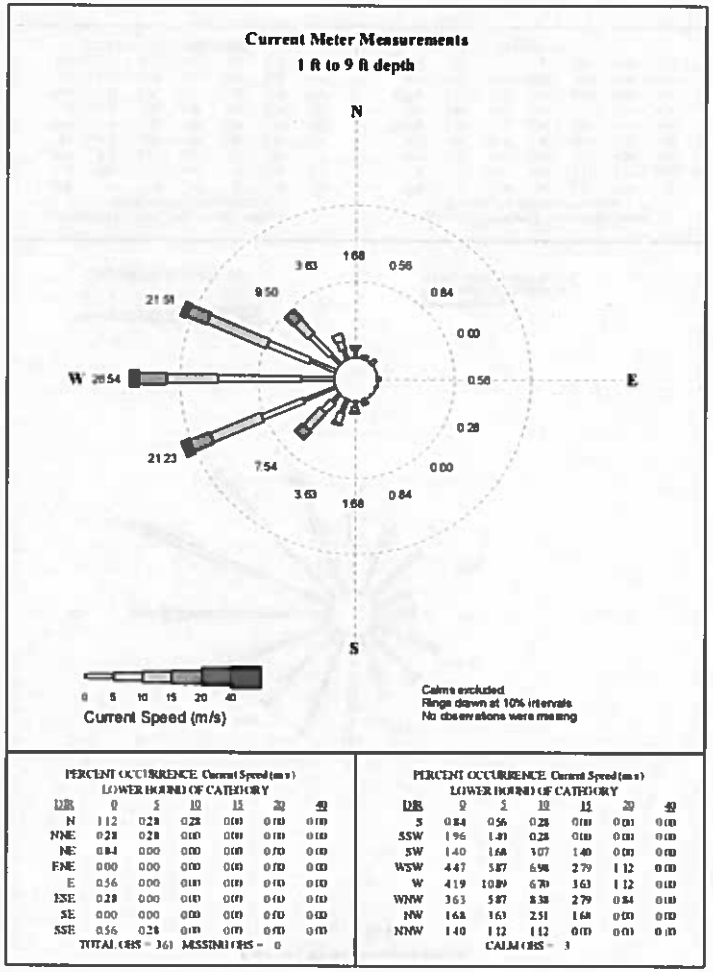
CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	6.9	2.1	1.0	2.0	1.9	1.6	1.6	2.0	2.3	3.0	2.7	3.4	3.3	4.0	3.7	2.3	2.7	46.4
5-9.9		0.8	0.6	0.8	1.1	0.6	0.5	0.8	2.1	2.5	2.8	5.0	5.1	5.4	3.3	2.2	1.5	35.0
10-14.9		0.2	0.1	0.2	0.0	0.1	0.1	0.1	0.3	0.8	1.2	2.3	2.6	1.8	1.1	1.1	0.3	12.3
15-19.9		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	1.0	1.0	0.7	0.8	0.3	0.1	4.4
20-24.9		0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.2	0.4	0.0	0.1	1.1
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.2	0.1	0.1	0.6
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.2
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	6.9	3.3	1.7	2.9	3.1	2.3	2.2	2.8	4.8	6.5	7.0	11.6	12.3	12.3	9.4	6.1	4.7	100.0
AVE SPD		5.0	3.9	4.0	3.9	3.4	3.5	3.7	4.9	5.7	6.9	7.3	8.1	7.5	7.7	6.9	5.5	6.0
MAX SPD		22.0	10.0	14.0	9.0	10.0	11.0	12.0	17.0	16.0	26.0	19.0	30.0	30.0	25.0	27.0	27.0	30.0
STD DEV		4.6	2.4	3.0	2.6	2.5	2.7	2.4	3.1	3.5	4.9	4.3	5.2	5.1	5.7	4.9	5.1	4.9

Station: H-wharf Depth:28-36 ft/45 ft Deployment Period: 04/08/05 - 05/05/05
EBB TIDE MET TRANSPORT: 3.7 cm/s 255 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	5.7	2.3	0.8	1.4	1.8	1.7	1.1	2.1	1.9	2.4	2.7	3.8	2.4	5.0	3.6	2.3	3.2	44.0
5-9.9		0.9	0.8	0.8	1.1	0.6	0.6	0.8	2.4	2.3	3.2	4.8	5.9	5.9	3.2	1.8	2.0	36.9
10-14.9		0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.2	1.1	1.1	2.7	3.2	2.0	1.1	0.8	0.2	12.4
15-19.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.9	1.1	0.9	0.9	0.3	0.2	4.7
20-24.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.2	0.9
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.2	0.0	0.8
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.3
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	5.7	3.3	1.5	2.1	2.9	2.3	1.8	2.9	4.5	6.1	7.0	12.3	12.7	14.5	9.5	5.3	5.6	100.0
AVE SPD		3.9	4.1	4.1	3.8	3.3	4.8	3.3	5.4	6.4	5.7	7.3	8.3	7.7	8.4	7.2	5.1	6.2
MAX SPD		10.0	6.9	9.0	9.0	9.0	11.0	9.0	17.0	16.0	13.0	19.0	30.0	30.0	25.0	27.0	24.0	30.0
STD DEV		2.9	1.9	2.4	2.4	2.5	3.2	1.9	3.4	3.9	3.3	4.1	4.9	5.9	6.2	5.4	4.7	4.9

Station: H-wharf Depth:28-36 ft/45 ft Deployment Period: 04/08/05 - 05/05/05
FLOOD TIDE MET TRANSPORT: 3.2 cm/s 249 deg.T

CM/S	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-4.9	8.1	1.9	1.2	2.6	2.0	1.6	2.2	1.9	2.8	3.6	2.6	3.0	4.2	3.0	3.7	2.3	2.2	48.8
5-9.9		0.8	0.5	0.9	1.2	0.6	0.5	0.8	1.7	2.8	2.3	5.1	4.2	4.8	3.4	2.6	0.9	33.1
10-14.9		0.2	0.2	0.3	0.0	0.2	0.0	0.2	0.5	0.5	1.4	1.9	2.0	1.7	1.2	1.6	0.5	12.1
15-19.9		0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	1.1	0.9	0.5	0.6	0.3	0.0	4.2
20-24.9		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.5	0.2	0.3	0.0	0.0	1.4
25-29.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.5
30-34.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39.9		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40 <		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL %	8.1	3.3	1.9	3.7	3.3	2.3	2.6	2.8	5.0	7.0	7.1	11.0	12.0	10.1	9.3	6.8	3.7	100.0
AVE SPD		6.1	3.7	4.0	3.8	3.5	2.6	4.1	4.4	5.0	8.2	7.4	7.8	7.1	7.0	6.7	6.0	5.7
MAX SPD		22.0	10.0	14.0	9.0	10.0	7.0	12.0	12.0	16.0	26.0	19.0	25.0	21.0	22.0	19.0	27.0	27.0
STD DEV		5.7	2.8	3.3	2.8	2.6	1.9	2.8	2.7	3.0	5.8	4.5	5.5	3.9	5.1	4.5	5.7	4.8



PERCENT OCCURRENCE Current Speed (m/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
N	1.12	0.28	0.28	0.00	0.00	0.00
NNE	0.28	0.28	0.00	0.00	0.00	0.00
NE	0.84	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.56	0.00	0.00	0.00	0.00	0.00
ESE	0.28	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.56	0.28	0.00	0.00	0.00	0.00

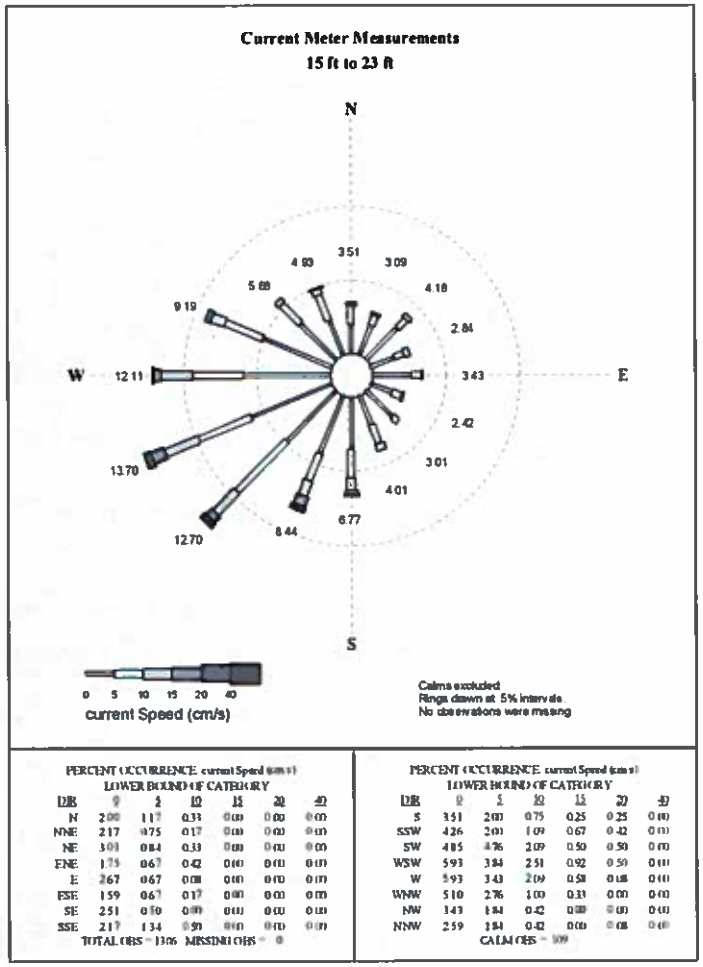
TOTAL OBS = 361 MISSING OBS = 0

PERCENT OCCURRENCE Current Speed (m/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
S	0.84	0.56	0.28	0.00	0.00	0.00
SSW	1.96	1.40	0.28	0.00	0.00	0.00
SW	1.40	1.68	3.07	1.40	0.00	0.00
WSW	4.47	5.87	6.98	2.79	1.12	0.00
W	4.19	10.89	6.70	3.63	1.12	0.00
WNW	3.63	5.87	8.38	2.79	0.84	0.00
NW	1.68	3.63	2.51	1.68	0.00	0.00
NNW	1.40	1.12	1.12	0.00	0.00	0.00

CALM OBS = 3

Figure 4-9. Current roses for depth layer 1 to 9 feet.



PERCENT OCCURRENCE current Speed (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
N	2.00	1.17	0.33	0.00	0.00	0.00
NNE	2.17	0.75	0.17	0.00	0.00	0.00
NE	3.01	0.84	0.33	0.00	0.00	0.00
ENE	1.75	0.67	0.42	0.00	0.00	0.00
E	2.67	0.67	0.08	0.00	0.00	0.00
ESE	1.59	0.67	0.17	0.00	0.00	0.00
SE	2.51	0.50	0.00	0.00	0.00	0.00
SSE	2.17	1.34	0.50	0.00	0.00	0.00

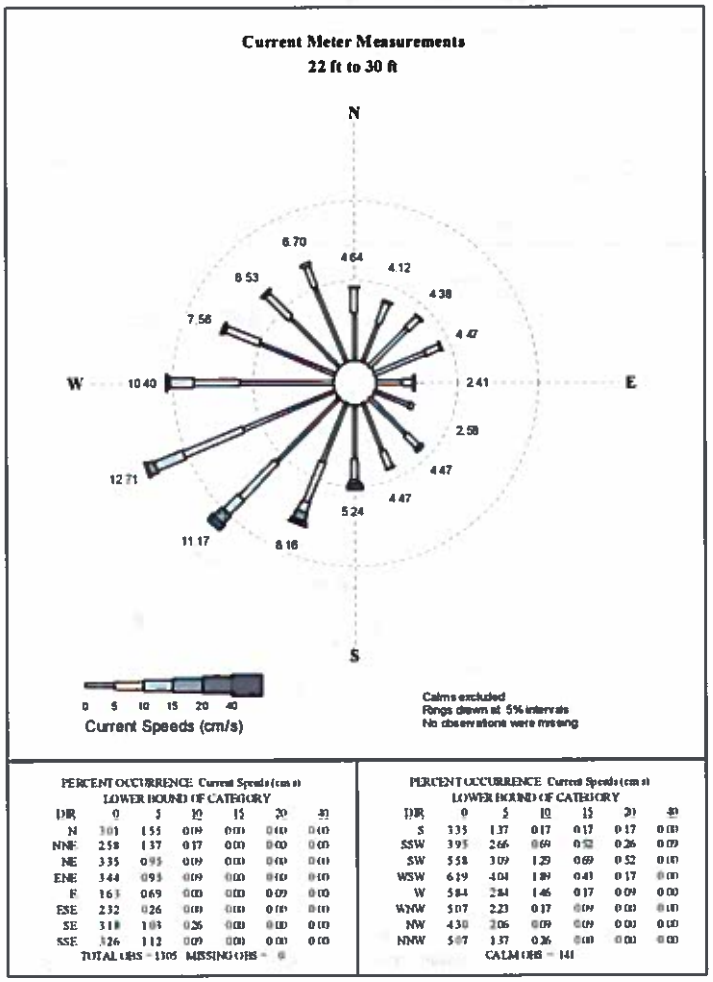
TOTAL OBS = 1306 MISSING OBS = 0

PERCENT OCCURRENCE current Speed (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
S	3.51	2.00	0.75	0.25	0.25	0.00
SSW	4.26	2.01	1.09	0.67	0.42	0.00
SW	4.85	4.76	2.09	0.50	0.50	0.00
WSW	5.93	3.84	2.51	0.92	0.50	0.00
W	5.93	3.43	2.09	0.58	0.08	0.00
WNW	5.10	2.76	1.00	0.33	0.00	0.00
NW	3.43	1.84	0.42	0.00	0.00	0.00
NNW	2.59	1.84	0.42	0.00	0.08	0.00

CALM OBS = 109

Figure 4-10. Current roses for depth layer 15 to 23 feet.



PERCENT OCCURRENCE Current Speeds (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
N	3.01	1.55	0.09	0.00	0.00	0.00
NNE	2.58	1.37	0.17	0.00	0.00	0.00
NE	3.35	0.93	0.09	0.00	0.00	0.00
ENE	3.44	0.93	0.09	0.00	0.00	0.00
E	1.63	0.69	0.00	0.00	0.09	0.00
ESE	2.32	0.26	0.00	0.00	0.00	0.00
SE	3.18	1.03	0.26	0.00	0.00	0.00
SSE	3.26	1.12	0.09	0.00	0.00	0.00

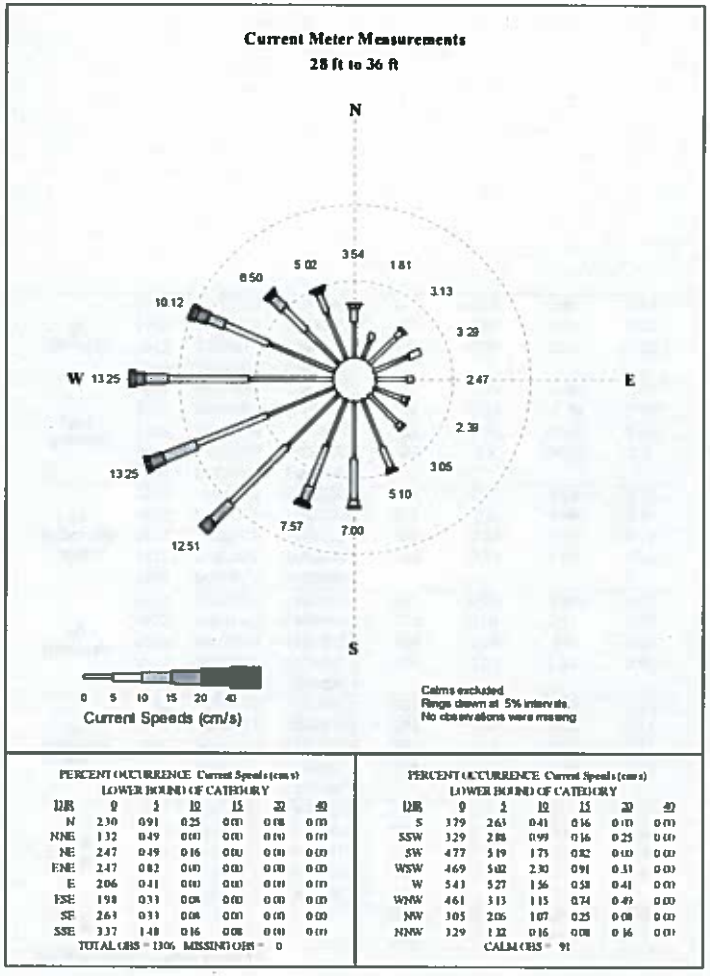
TOTAL OBS = 1305 MISSING OBS = 0

PERCENT OCCURRENCE Current Speeds (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
S	3.35	1.37	0.17	0.17	0.17	0.00
SSW	3.95	2.66	0.69	0.52	0.26	0.09
SW	5.58	3.09	1.29	0.69	0.52	0.00
WSW	6.29	4.04	1.89	0.43	0.17	0.00
W	5.84	2.84	1.46	0.17	0.09	0.00
WNW	5.07	2.23	0.17	0.09	0.00	0.00
NW	4.30	2.06	0.09	0.09	0.00	0.00
NNW	5.07	1.37	0.26	0.00	0.00	0.00

CALM OBS = 141

Figure 4-11. Current roses for depth layer 22 to 30 feet.



PERCENT OCCURRENCE Current Speeds (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
N	2.30	0.91	0.25	0.00	0.00	0.00
NNE	1.32	0.49	0.00	0.00	0.00	0.00
NE	2.47	0.49	0.16	0.00	0.00	0.00
ENE	2.47	0.82	0.00	0.00	0.00	0.00
E	2.06	0.41	0.00	0.00	0.00	0.00
ESE	1.98	0.33	0.08	0.00	0.00	0.00
SE	2.63	0.33	0.08	0.00	0.00	0.00
SSE	3.37	1.48	0.16	0.08	0.00	0.00

TOTAL OBS = 1306 MISSING OBS = 0

PERCENT OCCURRENCE Current Speeds (cm/s)
LOWER BOUND OF CATEGORY

DIR	0	5	10	15	20	40
S	3.79	2.63	0.41	0.16	0.00	0.00
SSW	3.29	2.88	0.99	0.16	0.25	0.00
SW	4.77	5.19	1.73	0.82	0.00	0.00
WSW	4.69	5.02	2.30	0.91	0.33	0.00
W	5.43	5.27	1.56	0.58	0.41	0.00
WNW	4.61	3.13	1.15	0.74	0.49	0.00
NW	3.05	2.06	1.07	0.25	0.08	0.00
NNW	3.29	1.32	0.16	0.08	0.16	0.00

CALM OBS = 91

Figure 4-12. Current roses for depth layer 28 to 36 feet.

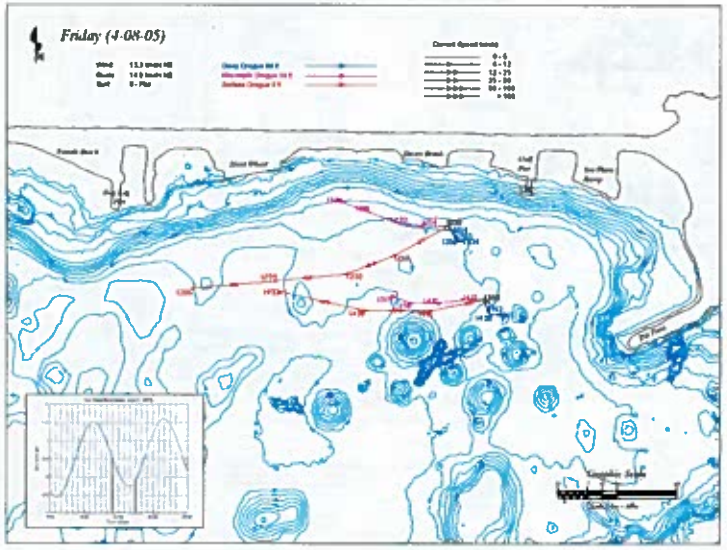


Figure 4-13. Drogue plots for Friday (4-08-05).

Table 4-5. Drogue detail for Friday (4-08-05).

Drogue Detail (Friday 4/08/05)							
Depth	TIME	X (m)	Y (m)	DIR (TN)	(kts)	SPD (cm/s)	(ft/s)
Surface (8ft)	1152	246291.8	1489486.4				
	1213	246144.7	1489414.9	244	0.25	12.98	0.43
	1232	246018.3	1489361.1	247	0.23	12.05	0.4
	1259	245824.2	1489344.2	265	0.23	12.03	0.39
	1326	245602	1489322.3	264	0.27	13.79	0.45
Mid-Depth (50 ft)	1152	246291.8	1489486.4				
	1214	246220.1	1489491.3	274	0.11	5.44	0.18
	1233	246149.3	1489503.4	280	0.12	6.3	0.21
	1301	246069.4	1489533.7	291	0.1	5.08	0.17
	1330	245991.2	1489564.3	291	0.09	4.83	0.16
Deep (80 ft)	1152	246291.8	1489486.4				
	1214	246302.8	1489466.4	151	0.03	1.73	0.06
	1235	246309.4	1489458.7	139	0.02	0.8	0.03
	1302	246317.3	1489450.3	137	0.01	0.71	0.02
	1334	246326.1	1489449.9	93	0.01	0.46	0.02
Mid-Depth (50 ft)	1355	246387.4	1489286.2				
	1412	246328.6	1489294.2	278	0.11	5.82	0.19
	1431	246265.5	1489283.5	260	0.11	5.61	0.18
	1456	246190.7	1489284.4	271	0.1	4.98	0.16
	1515	246140.5	1489296.7	284	0.09	4.54	0.15
Surface (8ft)	1355	246387.4	1489286.2				
	1411	246243.6	1489258.5	259	0.3	15.26	0.5
	1430	246063.8	1489262	271	0.31	15.77	0.52
	1453	245839.2	1489306	281	0.32	16.58	0.54
	1515	246140.5	1489296.7	92	0.44	22.83	0.75
Deep (80 ft)	1355	246387.4	1489286.2				
	1413	246396.9	1489259.4	161	0.05	2.64	0.09
	1432	246405.5	1489252.9	127	0.02	0.95	0.03
	1511	246425.3	1489245.3	111	0.02	0.91	0.03

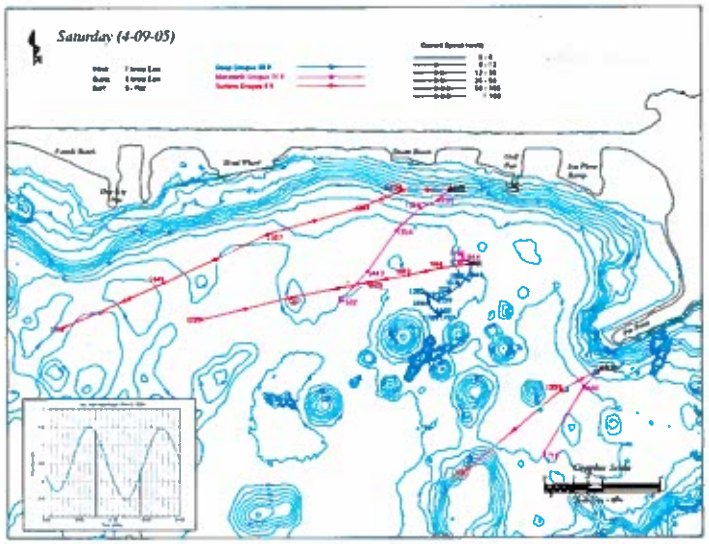


Figure 4-14. Drogue plots for Saturday (4-09-05).

Table 4-6. Drogue detail for Saturday (4-09-05).

Drogue Detail (Saturday 4/09/05)							
Depth	TIME	X (m)	Y (m)	DIR (TN)	(kts)	SPD (cm/s)	(ft/s)
Deep (80 ft)	901	246387.4	1489385				
	944	246379.5	1489354	194	0.02	1.23	0.04
	1002	246370.7	1489342	216	0.03	1.4	0.05
	1031	246353.6	1489320	219	0.03	1.58	0.05
	1110	246323.8	1489300	235	0.03	1.55	0.05
	1159	246292.4	1489281	240	0.02	1.23	0.04
	1233	246267.5	1489292	292	0.03	1.32	0.04
	1303	246256.8	1489297	298	0.01	0.68	0.02
	1355	246261.5	1489304	37	0	0.25	0.01
	1444	246266.9	1489280	167	0.02	0.84	0.03
	1523	246274.8	1489261	157	0.02	0.87	0.03
	1602	246285.8	1489255	120	0.01	0.54	0.02
	1703	246298.9	1489243	133	0.01	0.49	0.02
	1709	246295.4	1489244	294	0.02	1.04	0.03
Mid-Depth (50 ft)	901	246387.4	1489385				
	944	246381.1	1489383	254	0	0.26	0.01
	1002	246379.1	1489385	319	0.01	0.27	0.01
	1032	246370.5	1489391	305	0.01	0.58	0.02
	1110	246361.5	1489395	291	0.01	0.42	0.01
	1200	246364.4	1489396	70	0.000	0.100	0.000
Surface (8 ft)	901	246387.4	1489385				
	944	246304.2	1489368	259	0.06	3.29	0.11
	1003	246214.5	1489351	259	0.16	8.02	0.26
	1029	246098.2	1489330	260	0.15	7.58	0.25
	1107	245887.3	1489289	259	0.18	9.42	0.31
	1155	245638.5	1489229	256	0.17	8.89	0.29
Surface (8 ft)	1205	246326.1	1489582				
	1236	246197.1	1489577	268	0.13	6.94	0.23
	1304	246075.7	1489531	249	0.15	7.73	0.25
	1357	245819.7	1489456	254	0.16	8.39	0.28
	1441	245534.3	1489327	246	0.23	11.87	0.39
	1518	245259.3	1489209	247	0.26	13.47	0.44
Mid-Depth (50 ft)	1205	246326.1	1489582				
	1235	246292.6	1489549	225	0.05	2.62	0.09
	1304	246246.9	1489527	244	0.06	2.91	0.1
	1354	246179	1489469	230	0.06	2.97	0.1
	1443	246098.1	1489357	216	0.09	4.7	0.15
	1522	246022.6	1489280	224	0.09	4.62	0.15
Mid-Depth (50 ft)	1530	246744.8	1489086				
	1600	246697.7	1489038	224	0.07	3.73	0.12
	1714	246586.1	1488862	212	0.09	4.69	0.15
Surface (8 ft)	1530	246744.8	1489086				
	1559	246633.9	1489029	243	0.14	7.15	0.23
	1711	246364.9	1488807	230	0.16	8.08	0.27

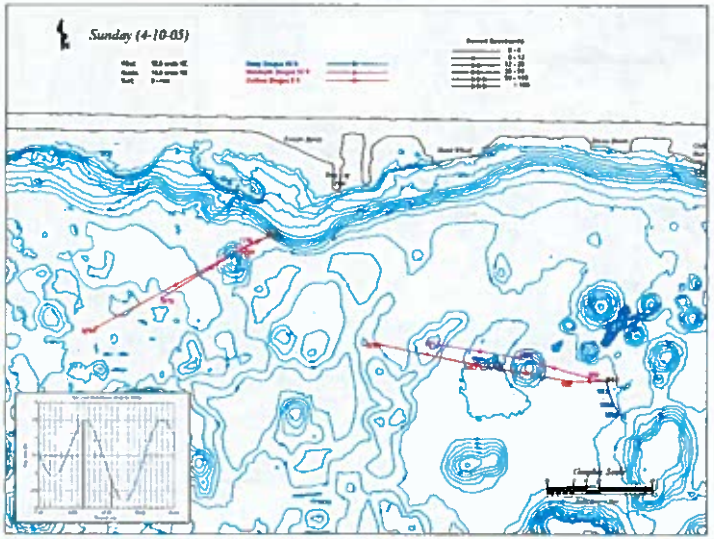


Figure 4-15. Drogue plots for Sunday (4-10-05).

Table 4-7. Drogue detail for Sunday (4-10-05).

Drogue Detail (Sunday 4/10/05)							
Depth	TIME	X (m)	Y (m)	DIR (TN)	(kts)	SPD (cm/s)	(ft/s)
Deep (80 ft)	842	246215	1488951				
	903	246220.3	1488924	169	0.04	2.24	0.07
	1000	246235.1	1488883	160	0.02	1.26	0.04
	1058	246253.5	1488855	147	0.02	0.97	0.03
Mid-Depth (50ft)	842	246215	1488951				
	902	246162.9	1488962	281	0.09	4.43	0.15
	1002	245950.4	1489017	284	0.12	6.1	0.2
	1052	245706.9	1489061	280	0.16	8.25	0.27
Surface (8 ft)	842	246215	1488951				
	902	246105.4	1488946	267	0.18	9.15	0.3
	1003	245821	1489003	281	0.15	7.92	0.26
	1050	245524.4	1489059	281	0.21	10.71	0.35
Surface (8 ft)	1121	245185.2	1489390				
	1139	245102.8	1489346	242	0.17	8.67	0.28
	1254	244658	1489113	242	0.22	11.16	0.37
Mid-Depth (50ft)	1121	245185.2	1489390				
	1138	245133.9	1489367	245	0.11	5.54	0.18
	1251	244858.7	1489201	239	0.14	7.33	0.24

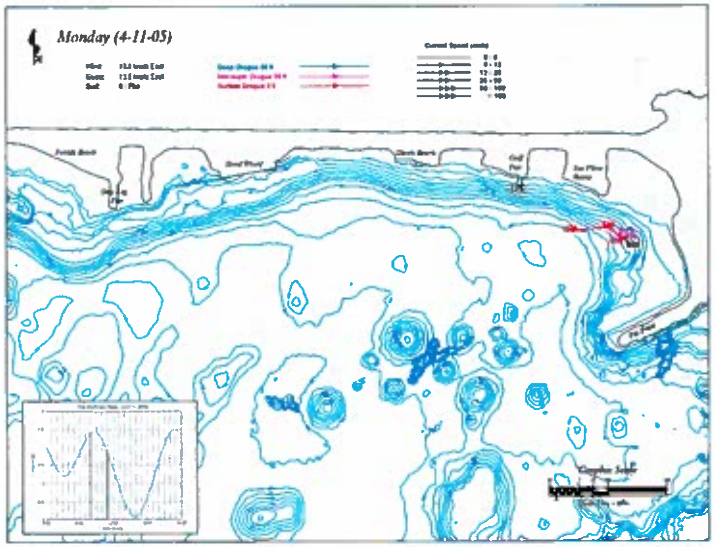


Figure 4-16. Drogue plots for Monday (4-11-05).

Table 4-8. Drogue detail for Monday (4-11-05).

Drogue Detail (Monday 4/12/05)							
Depth	TIME	X (m)	Y (m)	DIR (TN)	(kts)	SPD (cm/s)	(ft/s)
Mid-Depth (50 ft)	829	246800.9	1489440				
	852	246790.9	1489454	323	0.02	1.21	0.04
	923	246699.1	1489580	324	0.16	8.38	0.27
	1026	246781.2	1489459	146	0.07	3.86	0.13
Surface (8 ft)	829	246800.9	1489440				
	852	246790.9	1489454	323	0.02	1.21	0.04
	942	246743.4	1489479	298	0.03	1.8	0.06
	1024	246653.1	1489468	263	0.07	3.61	0.12

5.0 NUMERICAL MODEL

5.1 Description

The dredging for construction of a new wharf near the existing Hotel Wharf will result in the formation and transport of a turbid suspended sediment plume in the harbor. Plume transport and mixing in coastal waters is a complex process that depends on the characteristics of both the discharge plume and the ambient receiving waters. The plume will be transported and dispersed due to currents driven by winds and tides, and modified by local and regional bathymetric features. Evaluating these processes and possible plume impacts to the environment requires a record of currents in the project site coupled with a numerical modeling analysis. As described in the previous report section, a current meter and current drift drogues were deployed to characterize currents at the project site. This current information was used to calibrate a numerical model applied to the site to evaluate the plume transport and mixing and possible impacts to the environment. This and the following report sections describe the development, application and results of a numerical transport model of the site.

The numerical analysis was performed using the model EFDC (Environmental Fluid Dynamics Code). The model is an EPA approved, state-of-the-art, three-dimensional hydrodynamic model developed at the Virginia Institute of Marine Science by John Hamrick (1996) for the EPA to simulate hydrodynamics and water quality in rivers, lakes, estuaries, and coastal regions. The EPA describes the model as one of the most widely used and technically defensible hydrodynamic models in the world. This model was selected because it has the following capabilities:

- The model is 3-dimensional, which allows for variations in water properties and currents at different depths.
- It computes suspended sediment transport and deposition.
- It allows input of variable suspended sediment load size distributions and concentrations.
- The model allows input of time varying flows with time varying concentrations of contaminants.

Suspended sediments are assessed by specifying a flow of suspended sediments into the model domain. For a given distribution of sediments, the extent of suspended sediment transport is determined from the currents and circulation computed by the model. Additionally, settling and deposition are calculated. Sediment deposition is evaluated by calculation of the critical shear stress term. Sediments will only deposit onto the bottom when the shear stress exerted by waves and currents on the bottom is less than the critical shear stress for deposition of particular sediment. The bottom shear stresses throughout the region due to currents are calculated in EFDC, and sediment deposition determined. Sediment resuspension is not included in this analysis.

5.2 Model Domain and Grid

EFDC requires input of the regional coastal bathymetry. Model inputs and results are constrained to metric units only. Figure 3-1 shows the bathymetry of Apra Harbor in the project area, as derived from airborne lidar and boat hydrographic surveys. The figure shows that the harbor basin is typically 40 to 50 meters (130 to 160 feet) deep, with many patch reefs rising steeply off the bottom. The bottom slopes steeply from the shoreline to the basin bottom.

Bathymetry is represented in a numerical model through the creation of a grid, and the specification of depth at each grid point. The model grid dimensions are a tradeoff between desired resolution and computer computation capability. To maximize resolution at the project site and computational efficiency, an expanding grid was used for this analysis. Figure 5-1 shows the EFDC model grid. The grid cell size is 20 meters on a side at the project site near Hotel Wharf. The grid dimensions expand by 2% with each cell to a maximum size of 50 meters. This provides maximum resolution at the project site, and less detail at greater distances from the project site. The grid contains 7,331 active computation cells. Figure 5-2 shows color-coded bathymetry overlain on the model grid. Inner Apra Harbor and the shallow inlets and flats along the eastern margin of Outer Apra Harbor were not included in our model representation. They are too far away to significantly influence transport dynamics at the project site, yet their inclusion in the model would greatly increase computational requirements.

At the open boundary to Apra Harbor, designated by the "W" in the boundary cells in Figure 5-1, tidal water surface elevations are specified. Vertical variability in the water is modeled by dividing the water column into six layers whose thickness is a percentage of the total water depth, as shown in the table below.

Layer	Thickness (% of total depth)
6 (surface)	8
5	15
4	26
3	26
2	15
1 (bottom)	10

Figure 5-3 shows the depth variable vertical model grid along an east-west trending profile across the harbor.

5.3 Model Flow Forcings

As discussed in Section 4, currents and circulation within the harbor are driven by winds and tides, with winds predominating. Currents in the numerical model are therefore also forced by numerically applying tidal and wind boundary conditions. Tides are specified at the open boundary to the model (see Figure 5-1 cells marked with W) as a time-varying rise and fall of water level. Figure 5-4 shows the tidal condition applied to the open boundary, corresponding to tides in Apra Harbor from April 8 to 11, 2005. Figure 5-4 shows that the peak flood tide elevations were approximately 0.9 meters (mean lower low water datum), and the low tide levels were 0.18 to 0.25 meters.

Wind conditions in the harbor were also discussed in Section 2, and can be characterized by east to northeast trade winds which occur nearly 75% of the time, and variable conditions consisting of calm and infrequently occurring winds from the south and west directions. Winds on the island typically also have a strong diurnal variation, peaking in the early afternoons, and significantly weakening during the night. To best characterize the range of possible impacts from wind-driven flows at the project site, 2 different winds conditions were selected for model forcing:

- Steady 7 m/s (15 mph) east-northeast trade winds – Typical peak daily tradewind speeds in Apra Harbor are about 15 mph (7 m/s). Applying these peak wind speeds as steady throughout the day therefore represents a conservative model input for evaluating impacts because these steady, moderate winds would result in stronger currents and greater plume transport and impacts.
- Typical, diurnally varying trade winds – As discussed previously, typical tradewind speeds peak at about 15 mph (7m/s) in the early afternoon, and drop to about 5 mph (2.2 m/s) during the night. To model plume transport under these conditions, actual wind data recorded in Apra Harbor during typical tradewind conditions from April 8 to 11 were applied to the model. Figure 5-5 shows the model wind input condition. Winds peak in the early afternoon at 7 to 8.5 m/s, and diminish to 0 to 3 m/s during the night. The wind direction input into the model is defined as the wind stress direction, and refers to the direction to which the wind is blowing, rather than the standard convention of the direction the wind is from. Figure 5-5 shows that the wind stress direction is approximately 250°, corresponding to winds from the east-northeast.

The wind numerically drives currents in the model through the application of a quadratic stress formulation that converts the wind speed and direction to a stress on the water surface.

5.4 Dredge Plume Characterization

The nature of the plume at the dredging site is a key input to the numerical model. In the EFDC model, the dredge plume is defined by a concentration of suspended sediment in the water column. EFDC then has the capability to transport, disperse and deposit suspended sediment of specified concentration and grain size according to the current patterns calculated by the hydrodynamic model. To adequately characterize the plume for the modeling analysis therefore requires information on:

- the amount of suspended sediment released to the water column,
- the grain size distribution of the suspended sediment, and
- the distribution of suspended sediment throughout the water column.

Defining these parameters is frequently difficult because field data during dredging operations is difficult to obtain, and existing available data is limited and specific to a particular dredge site and method. The U.S. Army Corps of Engineers, in fact, has established the Dredging Operations and Environmental Research (DOER) program and an active area of research is characterizing dredge plumes for input into numerical models. Recent research by Hayes and Wu (2001) and the DOER program (2000) describe methods for defining the dredge plume, or the amount of dredge material released into the water column, as a percentage of material lost or released from the total dredging production rate. For this analysis, we follow the approach presented by Hayes and Wu (2001) and the DOER (2000). A detailed discussion of the key input variables and the selected values for the modeling analysis are presented below:

1. Amount of suspended sediment released into the water (TSS load) – Following the approach of Hayes and Wu (2001) and DOER (2000), the amount of suspended sediment released into the water column can be determined as a percentage of the total dredging production rate. Two inputs are necessary – the total dredging production rate, and the percent loss or release rate. The total dredging production rate depends primarily on the dredging method and the material type. The dredging for the Deep Wharf project will occur in coralline/reef substrate, most likely using a barge-mounted clamshell dredge. Clamshell dredging production rates applicable to the project were determined through discussions with Healy Tibbitts Builders – a Hawaii construction company with extensive dredging experience. Most recently, Healy Tibbitts completed the dredging for the Barbers Point Expansion Basin, which required dredging of 1.75 million cubic meters of hard, coralline/reef material. Healy Tibbitts personnel estimated that a good production rate for barge-mounted clamshell dredging in a reef environment would be 1,530 cubic meters (2,000 cubic yards) per day. A good production rate was described as a day when dredging proceeded continuously without major interruption for equipment breakdowns or other obstacles. Days of good production are interspersed with days of significantly less production. The average daily production rate would be significantly less than the rate of 1,530 cubic meters per day. Average clamshell production rates in hard material, published for construction cost estimating purposes, are approximately 1,000 cubic yards per day (760 cubic meters).

   For our model input, we selected the higher dredging rate of 1,530 cubic meters per day because dredge plume creation, and thus possible environmental impacts, would be greatest during periods of sustained maximum dredging. A daily dredging rate of 1,530 cubic meters corresponds to a rate of 34 kg of material removed per second.

   To determine the amount of material released into the water requires estimating the percent of the dredge material that is lost or released during the clamshell dredge process. Release rates measured during five different clamshell dredging operations ranged from 0.16% to 0.88%, with an average of 0.45% (Hayes and Wu, 2001). Modeling studies at the DOER have used release rates of 1.5% for sealed environmental buckets, 2% for conventional clamshell buckets, and 4% for conventional buckets with allowance for barge overflow (DOER, 2000). To bracket the range of possible conditions in our modeling analysis, we utilize 0.45% representing an average loss rate and 4% representing a worst-case loss rate. The total suspended sediment (TSS) loading to the water column resulting from these loss rates is presented in Table 5-1.

Table 5-1. TSS load rates.

Loss Rate	Dredging Rate	TSS Loading Rate
0.45%	34 kg/s	0.15 kg/s
4.0%	34 kg/s	1.36 kg/s

2. TSS grain size distribution – The transport and deposition of the suspended sediment in the dredge plume depends on the current patterns and the grain size distribution of the suspended sediment. Larger grains settle rapidly through the water column and will be deposited close to the dredging, while fine-grained material (silt and clay) will remain suspended for long periods of time, and will likely be transported out of the project area. Sullivan and Gerritsen (1972) measured suspended solids grain size distributions near the discharge from a hydraulic dredge during dredging of Kawaihae Harbor on the island of Hawaii. This is the only known published information on the grain size distribution resulting from dredging in reef environments, and is considered to reasonably represent the suspended grain size characteristics near a dredge source. This grain size distribution was used for our modeling analysis and is shown in Table 5-2 below. The table shows that sediments greater than 0.177mm (fine sand) are not present, and thus had immediately settled out of suspension. Most of the sample is silt and finer (<0.063mm), and settles out of suspension slowly, at a fall rate of less than 4 meters/hour.

Table 5-2. Suspended Sediment Grain Size Distribution (from Sullivan and Gerritsen, 1972)

Grain Size (mm)	Weight Frequency (%)	Fall Velocity (meters/hour)
0.177	7	58
0.088	11	14
0.044	18	4.0
0.022	60	1.0
<0.011	4	0.25

3. Water column distribution of TSS – The amount of material spilled or released from the clamshell bucket into the water will vary with depth in the water. Typically, material is released in decreasing amounts from bottom to surface. Modeling studies at the DOER suggest a water column release distribution as listed in Table 5-3 (DOER, 2000). This distribution was utilized in our modeling analysis. The table shows that 40% of the material is released in the bottom 20% of the water column, decreasing to 5% of the material in the uppermost 20% of the water.

Table 5-3. Water column TSS release distribution.

Percent of Water Depth	Percent of Material Released
80 – 100 (surface)	5
60 – 80	10
40 – 60	15
20 – 40	30
0 - 20	40

4. Dredge Location – The dredge site for the modeling analysis was at a water depth of 35 feet (10.6 meters) at the approximate center of the proposed wharf location (see Figure 1-2). Figure 5-1 shows the location of the dredge site in the model grid.

5.5 Model Verification

EFDC has been successfully used in previous studies to simulate circulation and transport in a multitude of environments, including the Chesapeake Bay, the Florida Everglades, the James and York River Estuaries, the Potomac River, San Francisco Bay, and Puget Sound. It has been calibrated and verified with extensive field data sets (Tetra Tech, 2002, www.epa.gov/athens/research/modeling/efdc.html).

To verify that EFDC correctly models existing conditions in the project area, velocities calculated by EFDC using typical tradewind conditions of 7 m/s winds were compared with the current meter and drogue measurements. The EFDC calculated average velocities in the surface layer and mid-water column at the current meter site were 8.5 and 4.5 cm/s respectively. This compares well to the current meter measurements and drogue results. The average surface layer current speeds measured by the current meter and current drogues were 9.5 and 9.4 cm/s, respectively. The average mid-water column currents speeds measured by the current meter and drogues were 5 to 6 cm/s and 4 cm/s, respectively. The EFDC calculated average velocity in the bottom model layer was 1.3 cm/s. This cannot be compared to the current meter data because the current meter is not able to measure currents in the bottom 9 feet of the water. The average speed of the deep drogues, however, was 1.4 cm/s, and compares well to the EFDC calculations.

In addition, previous studies have indicated that during trade winds, the harbor is characterized by a two layer flow pattern, with surface layer flow out of the harbor to the west, and a return flow into the harbor in the bottom layers. Figures 6-1A and 6-1B (in the next section) show that EFDC reproduces this general circulation pattern. The figures show the current patterns in the surface layer (Figure 6-1A) and bottom layer (Figure 6-1B).

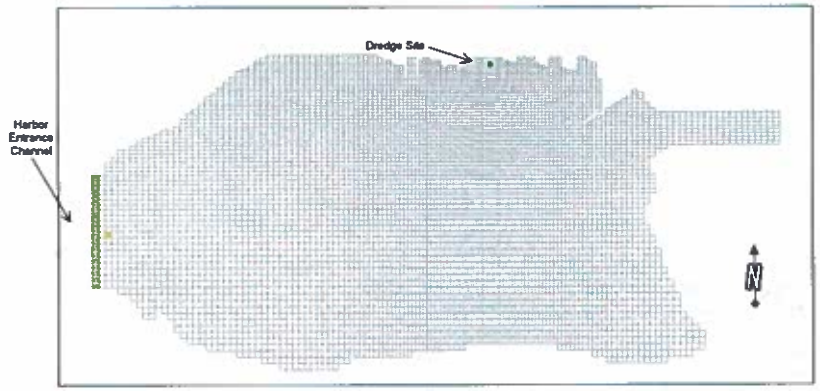


Figure 5-1. Model Grid with 7331 cells.
The cell size is 20x20 meters at the project site, increasing by 2% each cell to a maximum size of 50 meters.
Marked cells indicate boundary inputs.

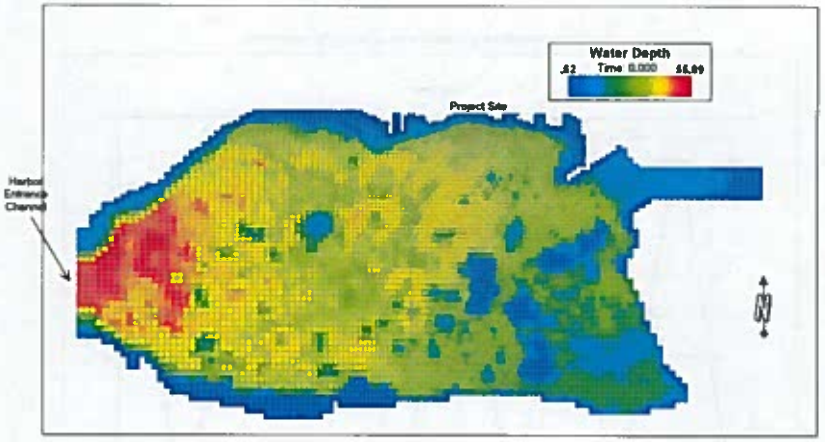


Figure 5-2. Color-coded model bathymetry (in meters) overlain on the model grid.

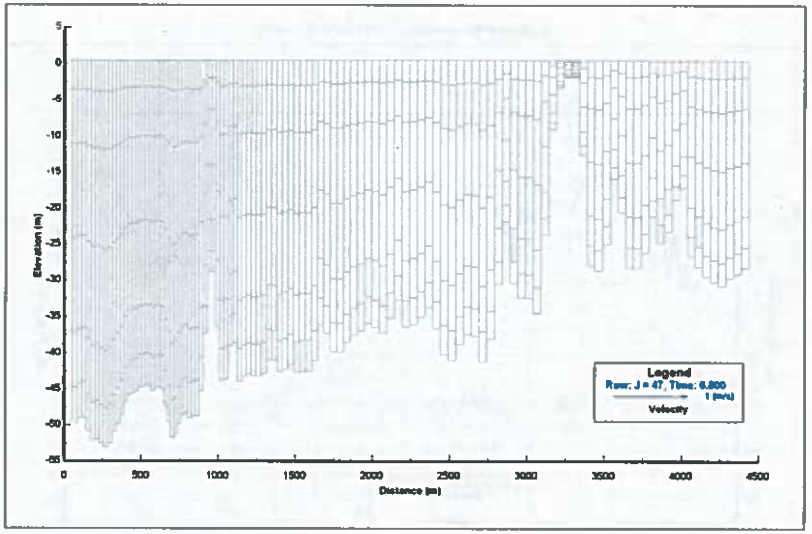


Figure 5-3. Vertical layers in the model along a transect from the entrance channel (distance 0) to the east end of the harbor (distance 4500m)

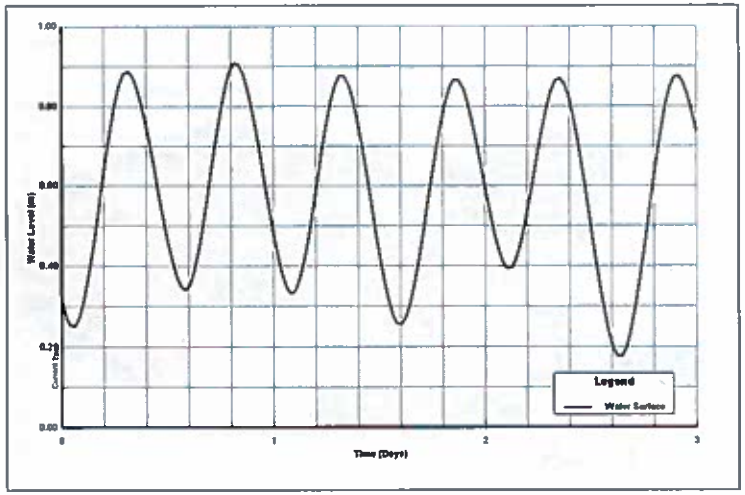


Figure 5-4. April 8 to 11 tides applied at model open boundary.

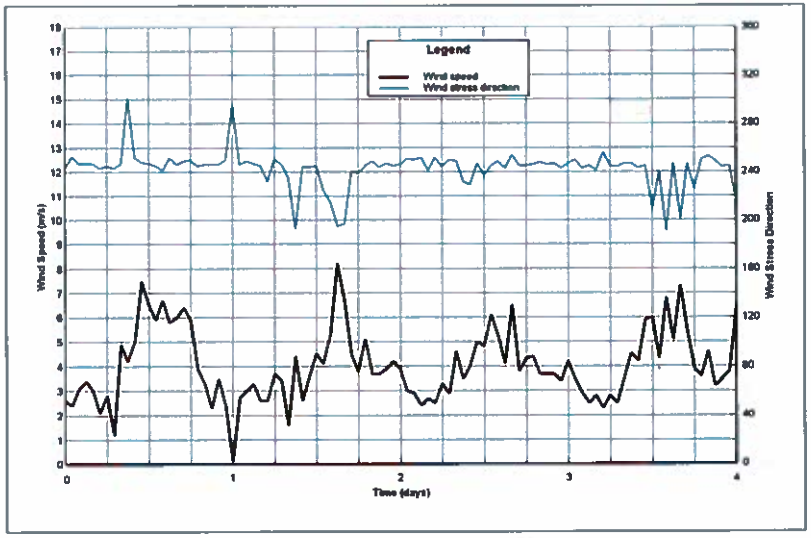


Figure 5-5. April 4 to 11, 2005 wind input condition.

6.0 MODEL RESULTS

Three different model runs were completed using combinations of the input parameters described in Section 5 above. These model runs are listed in Table 6-1. At every time step for the specified duration of the model run, EFDC calculates currents and water properties at each model grid point. These values can be output at specified times and locations during the model run. Models were run for a time period of 2 days. Model output is referenced to decimal days, beginning at 0 and ending at 2.6 days. In each model case, dredging, or release of suspended sediment into the water column, was initiated at 0.2 days and continued for 24 hours, ending at 1.2 days.

The model results were presented in several different formats:

1. Velocity Vector Plots – Velocity vector plots of the bottom and surface layers were produced for model case 1 to show the general circulation patterns produced by trade winds.
2. Total Suspended Sediment (TSS) Contour Plots – The representative plumes of suspended sediment are displayed in plots showing concentrations of total suspended sediment (TSS), plotted in mg/L. In the model, the background levels of TSS are assumed to be 0, therefore all TSS values computed by the model derive from the dredging. In the baseline water quality assessment completed for this project, AECOS Inc. (2005) measured near surface TSS at 6 stations in the project vicinity. The measured TSS values ranged from 3 to 7.6 mg/L, with average of about 5 mg/L. In the modeling analysis and discussion of results, the TSS plume boundary in the bottom layer is therefore defined by the 5 mg/L contour. This represents the location at which the dredge plume concentration declines to background levels. Measurements of plume size refer to these contours, unless otherwise stated. In the surface layer, the dredge plume is significantly less concentrated yet more visible, and is therefore delineated by the 1 or 2 mg/L contour. In general, these figures show a snapshot of the plume at its maximum size.

3. Total Suspended Sediment (TSS) Time Series – To show how the plume concentrations change with time, graphs were prepared showing how surface and bottom TSS concentrations change with time at the dredge site and 100 to 200 meters down drift of the dredge site. These graphs indicate how quickly the ocean waters return to ambient conditions following cessation of dredging.

4. Sediment Thickness Contour Plots – EFDC calculates the deposition of sediment as the dredge plume is transported by currents away from the dredge site. Contour plots were prepared for each model case showing the thickness of sediment deposited during the 24 hour dredging operation. The thicknesses are presented in millimeters (mm) and represent sediment deposited during the dredging of 1,530 cubic meters (2,000 cubic yards) of material, or one day of dredging production. A sediment thickness of 0.2 mm was selected to represent the zone of possible impacts of the sediment resulting from the dredge plume. This corresponds to a sedimentation rate of 0.37 kg/m^2 per day, or 37 mg/cm^2 per day. Studies on the effects of sedimentation on reef corals have shown that a sedimentation rate of 40 mg/cm^2 per day for 7 days resulted in mortality in 27% of the species tested, tissue damage in 32% of the species tested, and no visible damage in 41% of the species (Hodgson, 1989). These tests were completed in an aquarium. This sedimentation rate of 40 mg/cm^2 per day, corresponding to the deposition of a sediment layer 0.2 mm thick in one day, was selected as a conservative indicator of possible plume impacts to coral. It is conservative in our analysis because this sedimentation rate is achieved by assuming a high dredging production rate of 1,530 cubic meters per day (2,000 cubic yards), and dredging 24 hours per day. The average dredging rate over the life of the project will probably be less than half of 1,530 cubic meters per day, and the dredging is not likely to be sustained for a full 24 hours. Thus, the sedimentation rates represented by the 0.2 mm sediment thickness contour will likely be significantly less than the rate of 40 mg/cm^2 per day cited in the literature.

Table 6-1. Model Cases.

Case No.	Wind Conditions	Release Rate – TSS Load	Figures
1	Moderate trades (7m/s from 70deg.)	0.45% – 0.15kg/s	6-1A to G
2	Moderate trades (7m/s from 70deg.)	4% – 1.36kg/s	6-2A to E
3	April 8 to 11 trades	4% – 1.36kg/s	6-3A to E

6.1 Case 1 – Moderate trade winds, 0.45% release rate

Model Case 1 is a calculation of the transport of a plume generated by dredging during moderate steady trade winds of 7 m/s (15 mph). The rate of release of dredge material into the water column is assumed to be 0.45%, an average release rate cited in the literature. This corresponds to a suspended sediment loading rate of 0.15 kg/s, or a total of 12960 kg of material during 24 hours of dredging. Figures 6-1A and 6-1B show the general circulation pattern calculated by the model; surface currents generally flow downwind to the west and west-southwest. Bottom currents also flow to the west in shallower waters close to shore. However, in the deeper water of the harbor basin, currents flow to the east. In the vicinity of Hotel Wharf, surface current speeds average about 8.5 cm/s, while bottom layer speeds are only 1.4 cm/s. These results are consistent with the current meter data, as described in Section 5.5. In this model case, 0.15 kg/s of suspended sediment is released into the water column, forming a dredge plume that is transported by the currents described above. Figures 6-1C and D show the suspended sediment plume generated by the dredging. In the surface layer, TSS from the dredging exceeds background levels of 5 mg/L only within 100 meters of the dredge site. The plume bounded by the 2 mg/L contour extends about 500 meters to the east and is only 40 meters wide (Figure 6-1C). Because of the weak currents, the suspended sediment plume in the bottom layer, bounded by the 5 mg/L contour, is also confined near the dredge site, extending only about 90 meters east of the dredge site (Figure 6-1D).

Time series plots of TSS show that the maximum TSS concentration reached in the surface layer is 5 mg/L at the dredge site, and 6 mg/L 100 meters down current from the dredging (Figure 6-1E). The TSS levels in the surface layer return to 0 almost immediately after the dredging stops at time 1.2 days. The maximum plume concentration in the bottom layer is 38 mg/L at the dredge

site, but drops rapidly to only 5 mg/L 100 meters down drift of the dredging (Figure 6-1F). The plume concentrations return to 0 at the dredge site almost immediately after the dredging stops.

Suspended sediment deposition was also calculated. During the 24 hours of dredging, approximately 13,000 kg of suspended sediment are released into the water column. At the end of the model run of 2 days, approximately 11,600 kg of sediment are deposited in the model area, and 1,300 kg remain suspended in the water column within the model domain. Maximum deposition occurs at the dredging site, where approximately 2 mm of sediment are calculated to be deposited. Sediment deposition greater than 0.2 mm only occurs within 60 meters of the dredge site (Figure 6-1G).

6.2 Case 2 – Moderate trade winds, 4% release rate

Model Case 2 is similar to Case 1 (dredging during moderate steady trade winds of 7 m/s), except that the rate of release of dredge material into the water column is assumed to be 4%. A release rate of 4% is the highest value we found cited in the literature (DOER, 2000), and therefore represents a worst-case scenario of TSS loading into the water. This corresponds to a suspended sediment loading rate of 1.36 kg/s, or a total of 117,504 kg of material during 24 hours of dredging. This is almost 10 times greater than the loading assuming the average release rate of 0.45% from Hayes and Wu (2001). Figures 6-2A and 6-2B show the calculated suspended sediment plume generated by dredging with a 4% release rate. The plume on the surface is transported downwind to the west along the shoreline. The plume that exceeds the background TSS level of 5 mg/L extends approximately 1000 meters to the west along the shoreline (Figure 6-2A). Surface TSS concentrations exceeding 2 mg/L extend a further 600 meters to the west. The plume in the bottom layer is similar to that in the surface layer. Figure 6-2B shows that the size of the plume where TSS concentrations exceed the background level of 5 mg/L is approximately 1,200 meters long and extends 100 to 150 meters offshore.

Time series plots of TSS show that the maximum TSS concentration reached in the surface layer is 44 mg/L at the dredge site, and 36 mg/L 200 meters down current from the dredging (Figure 6-2C). The TSS levels in the surface layer return to 0 almost immediately after the dredging stops at time 1.2 days. The maximum plume concentration in the bottom layer is 320 mg/L at the dredge site, and 50 mg/L 100 meters down drift of the dredging (Figure 6-2D). The plume concentrations return to 0 within 0.1 days (2 hours) after the end of the dredging.

Approximately 117,500 kg of suspended sediment are released into the water column during the 24 hours of dredging, assuming a 4% release rate. At the end of the model run of 2 days, approximately 105,000 kg of sediment are deposited in the model area, and 12,000 kg remain suspended in the water column within the model domain. This increased loading results in a larger depositional footprint than in Case 1. Maximum deposition occurs at the dredging site, where approximately 18 mm of sediment are calculated to be deposited. The primary zone of deposition extends to the west of the dredge site, following the initial transport of the plume. Sediment deposition greater than 0.2 mm occurs to a distance of 600 meters from the dredge site, within approximately 60 meters of the shoreline. The model calculates that a total of 48 cubic meters of sediment are deposited due to the 24 hours of dredging, assuming a release rate of 4%.

6.3 Case 3 – April 8 to 11 trade winds, 4% release rate

Model Case 3 is similar to Case 2 (release rate of 4%), except that the wind forcing is the actual wind conditions measured April 8 to 11, 2005, rather than steady, moderate trade winds. This model case represents a worst-case scenario of TSS loading into the water, with circulation and transport produced by the April 8 to 11 trade winds. As discussed previously, the trade winds typically peak in the early afternoon at 7 to 8.5 m/s, and diminish to 0 to 3 m/s during the night. Figures 6-3A to 6-3D show the calculated suspended sediment plume in the surface and bottom layers at times 0.75 days (6:00 p.m.) and 1.2 days (5:00 a.m.). The figures corresponding to 6:00 p.m. (Figures 6-3B and D) show plume transport during vigorous afternoon trade winds, while the 5:00 a.m. figures illustrate plume transport during the weaker nighttime trade winds. As in Case 2, the plume on the surface is transported downwind to the east. The surface plume that exceeds the background TSS level of 5 mg/L extends to the west 1,200 meters at 6:00 p.m., and 1,000 meters at 5:00 a.m. (Figure 6-3A and B). Surface TSS concentrations exceeding 2 mg/L extend to the west 940 meters at 6:00 p.m. and 740 meters at 5:00 a.m. A similar pattern occurs in the bottom layer. The plume in the bottom layer is transported primarily to the west (Figure 6-3B). The size of the plume where TSS concentrations exceed the background level of 5mg/L is approximately 940 meters long at 6:00 p.m. and 840 meters long at 5:00 a.m.

Time series plots of TSS show that the maximum TSS concentration reached in the surface layer is 110 mg/L at the dredge site, and 65mg/L 200 meters down current from the dredging (Figure 6-3E). The maximum plume concentration in the bottom layer is 1,050 mg/L at the dredge site, and 150 mg/L 100 meters down drift of the dredging (Figure 6-3F). The peaks occur in the early morning hours when currents are weaker and do not quickly transport TSS away from the dredge site. The plume concentrations return to 0 within 0.2 days (5 hours) after the end of the dredging.

In this model case, as in Case 2, approximately 118,000 kg of suspended sediment are released into the water column. Approximately 109,000 kg of the sediment are deposited in the model area, and 9,000 kg remain suspended in the water column within the model domain. Maximum deposition at the dredging site is 25 mm. Deposition of more than 0.2 mm of sediment occurs primarily to the west, across an area 600 meters long and 80 to 90 meters wide (Figure 6-3G).

6.4 Spill Impacts

The numerical model EFDC was also used to model possible impacts of spills, such as oil, during project construction or future wharf operations. Spill trajectories were simulated by releasing drifters in the model at the model dredging site at Fill Area 1, and from the center of Fill Area 2C. The location of the drifters was output at specified intervals during the model run. The model run was the same as Case 3 – wind forcing of actual winds measured April 8 to 11, and tides. Figure 6-4 shows the drifter transport paths during the model run. Drifter 1 was released at the dredge site, and Drifter 2, from Spill Area 2C. The figure shows that the drifters moved downwind with little variation. Drifter 1 more closely followed the shoreline, while Drifter 2 moved through the harbor basin. Directions of flow were to the west-southwest. Drifter 1 reached the harbor entrance channel area in approximately 1.4 days, while Drifter 2 reached the entrance channel area in 1.7 days. These results indicate that during typical trade wind

conditions, surface spills from the project vicinity will most likely flow to the west-southwest toward the harbor entrance.

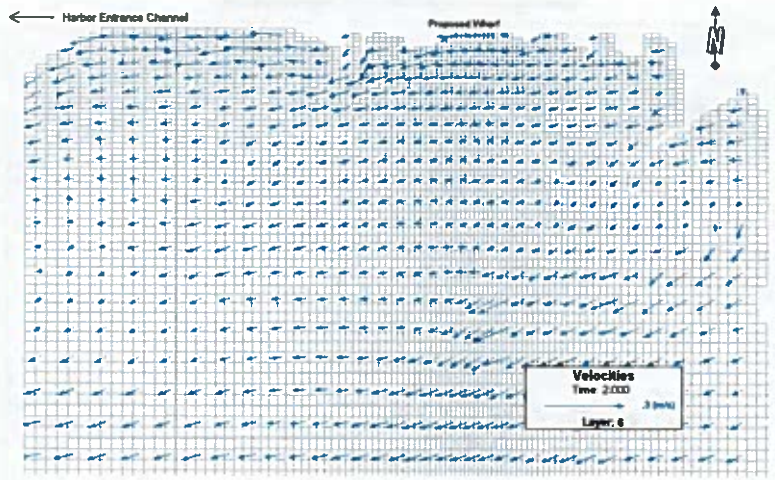


Figure 6-1A. Model grid showing surface layer currents during moderate, steady trade winds.

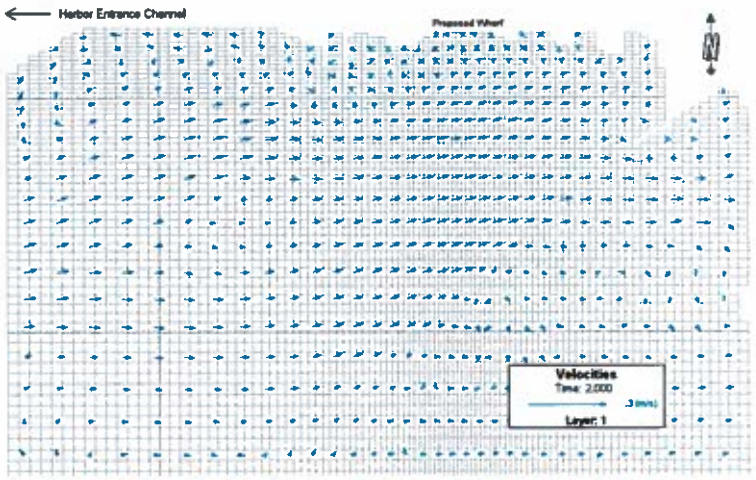


Figure 6-1B. Model grid showing bottom layer currents during moderate, steady trade winds.

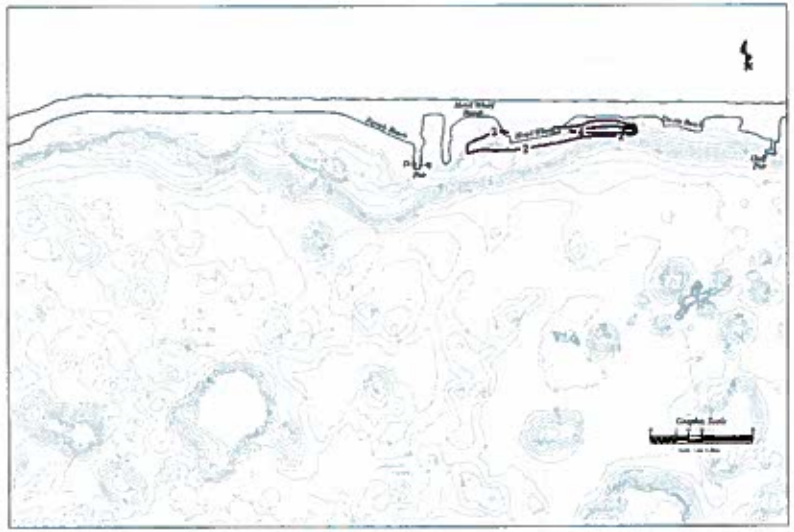


Figure 6-1C. Surface layer suspended sediment concentration.
Contour interval 2mg/L.

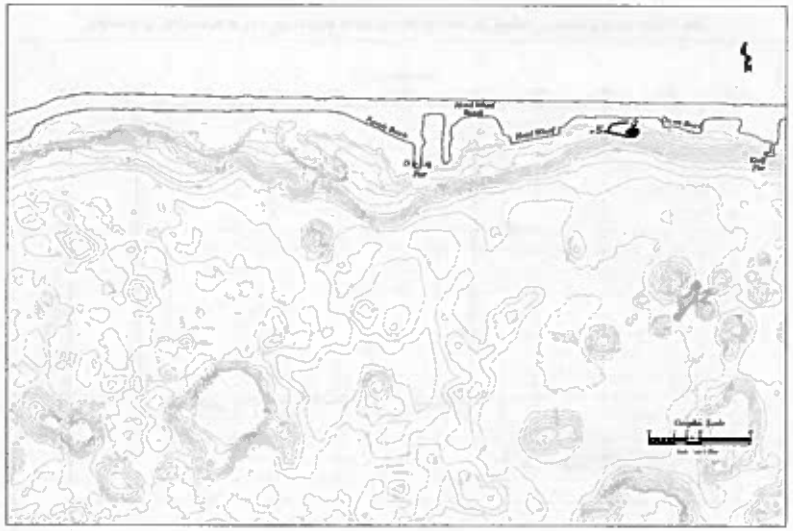


Figure 6-1D. Bottom layer suspended sediment concentration.
Contour interval 5 mg/L.

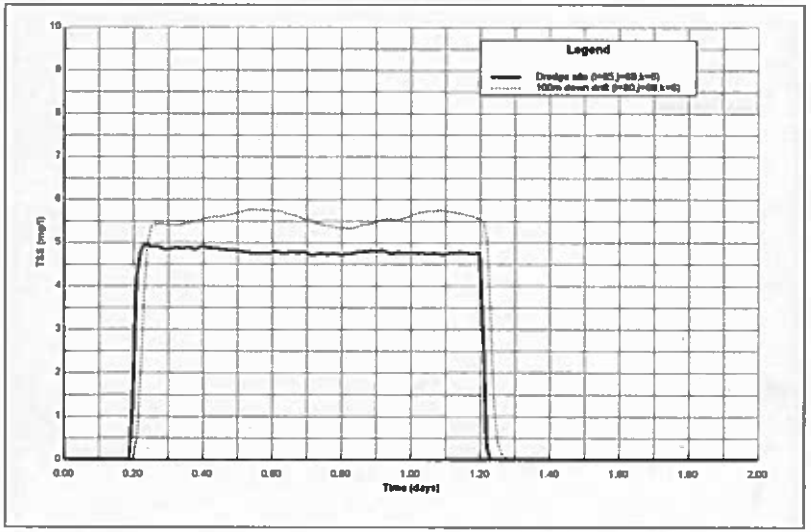


Figure 6-1E. Surface layer TSS time series at the dredge site and 100 meters down drift of the dredge site.

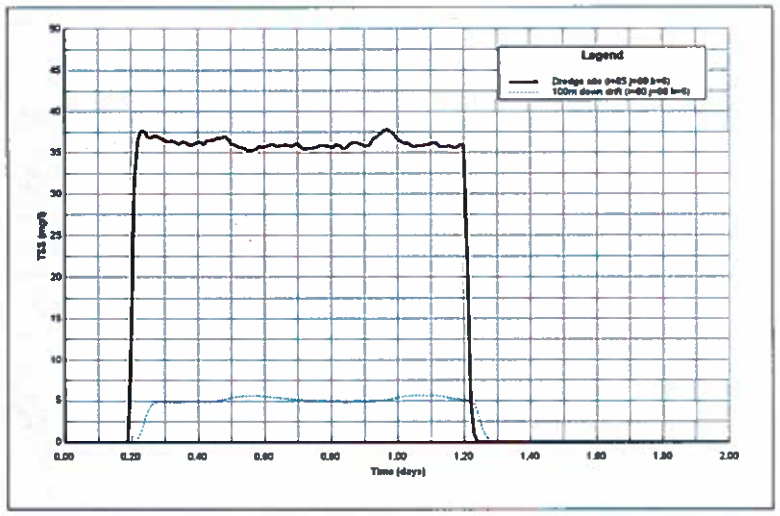


Figure 6-1F. Bottom layer TSS time series at the dredge site and 100 meters down drift of the dredge site.

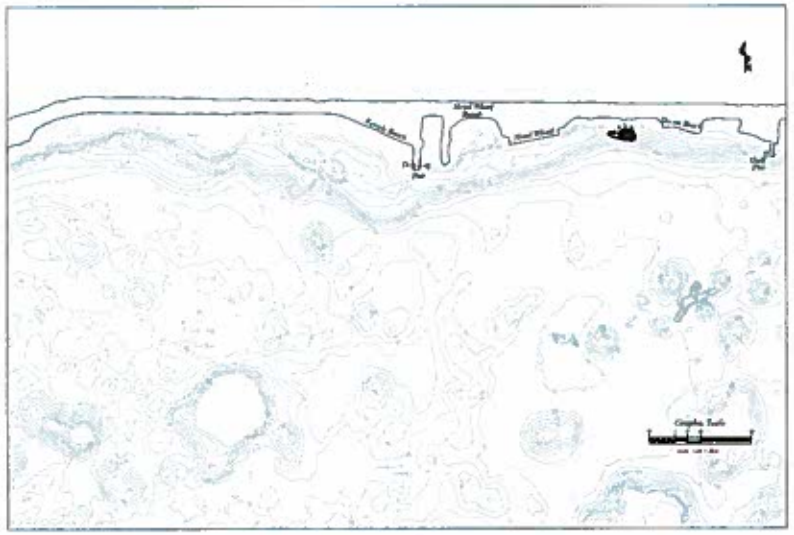


Figure 6-1G. Sediment thickness in mm.
Contour interval 0.2 mm.

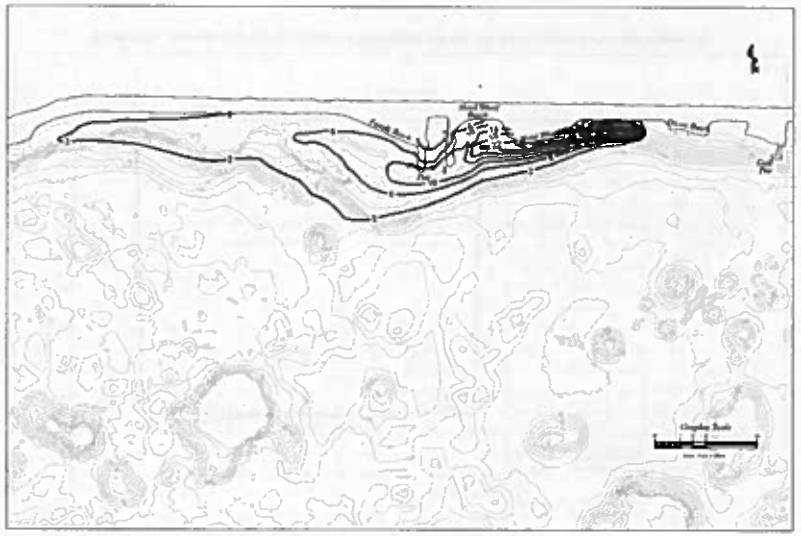


Figure 6-2A. Surface layer suspended sediment concentration.
Contour interval 5mg/L

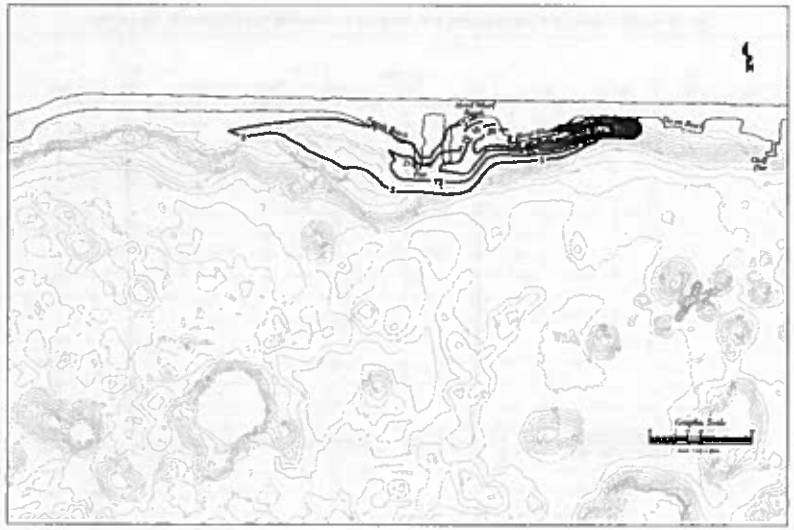


Figure 6-2B. Bottom layer suspended sediment concentration.
Contour interval 10 mg/L.

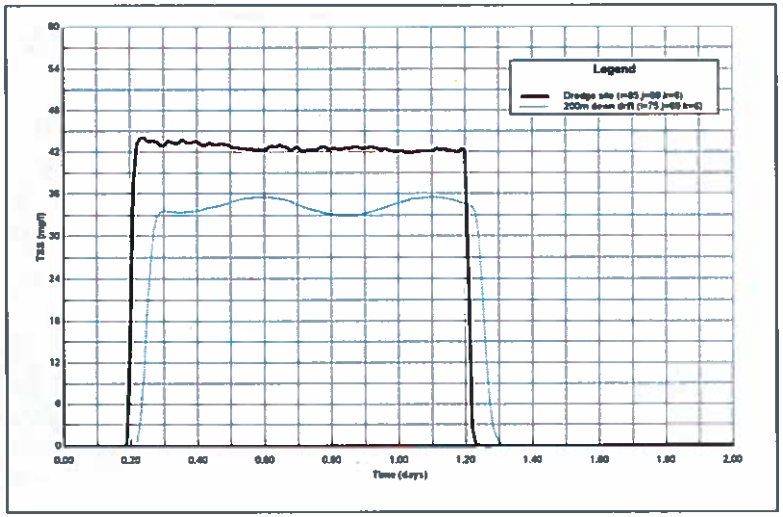


Figure 6-2C. Surface layer TSS time series at the dredge site and 200 meters down drift of the dredge site.

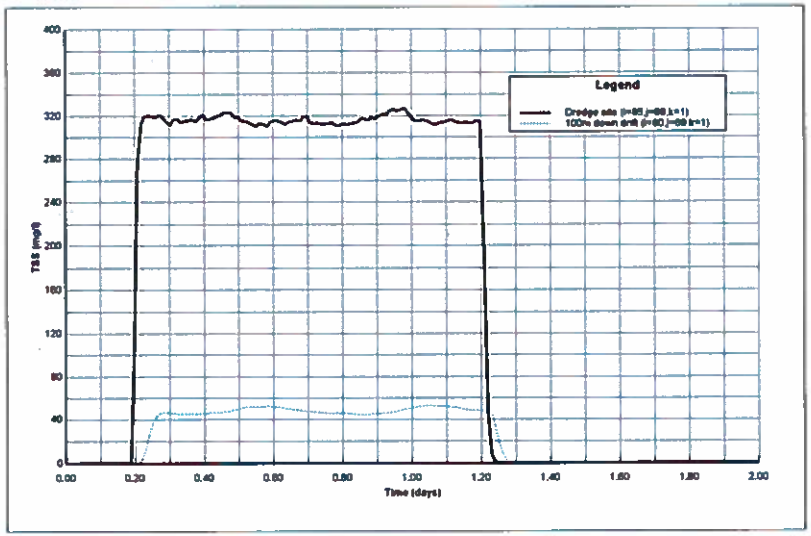


Figure 6-2D. Bottom layer TSS time series at the dredge site and 100 meters down drift of the dredge site.

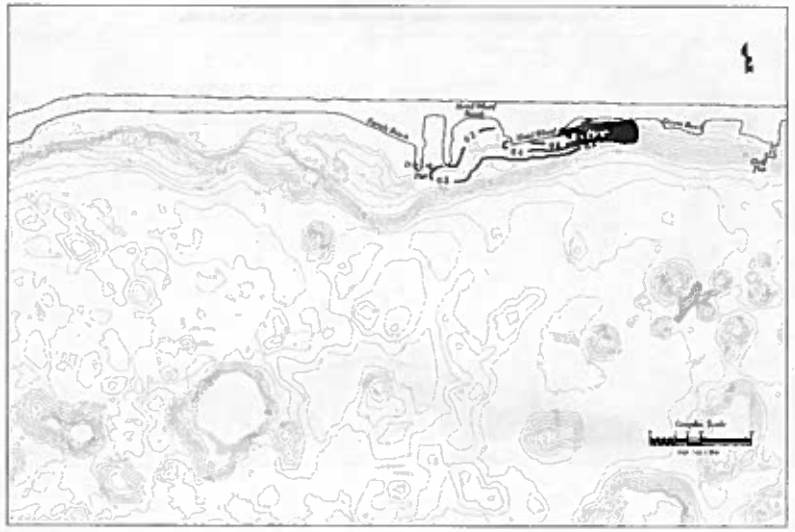


Figure 6-2E. Sediment thickness in mm.
Contour interval 0.2 mm.

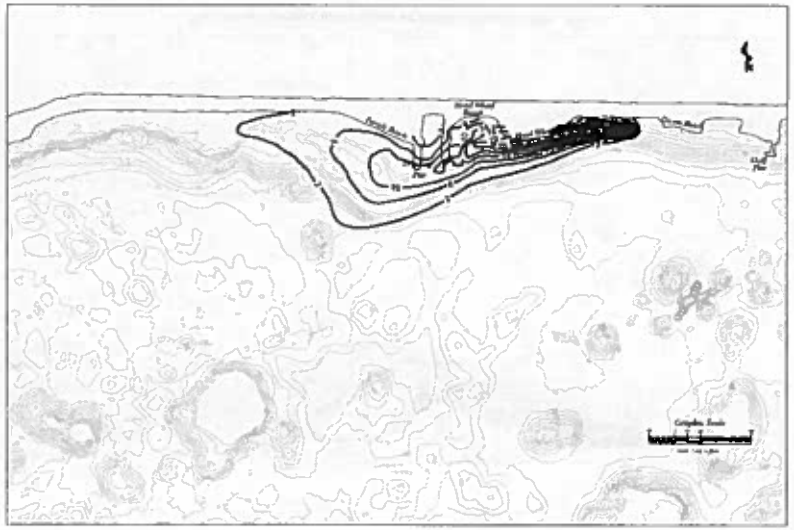


Figure 6-3A. Surface layer suspended sediment concentration at 6pm.
Contour interval 4mg/L.



Figure 6-3B. Surface layer suspended sediment concentration at 5:00 a.m.
Contour interval 4mg/L.

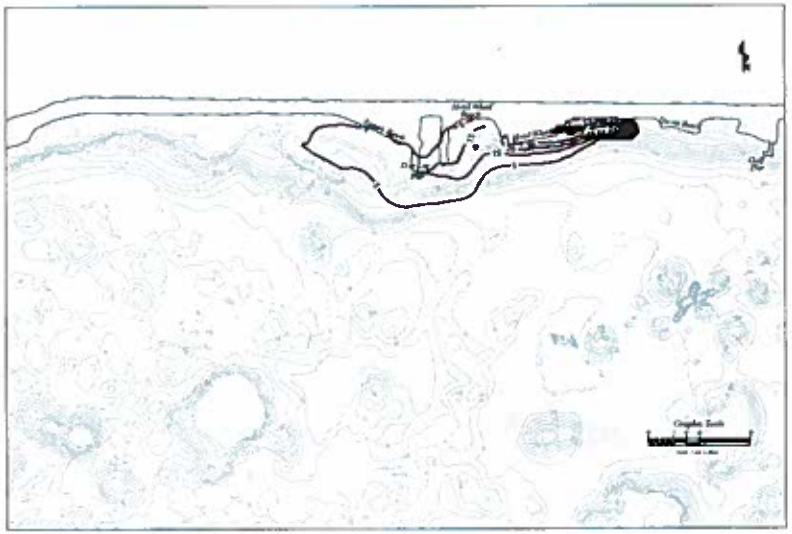


Figure 6-3C. Bottom layer suspended sediment concentration at 6pm.
Contour interval 10 mg/L.

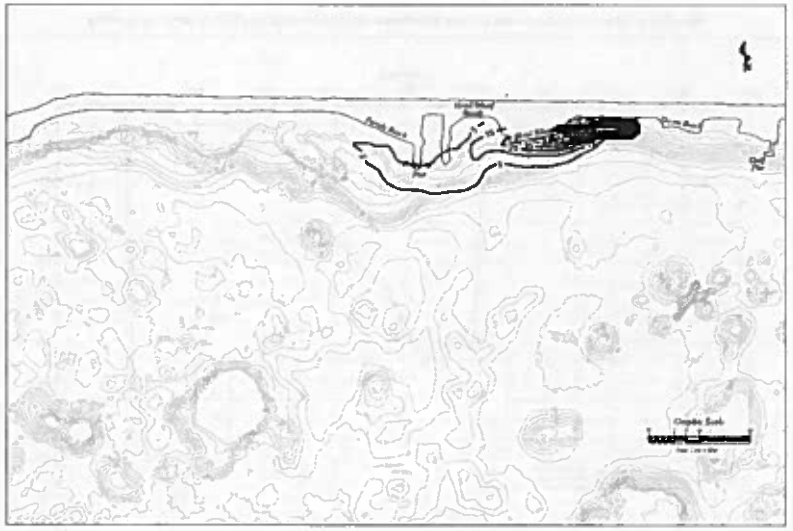


Figure 6-3D. Bottom layer suspended sediment concentration at 5:00 a.m.
Contour interval 10 mg/L.

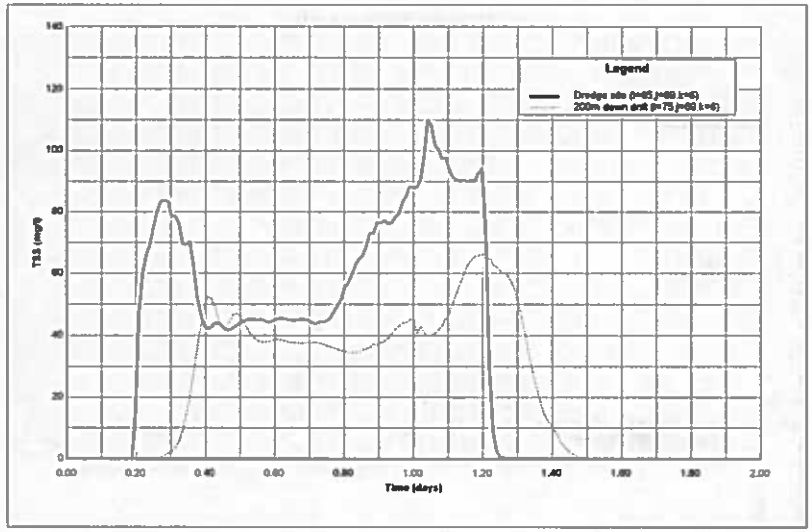


Figure 6-3E. Surface layer TSS time series at the dredge site and 200 meters down drift of the dredge site.

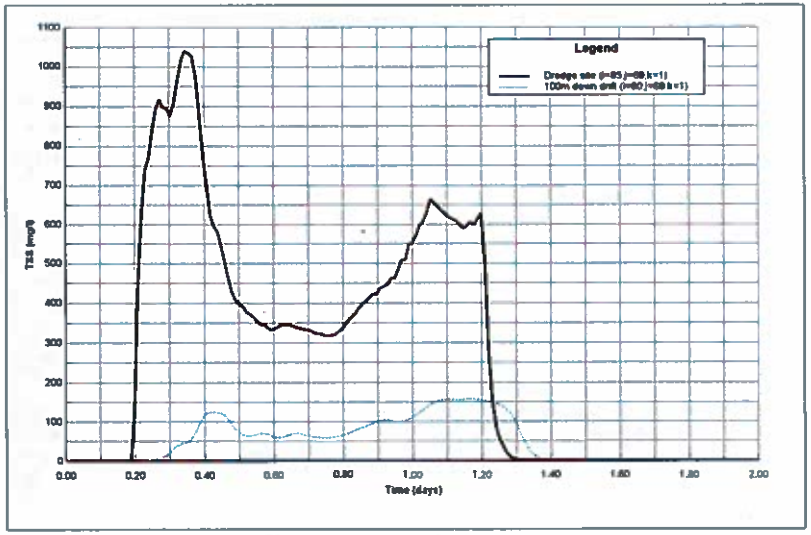


Figure 6-3F. Bottom layer TSS time series at the dredge site and 100 meters down drift of the dredge site.

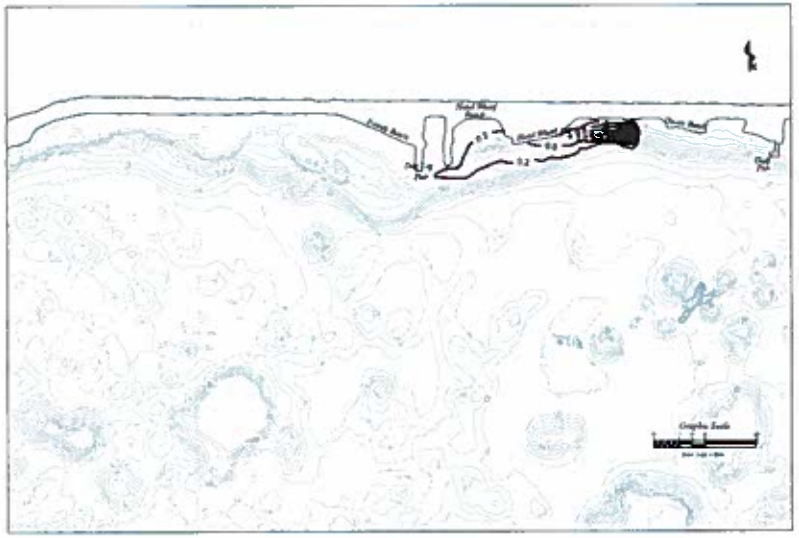


Figure 6-3G. Sediment thickness in mm.
Contour interval 0.2 mm.

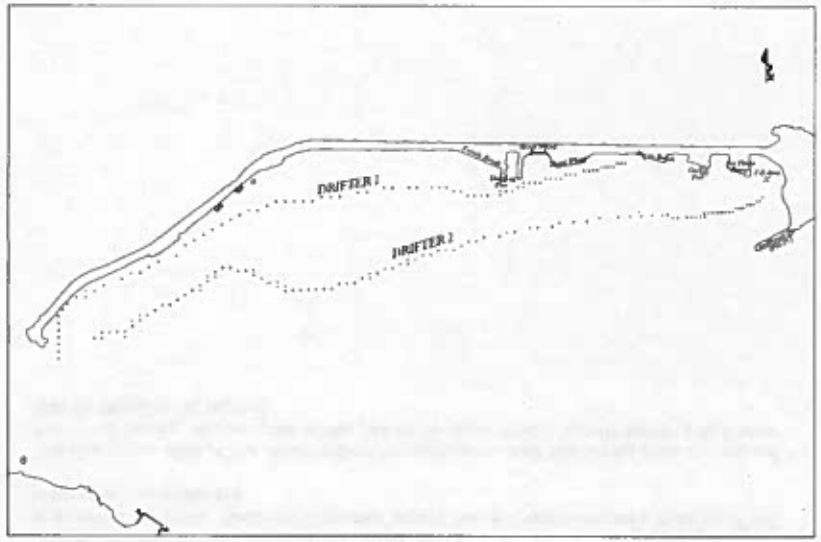


Figure 6-4. Drifter transport paths.

7.0 CONCLUSIONS

A coastal engineering assessment was completed for the proposed improvements to the Commercial Port area in Apra Harbor, Guam. The work included an assessment and description of the current shoreline condition, a current measurement program, and numerical modeling of dredging and spill impacts. The shoreline assessment indicated that the shoreline is presently highly segmented, consisting of a series of man-made headlands, piers and wharves bounding six small coves. Rip-rap revetments line much of the shoreline, interspersed with patches of rubble, gravel, and sand. The shoreline is composed entirely of fill material placed on the pre-existing reef flat to protect the north side of the harbor from the open ocean. Prevailing conditions along the shoreline are calm, as the trade winds are directed offshore. There are no indications of sediment transport along the shoreline, and there is little sand along the shoreline and nearshore zone. The proposed project is therefore not expected to have significant impacts on the neighboring shorelines such as Hotel Wharf Beach and Family Beach. The primary impacts will be the loss of shoreline and nearshore bottom due to the actual filling and land reclamation in Fill Areas 1, 2A, 2B and 2C.

The current measurement program included deployment of a current meter for one month at a water depth of 45 feet offshore of Hotel Wharf, and tracking of current drift drogues in the project vicinity for four days. The current measurement program indicated the currents are primarily driven by winds, and are directed to the west to southwest during typical tradewinds. Surface current speeds averaged 10 cm/s, while mid-water column currents averaged 6 cm/s. The drogues indicated the currents in deeper water averaged 1.5 cm/s. In the harbor basin, a two-layer flow pattern is present, with surface currents directed downwind toward the harbor entrance, and bottom layer flow to the east. In shallower water near the shoreline, currents flowed to the west, parallel to the shore.

A three-dimensional circulation and transport model of the project area was developed using the Environmental Fluid Dynamics Code (EFDC). The model included wind and tide forcing, the dredge plume was simulated by loading the water column with specified quantities of suspended sediment composed of 5 different grain sizes. The model calculated transport, dispersion and deposition of the plume suspended sediments. The modeling results can be considered representative of the general impact footprints, assuming the general wind-driven currents that prevail in the area. During the actual dredging operations, however, different wind and current conditions may occur that will result in different transport patterns.

Three model cases were completed, simulating different wind forcing conditions and total suspended solids (TSS) loading. The TSS loading is simulated by assuming that a specified percentage of the material being dredged is released (or spilled) into the water column. The release rates utilized included an average value of 0.45%, and a worst-case value of 4%. Wind conditions included steady 15mph (7 m/s) trade winds, and the measured trade wind time series for April 8 to 11. An average release rate of 0.45% results in surface TSS plumes and sediment deposition being confined to the immediate vicinity of the dredging. TSS concentrations in the surface plume exceed background levels only within 100 meters of the dredge site. TSS concentrations exceeding 2 mg/L extend about 500 meters east of the dredge site. The limited surface plumes are partly attributable to the vertical distribution of sediment release in the water column. The analysis assumes that the

amount of material released into the water column decreases from 40% in the bottom 20% of water to 5% in the surface 20% (DOER, 2000). This distribution assumes that best management practices are adhered to during construction that minimize the amount of spillage and barge overflow during dredge material loading. Sediment deposition of greater than 0.2 mm is confined to within 60 meters of the dredge site. A sediment deposition of 0.2 mm represents a conservative, outer bound for possible impacts due to sedimentation.

Worst case scenarios were analyzed by assuming a release rate of 4%, the highest figure found in the literature for clamshell dredging operations. The model results show that during worst case TSS loading a TSS plume exceeding background levels of 5mg/L could extend 1,000 meters to the west along the shoreline, and thus, could impact Family Beach and Hotel Wharf Beach. The primary zone of sediment deposition extends to the west of the dredge site, following the initial transport of the plume. Sediment deposition greater than 0.2 mm occurs to a distance of 600 meters from the dredge site.

The time series plots of the dredge plume concentrations show that during both average and worst case loading scenarios, the dredge plumes dissipate rapidly, usually within 2 to 3 hours after the dredging has stopped.

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EXHIBIT IV B.

Department of Parks and Recreation
Dipattamenton Plaset Yan Dibuetision
Government of Guam
P.O. Box 2950
Hagatña, Guam 96932
Telephone: (671)475-6290/1
Facsimile:(671)477-2822

Carl T.C. Gutierrez
Governor

Madeleine Z. Bordallo
Lt. Governor

Dominic G. Muna
Director

Frank A. Acfalle
Deputy Director

RECEIVED
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January 23, 2002

George Hollingsworth
Planner III
Port Authority of Guam
1026 Cabras Highway
Suite 201
Piti, Guam 96915

Dear Mr. Hollingsworth:

We have reviewed your documentation including maps of the Port Authority's property where federal grant will be used for its Architectural Design and have the following comments.

The entire peninsula is a man made area which does not contain any significant cultural resources. The Architectural Design and any subsequent undertaking to be carried out on that property will not be detrimental to any property listed or eligible for the National Register of Historic Places.

No formal Section 106 determination was submitted for our concurrence, however, we would have concurred with a determination of "*No Historic Properties Affected*" for this undertaking based on the above information.

Sincerely,

LYNDA B. AGUON
State Historic Preservation Officer

The Way Forward!

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Ms. Lynda Aguon
Guam Historic Preservation Officer
Department of Parks and Recreation
Guam Historic Preservation Division
490 Chalan Palasyo
Agana Heights, Guam 96931

Dear Ms. Aguon:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

The harbor is located near the center of the western coast of Guam (see Figure 1). It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F–2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include:

1. Construction of a new 1,500-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities;

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

Per 36 CFR 800.4, we ask for your assistance in the identification of historic properties, cultural resources and/or traditional cultural properties within the Area of Potential Effect (see Figure 1) for the proposed project. To better assist us with the EIS document, we would also appreciate any comments specific to potential project alternatives, potential impacts to other resources, and potential mitigation measures for unavoidable impacts. We have contracted Micronesian Archaeological Research Services (MARS) to conduct the cultural surveys and assessments for this project. We anticipate providing you with survey results and a determination of effect on historic properties this Summer (2005).

We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Thank you for taking the time to meet with Ms. Cindy Barger of my staff on February 24, 2005 during the EIS scoping visit. We look forward to further discussion and consultation on this and future actions.

Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Ms. Adrienne Loerzet
Governor's Special Assistant on the Environment
Governor's Office
Ufisinan Maga'lahi
P.O. Box 2950
Hagåtña, Guam 96932

Dear Ms. Loerzet:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

The harbor is located near the center of the western coast of Guam (see Figure 1). It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include:

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2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

Per 36 CFR 800.4, we ask for your assistance in the identification of historic properties, cultural resources and/or traditional cultural properties within the Area of Potential Effect (see Figure 1) for the proposed project. To better assist us with the EIS document, we would also appreciate any comments specific to potential project alternatives, potential impacts to other resources, and potential mitigation measures for unavoidable impacts. We have contracted Micronesian Archaeological Research Services (MARS) to conduct the cultural surveys and assessments for this project. We anticipate providing you with survey results and a determination of effect on historic properties this Summer (2005).

We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

for James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. JLawrence Cruz
Acting President
Department of Chamorro Affairs
P.O. Box 2950
Hagåtña, Guam 96932

Dear Mr. Cruz:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

The harbor is located near the center of the western coast of Guam (see Figure 1). It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include:

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3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

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We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

James L. Berg, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Larry Perez
Director
Department of Public Works
Dipattamenton Cho'Cho' Pupbleko
542 North Marine Corps Drive
Tamuning, GU 96913

Dear Mr. Perez:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

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Sincerely,

James L. Bergson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Robert Lizama
President
Mayor's Council
P.O. Box 786
Hagåtña, GU 96932

Dear Mr. Lizama:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Bergson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Leonard Iriarte
Director
Guma' Palu Li'e
c/o Guam Community College Library
P.O. Box 23069 GMF
Barrigada, Guam 96921

Dear Mr. Iriarte:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

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1. Construction of a new 1,500-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities;

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

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We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Ed Benavente
Executive Director
Guam Ancestral Lands Commission
P.O. Box 2950
Hagåtña, GU 96932

Dear Mr. Benavente:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

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Sincerely,

James L. Bergson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Commission on Decolonization
Kumision Dinitetminan-Maisa
PO Box 2950
Hagåtña, GU 96933

Ladies and Gentlemen:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

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Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Thomas Morrison
Deputy Director
Department of Parks and Recreation
P.O. Box 2950
Hagåtña, Guam 96931

Dear Mr. Morrison:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Benson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Frank Aguon
Vice Speaker
27th Guam Legislature
155 Hesler Place
Agana, Guam 96910

Dear Mr. Aguon:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Michael B. Makio
Chairman
c/o Ms. Rosanna P. Barcinas, Program Officer
Guam Preservation Trust
Guam Historic Preservation Review Board
P.O. Box 3036
Hagåtña, Guam 96910

Dear Mr. Makio:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Benson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Senator Tina Muna-Barnes
Chairperson
Committee on Community, Culture, Recreation and Public Broadcasting
155 Hesler Place
Agana, Guam 96910

Dear Ms. Muna-Barnes:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Joseph Borja
Administrative Director
Chamorro Land Trust Comission
Kumision Inangoklon Tano' Chamorro
P.O. Box 2950
Hagåtña, Guam 96932

Dear Mr. Borja:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Filamore P. Alcon
Director
Chamorro Artists Association
c/o Jay Baza Pascua
P.O. Box 362
Agana, Guam 96932

Dear Mr. Alcon:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Bousson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Frank Rabon
I Taotao Tano'
P.O. Box 3503
Hagåtña, Guam 96910

Dear Mr. Rabon:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Bergson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Masako Watanabe
Pacific Daily News
244 Archbishop Flores Street
Hagåtña, Guam 96910

Dear Mr. Watanabe:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Ms. Katie Worth
Pacific Daily News
244 Archbishop Flores Street
Hagåtña, Guam 96910

Dear Ms. Worth:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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James L. Bergson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Ms. Ann San Nicolas
Chairman
Sethisio Para I Manamko'
GGARP-SPIMA
P.O.Box 3057
Hagåtña, GU 96932

Dear Ms. San Nicolas:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Peter J. Onedera
Professor
University of Guam
UOG Station
Mangilao, Guam 96923

Dear Prof. Onedera:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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James L. Benson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Rudy Villaverde
University of Guam
UOG Station
Mangilao, Guam 96923

Dear Mr. Villaverde:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

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Figure 1 Pacific Area Map

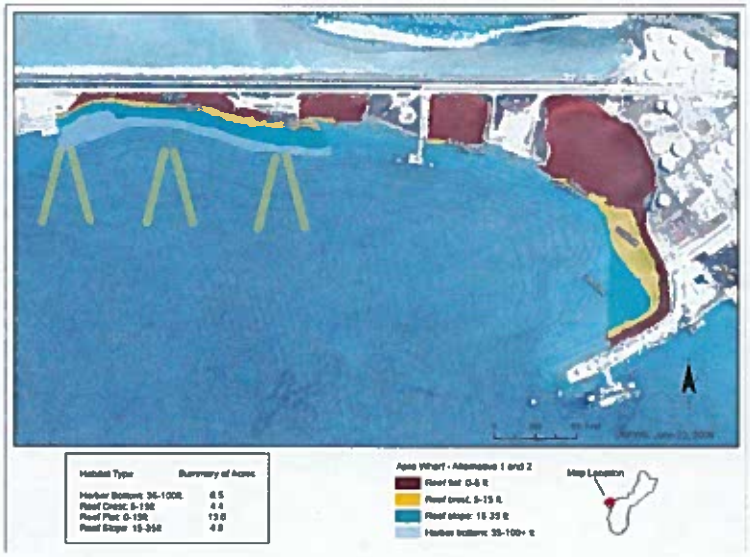


Figure 2a. Proposed Apra Harbor Expansion and Land Reclamation project site Alternatives 1 and 2

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proposed project site and throughout Apra Harbor provide habitat that support specialized ecological functions, which includes suitable space for nesting and reproduction, recruitment and population replenishment, food production and foraging, and shelter from predators for a diverse array of marine species including the federally listed green and the endangered hawksbill sea turtles. Coral reefs provide other ecological functions such as shoreline protection from oceanic swells and storm events; sources of larvae/juveniles to promote off-site species replenishment; prey items for federally protected migratory birds; and human activities such as subsistence harvest/fishing, recreation activities, tourism and cultural practices.

It is anticipated that the coral reef community within the proposed project area, as described for each of the three alternatives under consideration, would be negatively impacted by implementation of the proposed project. The primary resource impact under Alternatives 1 and 2 is the permanent loss of 22 ac (8.9 ha) of marine bottom habitat, which includes 13.03 ac (5.3 ha) of reef flat that provides food and shelter for juvenile reef fish and shallows vegetated with plants fed upon by sea turtles; 4.42 ac (1.89 ha) of reef crest that supports a high diversity of reef fish species; and 4.88 ac (2.0 ha) of reef slope that contains high live coral cover and supports high numbers and a high biomass of reef fish species. Losses under Alternative 3 are anticipated to be substantially higher for all habitat types.

From a resource conservation perspective, the least environmentally damaging practicable alternative for the construction of the proposed commercial dock is Alternative 1, provided that carefully developed and enforceable measures to avoid unnecessary impacts and minimize and compensate for unavoidable impacts to fish and wildlife resources are incorporated and made an integral part of the project. Incorporation into the project of our recommended Best Management Practices will help minimize unavoidable project-related impacts. We also recommend that the project proponent analyze sediment proposed for dredging for contaminant risk prior to dredging and that effective measures to control the movement of invasive species and wildlife diseases through the new wharf facilities be incorporated into the project.

Mitigation planning guidance (RGL 02-2; *F.R.* 71:59 15520-15556) provides a structured process to ensure that adequate compensatory mitigation will offset project-related impacts to aquatic resources, including impacts to coral reef habitats. We recommend that Habitat Equivalency Analysis or similar techniques be used to model the area-time recovery of the various habitat types anticipated to be impacted by the proposed project, in order to provide a means to quantify and define the extent of the associated mitigation requirement for both area and time scales. We also recommend that the project proponent develop a mitigation plan that verifiably addresses replacement of the ecological functions identified in this report. The plan should contain a suite of compensatory mitigation actions designed to replace the coral reef ecological functions actually lost and include adequate post-project monitoring of appropriate performance criteria.

We recommend that the compensatory mitigation plan be developed in close coordination with DAWR, NMFS, USEPA, the Corps Regulatory Branch, the Service and other parties.

The compensatory mitigation plan should be based on the project design alternative finally selected for implementation. Any changes to the proposed project alternatives that are currently under consideration will require additional coordination with the Service.

- Construction-related materials will not be stockpiled in the marine environment and will be placed or stored in ways to avoid or minimize disturbance to the marine environment;
- Under-layer fills for the wharf and embayment levies will be protected from erosion with core-loc units or similar construction material as soon after placement in the water as practicable;
- All construction-related materials and equipment (dredges, barges, backhoes etc) to be placed in the water will be cleaned and reasonably free of pollutants prior to use;
- No contamination (trash or debris disposal, etc.) of the marine environment will result from construction-related activities;
- A contingency plan to control the accidental spills of petroleum products at the construction site will be required and will include the storage of absorbent pads, containment booms and skimmers on-site to facilitate the clean-up of spills;
- Turbidity and siltation from dredging, debris removal, and placement of fills will be minimized and confined to the immediate vicinity of the work through the use of effective silt containment devices and the curtailment of work during adverse sea conditions (*i.e.*, in advance of typhoons and other storms);
- Debris extracted from harbor sediments will not be stockpiled in the marine environment and will be disposed of at an approved upland or ocean dumping site; and
- To minimize impacts to coral larvae and recruitment-related processes, project-related construction activities that may result in the mobilization of suspended sediment will not be conducted ten days before and ten days after the primary coral spawning period in Guam, which follows a lunar periodicity and usually takes place in June or July.

Harbor Sediment Risk Analysis

The Service recommends that the sediment that would be disturbed as part of the proposed project be analyzed for contaminant risk. Contaminants suspended/re-suspended in the water column by dredging may chemically alter coral gametes and larvae, and prevent normal fertilization and development. Harbor sediment should be dewatered, stored and handled in accordance with appropriate GEPA laws and regulations. If a Confined Disposal Facility (CDF) is constructed to manage contaminated harbor sediment, the CDF should be lined and managed to prevent contaminants from entering soil and ground water. Also, the CDF should be netted to prevent migratory bird from being exposure to contaminated sediment through dermal contact with accumulated water and sediment or ingestion of water or invertebrates that may be contained within the sediment.

Invasive Species

Plans to expand the physical infrastructure of the commercial wharf to accommodate increased commodities traffic and cargo transshipment will increase chances that invasive species will inadvertently be carried to Guam or be shipped away from Guam to other locations. Invasive species are a growing threat to business, agriculture and the ecological integrity of the region. For example, the brown tree snake is responsible for the near-extirpation of native land birds and fruit bats on Guam, and poses an enormous risk to the bird

and bat fauna of nearby islands such as Saipan and Rota. This threat also extends to islands in the Freely Associated States of Micronesia and Hawaii, especially Oahu, which are connected to Guam by commercial, shipping and military ties. Other biological agents such as avian influenza pose a risk associated with unauthorized shipments of poultry and other bird stocks.

To be effective in successfully containing these threats, we recommend that project planning incorporate strong controls to interdict accidental transportation of brown tree snakes and other invasive species and nuisance species through the installation of dedicated facilities throughout the new wharf facilities that house a permanent, on-site staff of invasive species specialists (representing United States Department of Agriculture – Wildlife Services and other programs) and equipment (vehicles, dogs etc). It is essential that the PAG consistently sustain an adequate inspection rate of all cargo, vehicles, munitions, household goods and other items departing from the Port of Guam or other sites where materials, goods, vehicles, and cargo are staged for departure from Guam. Support at the proposed wharf expansion site for brown tree snake quarantine efforts by Wildlife Services must accommodate the staff levels and operational infrastructure required to maintain programmatic integrity during all periods and all phases of cargo and vehicle movement off Guam. The importance of long-term adequate and consistent office and kennel facilities for Wildlife Services brown tree snake interdiction efforts at the proposed expanded wharf is essential. The PAG must adequately support sustained brown tree snake trapping, capture, and toxicant use by Wildlife Services directly in the vicinity of sites where cargo, vehicles, and other items are staged, stored, or packed prior to departing Guam. We strongly recommend a mechanism be cooperatively developed by the PAG and Wildlife Services that ensures a continued interdiction effort at appropriate levels.

Port operations should also seek to control and reduce the risk of introduction of marine invasive species by ensuring vessel compliance with the most current ballast water management guidelines. We recommend that the PAG operate the proposed expanded wharf facility with an ongoing program of compliance with national and international efforts to control the spread of marine invasive species. These programs include the ballast water exchange practices recommended by the International Maritime Organization (IMO) and the U.S. Coast Guard, which is implementing federal legislation consistent with IMO Guidelines, and the recommendations of the national Aquatic Nuisance Species Task Force, which has developed directives for state and territorial jurisdictions as identified by ANS Regional Panels.

SUMMARY AND FISH AND WILDLIFE SERVICE POSITION

The coral reef at and near the proposed project site has been identified as the habitat of major concern for the proposed project because of its contribution in supporting communities of coral reef organisms (*e.g.*, reef fish, corals, macro-invertebrates, algae and sea turtles). The institutional significance of U.S. coral reefs has been established through their designation as Special Aquatic Sites (40 CFR Part 230 §230.44/FR v 45n.249) and as a Federal Trust Resource (E.O. 13089 on Coral Reef Protection). To various degrees, the coral reefs at the

(Regulatory Guidance Letter [RGL] 02-2, Federal Register [F.R.] 71:59 15520-15556) provide a structured compensatory mitigation planning process that is intended to guide compensatory mitigation actions to effectively replace marine resources that are permanently lost due project-related impacts. National technical guidance for mitigation is supported by regionally developed mitigation guidance that considers aquatic and marine resources that are regionally of importance, including coral reefs (Corps Honolulu District P.N. 200400448). In addition to maintaining continuity of the *reach and extent* (area) of U.S. waters, a basic premise of compensatory mitigation in the CWA is that aquatic resource *functions and values* lost or degraded due to project-related activities are appropriately and verifiably replaced.

Guam's coral reefs, including those in Apra Harbor, are important because they provide physical habitat that supports a wide variety of ecological functions. From a biological perspective, these functions include the provision of forage, shelter, resting, nesting, and recruitment space for diverse assemblages of species, including two federally listed animals, the threatened green sea turtle (*Chelonia mydas*) and the endangered hawksbill sea turtle (*Eretmochelys imbricata*). Maintenance of coral reef habitats that support these ecological functions is dependent on protecting live coral tissue, which requires clean, clear, well-oxygenated, tropical seawater. Although corals are fragile and can be broken by storm waves, unimpaired reefs that are largely free of human-induced stressors are resilient to catastrophic events. Healthy coral reefs have the ability to continually heal themselves from wave damage and other periodic natural impacts.

Healthy coral reefs provide other well-recognized ecological and natural services, such as buffering island shorelines from erosion by currents and waves. This protection typically helps support upland areas for human inhabitants and a wide variety of native terrestrial organisms, including ecosystems and species of special concern such as coastal vegetation, sea turtles and other reptiles, seabirds, shorebirds, bats, land snails and other invertebrates. Other ecological functions provided by healthy coral reefs at Guam include the maintenance of intact near-shore marine communities that interact with pelagic or terrestrial species through complex predator, prey, or symbiotic relationships common in tropical ecosystems. For many years, coral reef resources have provided enormous benefits to the residents of Guam by supporting human activities such as subsistence harvest/fishing, cultural practices, recreational activities, and tourism. The coral reef at the proposed project site provides all of these ecological services to varying degrees while serving as the physical base upon which Apra Commercial Wharf operations are supported.

An acceptable strategy to compensate for project-related resource losses includes: (1) documentation of anticipated area of impact; (2) assessment of resources anticipated to be impacted; (3) correlation of anticipated impacts and compensatory mitigation; (4) scientific monitoring of compensatory mitigation; (5) establishment of performance standards and evaluation criteria; and (6) determination of the effectiveness of implemented compensatory mitigation (USFWS 2003). The first two components of this strategy, "documentation of anticipated area of impact" and "assessment of resources anticipated to be impacted" are addressed in this report. Additional oceanographic modeling may be required to better define the actual area of indirect impacts once construction methods and the sequence of

construction activities are finalized (*e.g.*, selection of alternative plan, use of hydraulic vs. mechanical dredging).

It is not likely that any single activity may adequately compensate for the degradation and loss of coral reefs and associated ecological functions that would result from implementation of the proposed project. However, the combined effects of multiple mitigation activities implemented in a coordinated manner at appropriate geographic and time scales could replace these losses as required under federal law. We recommend development of a comprehensive mitigation plan in close coordination with DAWR, NMFS, USEPA, the Corps Regulatory Branch, the Service and other parties.

The Service recommends that the following features be incorporated into the mitigation plan:

- Mitigation planning for the proposed project should consider permanent resource losses in certain reef areas as well as temporary resource losses in areas that will recover over time. It is important to consider that some coral reef community characteristics have a longer period of recovery that others (*e.g.*, impacts due to sedimentation on a biologically diverse coral reef flat may take much longer to recover than a deep sand bottom). Both the area of impacted resources and the time-to-recovery should be accounted for in mitigation planning. We recommend Habitat Equivalency Analysis (HEA) as an appropriate quantitative methodology to model area-time recovery of the various habitat types and provide a means to quantify and define the scale of off-site mitigation plans (Dunford et al 2006).

- A post-construction assessment of the marine environment in the vicinity of the completed project should be conducted. The marine assessment should evaluate the coral reef community throughout all adjacent areas where indirect impacts actually occurred. The assessment should validate the extent of project-related damage and should be timed to periodically confirm recovery times of the various habitat types are progressing as projected.

- Valid scientific methods should be used to monitor compensatory mitigation actions and their ultimate effectiveness. It is critical that the project sponsor commit to periodic monitoring commensurate with the ecological timescales that may be needed to ensure success of the mitigation plan, a timeframe that may extend over several decades. Data from before-and-after resource surveys at mitigation sites must indicate that a balanced community of indigenous coral reef species has been created, restored or preserved, and that it is scientifically defensible to conclude that any mitigation area(s) will support appropriate ecological functions in perpetuity.

Best Management Practices

The Service recommends that the following measures to minimize the degradation of the coastal water quality and impacts to fish and wildlife resources and habitats be incorporated into the project.

	Reef crest	Permanent	3 04
	Reef slope	Permanent	1 97
(3) Anchors/mooring line impacts to substrate	Deep sand	1 year[1]	3 3
(4) Sediment deposition impacts to benthic fauna	Reef flat	10 years	11 14
	Reef crest	10 years	2.92
	Reef slope	10 years	1 42
	Deep sand	1 years	5 1
(5) Sediment suspension and re-suspension impairment to reproduction and recruitment[2]	Reef flat	3 years	55 7
	Reef crest	3 years	14 6
	Reef slope	3 years	7 1
	Deep sand	3 years	25 5

Alternative 3

Impact	Habitat Type	Duration	Area (ac)
(1) Habitat loss - embayment fill.	Reef flat	Permanent	13 01
	Reef crest	Permanent	5 58
	Reef slope	Permanent	8 46
	Deep sand	Permanent	15 56
(2) Sediment deposition impacts to benthic fauna.	Reef flat	10 years	11 14
	Reef crest	10 years	2 92
	Reef slope	10 years	1 42
	Deep sand	1 year	5 1
(3) Sediment suspension and re-suspension impairment to reproduction and recruitment[2].	Reef flat	3 years	55 7
	Reef crest	3 years	14 6
	Reef slope	3 years	7 1
	Deep sand	3 years	25 5

[1] Time to recovery estimated for infauna to recolonize benthic habitat.
[2] Lethal and sub-lethal reproduction and recruitment impairment during construction period

One of two dredging methods would be implemented for the proposed action, mechanical dredging or hydraulic dredging, and it is likely that hydraulic dredging will be used. Mechanical dredging would involve the use of equipment such as drag buckets, clamshell buckets, and barge-mounted excavators. Hydraulic dredging would involve the use of hydraulic suction to remove sediment. Mechanical dredging would minimize the amount of water contained in the dredged material compared to hydraulic dredging. However, mechanical dredging could generate substantially larger silt plumes that would adversely impact adjacent near shore waters. Compared to mechanical dredging, hydraulic dredging would involve less auxiliary equipment, have higher production rates, minimize dredge sediments generated by the activity, and tend to have lower labor costs.

Construction activities associated with the proposed project are expected to cause minimal adverse impacts to terrestrial biological resources. However, dewatering, storage and handling of sediment from project-related dredging may result in significant adverse impacts to the marine environment. Until upland dewatering and storage sites are specifically identified, we cannot evaluate the anticipated potential impacts (via leachate or direct contact) to fish and wildlife resources that may occur from the practices that would be employed to manage the dredged material.

No Action

None of the impacts identified as a result of constructing and operating the proposed facilities at either of the terminal location alternatives would occur. Current land uses and development trends within the study area would continue without the construction of the proposed action. This "no-build" scenario is used to establish the baseline against which projected impacts of the proposed build and design alternatives alternative are compared. Under the No Action Alternative, the proposed project location site would not be developed to accommodate other types of port facilities similar to those presently located in existing areas of Apra Commercial Wharf. However, future unrelated developments consistent with current land use designations, and their associated impacts, would continue to occur in and around the harbor and near the Apra Commercial Wharf.

FISH AND WILDLIFE SERVICE RECOMMENDATIONS

The Service shares jurisdiction with the NMFS over federally listed threatened green sea turtles and endangered hawksbill sea turtles. The Service has sole jurisdiction over these species when they are on shore, and the NMFS has sole jurisdiction over these species when they are in the ocean. Based on information from the Guam DMWR, sea turtles may occur, but are not known to nest at the proposed project site. We are concerned that these species may be adversely affected during project construction activities. Therefore, we recommend that any NMFS recommendations for the protection and conservation of sea turtles in the waters of Apra Harbor be made an integral part of the project.

Based on a comparison of anticipated direct and indirect impacts at the proposed project site, we conclude that the least environmentally damaging practicable alternative for the construction of the proposed project is Alternative 1: Pier-on-Piles Deep-Draft Wharf and Land Reclamation. This decision is based upon the consideration of both the permanent project-related loss of marine habitats and the temporary construction-related impacts in the area immediately adjacent to the project site. Also, we recommend development of a mitigation plan that includes measures to avoid unnecessary impacts and minimize unavoidable impacts to fish and wildlife resources from the proposed project. We recommend that the plan include measures designed to compensate for the unavoidable loss of fish and wildlife resource ecological functions and services. We recommend that this mitigation plan to avoid, minimize and compensate for project-related impacts be finalized prior to beginning project construction activities and that implementation of mitigation activities in the plan be commensurate with the onset of the project.

Compensatory Mitigation

If built as proposed, the coral reef community within the project footprint will be permanently lost and ecological functions associated with coral reefs in adjacent areas will either be temporarily or permanently degraded during construction activities. Both long-standing and newly developed Corps and EPA guidance developed under section 404 of the CWA

but still are significant considering that these areas support some areas with very high live coral cover and high fish diversity and biomass.

Indirect Impacts

Indirect impacts to marine resources adjacent to the project footprint are anticipated to occur as a result of construction-related disturbance of the marine environment. These impacts will result primarily from suspension of particulates in the water column during dredge and fill operations, including disturbance of the substrate from the temporary placement of anchors and mooring lines for dredges, barges and other equipment. The indirect project-related impacts to fish and wildlife resources at the site may be significant. The proposed dredge and fill activities will suspend sediment that is highly transitory with water currents and could settle out of the water column and smother corals and other benthic invertebrates over down-stream areas. Coral polyps and larvae are particularly vulnerable to suspended sediment. Suspended sediment in the water column can abrade and lacerate coral larvae and can reduce the viability of larvae through chemical reactions if the larvae come into contact with contaminants carried into surface waters by the sediment. Once particulates settle to the benthos, coral polyps are at risk to similar sub-lethal and lethal impacts. In addition, this mobilized sediment may adversely impact fish and wildlife resources through ingestion or contact if the sediment is contaminated.

An oceanographic study using Environmental Fluid Dynamics Code (EFDC) was undertaken to model the aerial extent and potential range of effects of the sediment plume anticipated to result from wharf construction (SEI 2005). The model may be useful in determining localized water motion and current behavior in the proposed project area. However, the inherent limitations of the model substantially underestimate the probable extent and volume of sediment transfer to nearby benthic environments. (For example: the model does not account for re-suspension of sediments [Rongo 2004]; the model does not account for sediment settling conditions on live substrate such as mucous-covered algae and filter feeding corals and other invertebrates which account for approximately 80 percent of all substrate in the project area [Wolanski et al 2003]; and the model ignores physical-chemical characteristics and dynamics of suspended sediment in the water column, e.g. flocculation and formation of "marine snow" [Wolanksi et al 2004]). These limitations severely restrict the model's predictive value in estimating the proposed project's potential to cause indirect impacts from dredging.

Nevertheless, the EFDC model results derived from input parameters that assume a high rate of suspended material release (4% of total dredged material) under moderate, steady tradewind conditions (7 m/second) was used to provide an indication the aerial extent of potential mobilization of suspended sediment. These estimates indicate that the suspended sediment plume near the sea surface and its associated indirect impacts will extend over a kilometer to the west of the proposed project site, and suggest that the plume may be up to 200 m (656.1 ft) in width (SEI 2005). Given the nature of water movement in Apra Harbor, suspended sediment is modeled to rapidly disperse to background levels upon the cessation of the dredging activity (e.g., within 2 hours). Although EFDC model output is used with

caution here, the approximate aerial extent of indirect impact resulting from sediment deposition and associated suppression of reproductive functions in some marine organisms are used to calculate impacts on a habitat-area basis (Figure 8, Table B).

Overall Impacts

As indicated in Table B, the areas of anticipated direct and indirect impacts for both Alternative 1 and 2 are the same. The habitat type that is anticipated to be most affected by indirect impacts is the reef flat, which may be covered by a sediment plume that extends over 55 ac (22.3 ha) of this habitat type. A total of 17.52 ac (7.1 ha) of reef crest and 8.52 ac (3.4 ha) of reef slope are expected to incur these temporary construction-related impacts, which are anticipated to persist from three to ten years. The effect of these impacts would temporarily reduce the amount of habitat for juvenile reef fish in the reef flat areas and would reduce the amount of live coral in the reef crest and reef slope areas. Also, the normal processes of gamete production, fertilization, and larval settlement would be disrupted during the time that project-related sediments are present in the water column by direct suspension or subsequent re-suspension.

Table B. Impact area and time-to-recovery estimates.

Alternative 1.

Impact	Habitat Type	Duration	Area (ac)
(1) Loss due to wharf dredge/fill.	Reef flat	Permanent	1.39
	Reef crest	Permanent	1.38
	Reef slope	Permanent	2.91
	Deep sand	Permanent	6.50
(2) Loss due to embayment fill.	Reef flat	Permanent	11.64
	Reef crest	Permanent	3.04
	Reef slope	Permanent	1.97
(3) Anchors/mooring line impacts to substrate.	Deep sand	1 year[1]	3.3
(4) Sediment deposition impacts to benthic fauna.	Reef flat	10 years	11.14
	Reef crest	10 years	2.92
	Reef slope	10 years	1.42
	Deep sand	1 years	5.1
(5) Sediment suspension and re-suspension impairment to reproduction and recruitment[2].	Reef flat	3 years	55.7
	Reef crest	3 years	14.6
	Reef slope	3 years	7.1
	Deep sand	3 years	25.5

Alternative 2.

Impact	Habitat Type	Duration	Area (ac)
(1) Loss due to wharf dredge/fill.	Reef flat	Permanent	1.39
	Reef crest	Permanent	1.38
	Reef slope	Permanent	2.91
	Deep sand	Permanent	6.50
(2) Loss due to embayment fill.	Reef flat	Permanent	11.64

volume at the wharf site under Alternative 2 is larger due to the need to excavate a large volume of material to prepare the substrate for the cylindrical sheet piles prior to their placement as wharf supports. As a result, estimates for recovery time resulting from suspended sediment-related impairment to marine life are extended due to the greater volume of material generated and re-suspended over time.

The coral reef community that occurs in the shallow marine environment is the primary habitat of concern at this site. Because of the similarities between the two alternatives, the resources anticipated to be impacted due to construction of the commercial wharf under Alternative 2 are the same as those described for Alternative 1.

As above, the proposed construction activities would result in the direct loss of coral reef habitat and all the environmental and ecological functions and values associated with this area of habitat. Only limited replacement of lost ecological functions of marine resources in the immediate area of the wharf is expected due to the effects of ongoing wharf operations and vessel traffic. Indirect impacts to marine communities in the down-current areas adjacent to the proposed project site will occur, and these communities are expected to fully or mostly recover over time. It is possible that federally listed green and hawksbill sea turtles may be directly or indirectly affected by dredging activities.

Alternative 3

The permanent loss of reef flat, reef crest and reef slope habitat under this alternative is significant. The volume of fill required to create approximately 30 acres (12.1 ha) of fast land for wharf space and container handling and storage is much greater, and will require a longer construction period, than for either Alternative 1 or 2. The mobilization of suspended sediment during the period of construction will also be significant. The area of indirect impact is estimated to be similar to the other alternatives, however, due to the physical size of the wharf structure under Alternative 3 and the associated need for an increased construction period, the duration of the of impacts is projected to be longer. Time to recovery for each habitat type is projected to be similar to the other alternatives.

The coral reef community that occurs in the shallow marine environment is the primary habitat of concern for this alternative. The dominant organisms, functional groups, ecological services and natural resource values associated with the other alternatives also apply to Alternative 3. However, a larger total amount of reef flat habitat would be permanently eliminated under this alternative.

As above, the proposed construction activities would result in the direct loss of coral reef habitat and all of the environmental and ecological functions and values associated with this area of habitat. Only limited replacement of lost ecological services and values of the marine resources in the immediate area of the wharf is anticipated due to the effects of ongoing wharf operations and vessel traffic. Indirect impacts to marine communities in the down-current areas adjacent to the proposed project site will occur, but these communities are expected to

recover fully or mostly over time. It is possible that federally listed green and hawksbill sea turtles may be directly or indirectly affected by dredging activities.

Direct Impacts

Under Alternatives 1 and 2 the proposed project involves construction of the wharf and extensive fill to eliminate the existing artificial embayments to create fast land for container handing and storage space. The areas of anticipated direct impact for both Alternative 1 and 2 are the same (23.22 ac, 9.4 ha), although the volumes of dredge and fill are different (Table A). The anticipated impacts due to Alternative 3 are substantially greater on an area and volume basis.

Table A. Project area estimates, and fill/dredge volumes.

Alternative 1

Location	Area of direct marine impact	Fill (dredge)
Wharf	6.55 ac	(180,621 cy)
Wharf (backland fill)	--	83,524
Site 1	1.17 ac	10,019 cy
Site 2	2.26 ac	24,667 cy
Site 3	13.24 ac	251,066 cy
Total	23.22 ac	188,655 cy

Alternative 2

Location	Area of direct marine impact	Fill (dredge)
Wharf	6.55 ac	(160,000 cy)
Wharf (backland fill)	--	185,000
Site 1	1.17 ac	10,019 cy
Site 2	2.26 ac	24,667 cy
Site 3	13.24 ac	251,066 cy
Total	23.22 ac	310,752 cy

Alternative 3

Location	Direct impact area	Fill
Wharf/container yard	~40 ac	~900,000 cy

Direct losses of marine bottom habitat due to dredge and fill were calculated based on bathymetry and field surveys of habitats in the project area. The largest loss under Alternatives 1 and 2 is to reef flat habitat (13.03 ac, 5.3 ha) which would be permanently lost due to wharf construction and fill to create "backlands." This represents a significant loss of nursery habitat that is currently utilized by juvenile fish, and represents an extensive loss of vegetated shallows that support a variety of macro-algae and seagrass that may be used by sea turtles. Loss of reef crest (4.42 ac, 1.8 ha) and reef slope (4.88 ac, 2.0 ha) are smaller in area

Alternative 4: No Action

Under the No Action Alternative, PAG would not construct a new deep-draft wharf facility nor fill any existing embayments to create additional container yard space at the Apra Commercial Wharf.

PROJECT IMPACTS

Marine communities of tropical islands such as Guam are made up of thousands of plants and animals that form a coral reef ecosystem. The term "coral reef ecosystem," as used in this report, broadly refers to interrelated habitats with a variety of substrates including areas that may be covered either dominantly, or by a mix, of live coral colonies, coralline algae, rubble and sand, macro-algae and seagrass. Coral reefs are unique in that they are massive geologic structures built by living communities and represent one of the most diverse, or species-rich, ecosystems on the planet. Coral polyps deposit calcium carbonate skeletons and grow upward as they continue to deposit new skeletal material from below. Many other organisms including mollusks, crustaceans, calcareous algae, and others also deposit calcareous skeletons or shells on the reef. When corals or these other organisms die, their skeletal remains become part of the reef framework. New corals and other reef-building organisms settle on top of dead ones to continue the overall growth of the reef. Thus, the reef can be viewed as a thick framework of calcium carbonate rock covered with a fragile, thin veneer of life. The reef surface and underlying framework form an important complex of holes, tunnels, and elevated projections that provide a wide range of shelter, foraging, and reproductive habitats for numerous species of fishes, invertebrates, and other organisms.

Construction of wharfs, piers, shoreline revetments, and coastal roads can limit coral reef distribution by alteration of habitat, sedimentation, introduction of contaminants, and degradation of water quality. Dredging and other activities that suspend either marine or terriginous sediments in the water column can destroy coral tissue and entire coral colonies by direct contact. Sediment that becomes suspended may settle on coral polyps and smother them. Prior to settling, suspended sediment may also abrade polyps and planktonic larvae and render them non-viable through physical and chemical pathways.

Alternative 1

A volume of 188,655 yd³ (144,237.1 m³) of material would be filled across a total of 23.22 ac (9.4 ha) to construct the wharf under Alternative 1. This would permanently eliminate marine resources occurring in several marine habitat types, primarily reef flat habitat, within this area. In addition, indirect construction-related impacts would occur. Anticipated indirect impacts were estimated based on calculations associated with typical dredge/fill operation logistics (*e.g.*, mooring line requirements, temporary anchor placement, and sediment suspension/re-suspension). It is assumed that most marine resources subjected to temporary construction-related impacts would recover over time. However, once shipping operations at the new wharf begin, the recovery of resources will be slowed or prevented as a result of

repeated turbulent water motion due to large propeller wash and stormwater runoff from newly paved surfaces. These events will resuspend harbor bottom sediment, which will continuously cover and abrade coral polyps and other fragile sessile life forms and reduce photosythesis due to shading. Propeller wash will resuspend harbor bottom contaminants and stormwater runoff will introduce wharf-based sources of contaminants into surface waters which can chemically alter and reduce the viability of coral and other larvae.

The coral reef community that occurs in the shallow marine environment is the primary habitat of concern at the proposed project site. Based upon field survey results described above and information gathered from literature sources, the habitats that may be impacted are: *reef flats*, which are characterized by sand, rubble, macro-algae and scattered stands of seagrass. These shallow areas function to provide nursery areas for juvenile reef fish such as wrasses, parrotfish, surgeonfish and others; *reef crest* habitat, which is characterized by boulders, rubble and sand on a calcareous reef matrix, with ample macro-algae cover and low to moderate amounts of live coral. This habitat type provides habitat for a diverse fish community within the project area (57 species); *reef slopes*, which are characterized by a mix of boulder, rubble and sand, variable algal coverage, and with some areas of very high live coral coverage (mean = 20%, max = 81%). Reef slope areas represent a habitat type that attracts the greatest numbers, highest biomass, and most diverse fish community. Fish seen throughout this habitat type in the project area include species such as rabbitfish (Siganidae) that are culturally important, and fish such as jacks (Carangidae) that are recreationally and commercially important; and *deep sand* or harbor bottom habitat, which consist of large expanses of flat or gently sloping sand and silt and have scattered outcrops of live coral and rubble/boulder substrate. Deep sand areas contain a burrowing infauna (worms, crustaceans, other invertebrate groups) that supports a large forage base for selective and generalist predators (eg, goatfish [Mullidae]), which diurnally occupy the reef crest/reef slope areas and nocturnally move to adjacent deep sand habitats to forage over sand.

Over the 23.22 ac upon which the wharf will be constructed, all of the existing ecological functions and values associated with this area will be permanently lost as a direct impact of construction. A small amount of dredged deep sand habitat immediately fronting the wharf would remain and is anticipated to recover, but only limited replacement of ecological functions is anticipated in this area because of ongoing impacts due to wharf operations and vessel traffic (stormwater run-off, re-suspension of sediment etc). In addition, the pilings that will be placed for wharf support are expected to provide a limited amount of habitat for some fish, corals and other invertebrates. Indirect impacts to marine communities in the down-current areas adjacent to the proposed project site will occur. However, these communities are expected to fully or mostly recover over time. It is possible that federally listed green and hawksbill sea turtles could be directly or indirectly affected by dredging activities.

Alternative 2

A volume of 310,752 yd³ (237,587.0 m³) of material will be filled across an area of 23.22 ac (9.4 ha) under Alternative 2. The project footprint is the same as it is for Alternative 1 and the direct permanent loss of marine habitat is the same on an area basis. However, the dredge

that would be required for all three reclamation areas is approximately 285,762 yd³ (218,480.7 m³).

The total volume of dredge spoil excavated as part of the proposed project would be approximately 180,621 yd³ (138,094.7 m³). Of this total, approximately 83,524 yd³ (63,858.7 m³) would be used for wharf construction purposes. The remaining 97,097 yd³ (74,236.0 m³) of dredge spoil would be used as fill and placed directly into the three adjacent land reclamation areas. In addition to the dredge spoil obtained from the proposed project, 188,665 yd³ (144,244.7 m³) of fill would need to be obtained from another source or sources in order to complete construction of the proposed reclamation areas.

Alternative 2: Cellular Sheet Pile Deep-Draft Wharf and Land Reclamation

Under this alternative, the deep-draft wharf facility would be designed differently from that in Alternative 1. Other project features, such as the size and configuration of the land reclamation portion of the project would remain the same as Alternative 1.

Alternative 2 involves construction of a deep-draft wharf consisting of a concrete deck cast on top of a filled cellular sheet pile (caisson) foundation. The proposed wharf would be approximately 1,526 ft (465.1 m) in length and 230 ft (70.1 m) in width, providing an overall wharf deck area of approximately 345,000 ft² (7.9 ac, 3.2 ha). These dimensions include a 118-ft-wide concrete deck on a bulkhead wall consisting of fifteen 82-ft-diameter (25.0 m) caisson cells and 14 interconnecting arcs. The circular cells and interconnecting arcs would be constructed from steel sheet piles and would be filled with approximately 315,470 yd³ (241,194.1 m³) of densely packed gravel.

Like the preferred alternative, the main operational objective of the proposed wharf would be to accommodate deep-draft vessels and the final dredge elevation along the entire wharf face would need to be 55 ft (16.8 m) in depth. Similarly, dredging of the seabed along the face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required navigational depth. Dredging methods under this alternative would be the same as those proposed under the preferred alternative. The estimated total in-situ area that would require dredging would be approximately 285,146 ft² (6.5 ac, 2.6 ha). Of this amount, 168,487 ft² (3.9 ac, 1.5 ha) would be seaward of the wharf face and 116,659 ft² (2.7 ac, 1.1 ha) would be beneath the wharf structure.

For Alternative 2, the total volume material that would be dredged is greater than that for the preferred alternative, because Alternative 2 would involve dredging the full 82-ft-diameter of each cellular sheet pile in order to provide a level surface for placement of the sheet pile cell structure. Additionally, the dredge depth underneath the wharf would need to be 70 ft (21.3 m) in order to accommodate the bases of the proposed cellular sheet piles. The estimated total volume of material to be dredged under this alternative would be approximately 160,000 yd³ (122,328.8 m³). Approximately, 185,000 yd³ (141,442.7 m³) excavated dredge material would be required to backfill over the reef and reef flat between the landward edge of the new wharf and the existing shoreline. Therefore, approximately 25,000 yd³ (19,113.9 m³) of

additional fill material would be required from other sources. The aerial extent, design, and construction elements for the proposed marine fill component for Alternative 2 are identical to those proposed for the preferred alternative described above.

Alternative 3: Golf Pier/Southwest Point Fixed Pier

This alternative involves the construction of a fixed pier and backland support areas in the same general location as alternatives 1 and 2. However, this Alternative 3 would encompass a significantly different spatial footprint. This alternative would be located in the area between Outhouse Beach to the west of Golf Pier and the northern shoreline of Southwest Point and would result in construction of wharf facilities capable of accommodating deep-draft vessels along a 1,522 ft-long pier face. Under Alternative 3, a fixed pier and backland areas would be created by filling approximately 40 ac (16.2 ha) between Golf Pier and Southwest Point. The design for this alternative differs markedly from the designs for alternatives 1 and 2 in that it includes a fixed pier with contiguous operational backland areas. Planning for this alternative is only in the conceptual stages and specific design and engineering details have not yet been developed. However this alternative will be considered for further analysis.

The main feature of Alternative 3 involves the filling of approximately 900,000 yd³ (688,099.4 m³) of reef flat, reef crest, and reef slope habitat along the eastern end of Cabras Island to create approximately 30 ac (12.1 ha) of operational backland directly behind the proposed fixed-pier structure. Construction of a fixed-pier structure would result in suitable deep-draft wharf space along the pier's northern portion.

The proposed layout of the deep draft wharf and filled reclamation area under Alternative 3 would facilitate efficient container yard operations. The proximity and size of the proposed container storage area directly adjacent to the proposed wharf would more easily allow the use of traditional container handling equipment. In addition, the layout would eliminate double handling of containers since they would generally not have to be moved over large distances to be stored. Minimization of double handling of containers would aid in keeping operational costs down to maintain cost-competitive advantages gained by accommodating post-panamax vessels. Like Alternatives 1 and 2, three large container cranes would be located at the pier.

Though navigational dredge volumes for this alternative have not been quantified, based upon a qualitative evaluation, dredge volumes are anticipated to be "moderate" because the proposed pier design would be built out to required navigational depths. However, the fill material requirements for this alternative are anticipated to be "very substantial."

Therefore, of all the alternatives under consideration, this alternative would the least desirable due to the large project footprint and the enormous amounts of fill material that would be required to construct the wharf facility and container handling and storage areas.

projections for the population of Guam, including the planned redeployment of a large contingent of U.S. Marine Corps personnel from Okinawa, the existing commercial dock will eventually exceed its capacity to efficiently accommodate projected cargo ship activity. This situation is expected to worsen over time and will incrementally result in economic burdens and operational inefficiencies due to the worldwide shift to post-panamax sized ships operating in the Pacific.

Without the project, marine resources within and adjacent to the proposed project area will remain unimpacted by wharf expansion, however, increasing traffic at the existing commercial dock will contribute to increased vessel congestion and create an environment where the risk direct coral reef damage from vessel collisions and groundings may increase. Vessel collisions or groundings on coral reefs may result in the release of petroleum products into the harbor, posing a serious contamination threat to federal trust resources. The extended residence time for released petroleum products within Apra Harbor would contribute to an elevated risk of significant negative affects to federal trust resources.

DESCRIPTION OF ALTERNATIVES EVALUATED

In May and June 2006, the Corps provided the following descriptions of the wharf expansion alternatives that had been developed and selected for analysis.

Alternative 1: Pier-on-Piles Deep-Draft Wharf and Land Reclamation (Preferred Alternative)

This alternative includes construction of a wharf that would be 1,512 ft (460.9 m) in length and 215 ft (65.5 m) in width, providing approximately 325,000 ft² (7.5 ac, 3.0 ha) of deck area. The landward 102 ft (31.1 m) of wharf width would be constructed on a fill base and the seaward 113 ft (34.4 m) would be constructed over water on 24-in octagonal pre-cast concrete pilings. These pilings would be spaced 24 ft (7.3 m) apart in the longitudinal direction and 16 ft 8 in apart in the transverse direction. Pilings supporting two rail girders on the concrete deck would be spaced at half the spacing (*i.e.*, 12 ft [3.7 m] apart).

Water depths at the outer face of the proposed wharf would vary between 14 ft (4.3 m) and 55 ft (16.8 m), at the most seaward row of pilings and along the entire wharf face where deep-draft vessels would be accommodated. Dredging of the seabed along the wharf face and directly beneath the proposed wharf would be required to deepen the existing sea floor to the required navigational depth of 55 ft (16.8 m). Dredging would be accomplished by cutting into the existing sea bed beneath the wharf at a slope of 1.75 horizontal to 1 vertical. This slope would be covered by a 4-ft (1.23-m) thick layer of rip-rap. Longitudinal and transverse girders would be constructed to provide continuous piling caps. These girders would each be 3 ft (0.91 m) wide and have a total depth of 3 ft 10 in (1.17 m). A 16-in (0.41 m) thick concrete slab would be cast on top of the girders.

Two rail girders would run along the length of the concrete slab on its landward (inboard rail girder) and seaward (outboard rail girder) sides. Behind the inboard rail girder a sheet pile

cut-off wall would be installed to retain the backfill needed to support the upland fill area. The sheet pile tip elevation and structural section would vary along the length of the wharf, to accommodate the existing bathymetry. Crushed rock fill would be placed behind the cut-off wall over a distance of approximately 10 ft (3.04 m). Dredge material would be placed behind the crushed rock fill extending to the existing shoreline. The dredge material fill would be overlain by a sub-base and asphalt layer to comprise the backland area of the wharf.

The rail girders would house crane rails that would extend an approximate distance of 1,400 ft (426.7 m). Three gantry cranes would operate from these rails to offload containers from cargo vessels. The proposed wharf facility would also include roadway and utility improvements, including potable water, sanitary sewer, and electrical services.

The total area that would require dredging is approximately 285,146 ft² (6.5 ac, 2.6 ha). Of this area, 168,487 ft² (3.9 ac, 1.6 ha) would be seaward of the wharf face and 116,659 ft² (2.7 ac, 1.1 ha) would be beneath the wharf structure to be dredged to the required slope and depth characteristics. The total volume of dredge material excavated would be approximately 180,621 cubic yards (yd³) (138,094.7 cubic meters [m³]). Approximately, 83,524 yd³ (63,858.7 m³) of this excavated dredge material would be used to backfill the undersea portion between the wharf's landside sheet pile cut-off wall and the existing shoreline. The remaining 97,097 yd³ (74,235.0 m³) of dredge spoil would be used as fill material for the proposed land reclamation to the east of the proposed deep-draft wharf structure. Although the PAG currently has no specific development plans for the three reclamation sites, they would be used as additional container yard space in support of the proposed adjacent deep-draft wharf facility.

Fill area 1 would be directly to the east of the proposed deep-draft wharf and would have an approximate area of 1.17 ac (0.47 ha). Fill area 2 would be east of Golf Pier and would have an area of approximately 2.26 ac (0.91 ha). Fill area 3 would be east of the old Seaplane Ramp and would be the largest of the three fill areas comprising approximately 13.24 ac (5.36 ha). The total size of all three areas combined would be approximately 16.67 ac (6.746 ha). The fill in these areas (Figure 2) would be placed behind dikes and constructed to have a seaward 2:1 horizontal-to-vertical slope with revetments provided by two layers of rip-rap armor stone or concrete cubes.

The dike at fill area 1 would have a crest (top) elevation of 11 ft (3.4 m) above Mean Sea Level (MSL) and bottom elevations of 4 to 7 ft (1.2 to 2.1 m) in depth. The dike at fill area 2 would also have a crest elevation of 11 ft (3.4 m) above MSL but would have bottom elevations of 4 to 5 ft (1.2 to 1.5 m) in depth. The dike at fill area 3 would be the largest of the three with a crest elevation of 13 ft (4.0 m) above MSL and a bottom elevation of 25 ft (7.6 m) in depth. Water depths at fill areas 1 and 2 are in the 6-7 ft (1.8-2.1 m) depth range. The volume of fill material required for fill area 1 is 10,019 yd³ (7,660.1 m³), and the amount of material required for fill area 2 is 24,677 yd³ (18,867.0 m³). Water depths at fill area 3 range from 6 ft (1.8 m) to 25 ft (7.6 m) in depth. The amount of material that would be required for fill area 3 alone is 251,066 yd³ (191,953.7 m³), and the total amount of material

sp) and the sessile oyster *C. pacifica* was observed in reef crevices. The high density of filter-feeding organisms at this station suggests a low-energy, poorly flushed environment.

Reef Fishes

Fifty-nine species of reef fish from 18 families were encountered at this station (Shannon diversity $H' = 2.90$; Table 4, Figure 6). The parrotfish *C. sordidus* and the damselfishes *A. curacao* and *Abudefduf sexfasciatus* were the most numerically abundant species observed. Together, these species accounted for 40 percent of all fish observations. The parrotfishes *C. sordidus* and *S. psittacus* together were the largest contributors to the estimate of biomass and made op 45.5 percent of the standing stock estimate at this station. The numerical observations and biomass estimates at this station indicate a fish community represented by herbivores and generalist invertebrate predators.

Station 8

Substrate

This station was located between the seaplane ramp and Mobile fuel pier at a depth of 17 ft (5.18 m) (Figure 2). The bottom composition at this station consisted of macro-algae (62%), hard corals (22.5%), rubble (7.3%), sand (4.3%), macro-invertebrates(1%), and soft corals, primarily *Similaria* sp, which were present in very small areas (0.5%) (Table 1, Figures 3 and 7).

Algae

Most of the macro-algae present at this station included the green alga *Halimeda* sp, the brown algae *P. boryana* and *P. jonesii*, and an unidentified slime-forming blue green alga. Turf algae were present in small amounts at this station (Table 1, Figures 3 and 7).

Corals

One-hundred-fifty-three hard corals representing 9 species were observed within four 10-m^2 transects along topographically complex (rugosity = 1.48 ± 0.04 S.E.) lower reef slope at 5.8 m depth (Table 2, Figure 7). Five additional hard coral species (*Astreopora gracilis, L. corymbosa, L. hemprichii, P. damicornis*, and *P. nierstraszi*) were observed but did not occur within areas transected. The Shannon index of diversity was 1.42 (equability = 0.65) based on mean colony numbers. Colony densities were dominated by *P. lobata* and *P. rus* (Table 2). Thirty-two percent of colonies were ≥20 cm in greatest diameter, and 29 percent <5 cm. Colonies exceeding 80 cm diameter were observed for *P. rus*. Size trends varied among commonly occurring species (Figure 4). Fragmentation was only observed in *P. rus* (16% ± 7 S.E.). Recent visible recruit densities were low and appeared mainly of larval origin (Table 2). Approximately 5 percent of large colonies (2.7 ± 1.6 S.E. of all colonies) were completely parted by fission. Complete fission was only observed in *P. lobata* and *P. rus*. Size, density

and rugosity data suggest high habitat complexity with potential coral reproductive source capacity for *P. lobata* and *P. rus* species.

Macro-invertebrates

Twenty-six species from 20 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The ascidians *P. julinea, Polycarpa* sp, *R. circula*, and *R. crassa* were observed attached to vertical reef surfaces and were among the most numerically abundant macro-invertebrates at this site. Other macro-invertebrates observed were the mobile finger conch snail *Lambis lambis*, the sessile oyster *Chama* sp, the mobile snail *S. luhuanus* and the sea cucumber *E. godeffroyi*.

Reef Fishes

Fifty-eight fish species from 18 families were seen at this station (Shannon diversity $H' = 2.70$; Table 4, Figure 6). Schools of the small damselfish *A. curacao* and *P. vaiuli* were numerous at this station and accounted for 41.7 percent of all fish observed. At this station, two herbivores, the surgeonfish *A. nigrofuscus* and the parrotfish *C. sordidus*, made up 28.7 percent of the biomass estimate, and two generalist predators, the soldierfish (family Holocentridae) *Myripristis berndti* and the wrasse *C. fasciatus*, contributed an additional 26.4 percent to the standing stock estimate.

Sea Turtles

Areas within Apra Harbor but outside the immediate project area have long been used by sea turtles for foraging and resting. Green sea turtle nesting activity has been observed on a beach near Orote peninsula (Tibbatts 2001), and hawksbill sea turtle nesting within Apra Harbor has occurred in Sumay Cove. At least three species of algae and a blue green alga identified as green sea turtle forage (Balazs 1980, Forbes 1996, Hirth 1997, Uzcategui et al. 2005) were identified at the proposed project site (Table 1). Seagrass at the site may also be utilized by sea turtles (Hirth 1997, Mendonca 1983, Russell 2003). Various invertebrate and algal taxa observed in the proposed project area, including sponges, coelenterates, bryozoans, mollusks, urochodates, algae such as *Codium*, and seagrass, have been documented as hawksbill forage (Witzell 1983).

Future Without the Project

Apra Harbor is an important receiving and transshipment site for consumer goods and fuel to support the Territory of Guam's increasing population. The southern shoreline of the harbor is the U.S. Navy's most active port of operations in the western Pacific. The existing commercial wharf facility located on the northern side of Apra Harbor services container ships from ports throughout the Pacific basin and is a regular docking facility for various sizes of smaller, regional cargo ships and a modest number of fishing vessels. Due to growth

present in the general area. Other less common algae included blue-green algae, brown algae, and red coralline algae (Table 1, Figures 3 and 7).

Corals

A total 284 hard corals (11 species) were recorded within four 10-m^2 transects (Table 2, Figure 7). Three additional coral species (*A. myriophthalma*, *D. heliopora*, and *Fungia fungites*) were observed. The Shannon index of diversity was 1.06 (equability = 0.44) based on mean colony numbers. Colony densities were dominated by *P. rus*, followed by *P. lobata* and *P. cylindrica* (Table 2, Figure 4). Forty-two percent of colonies were >20 cm in greatest diameter, and 17 percent had diameters of <5 cm. Size trends were fairly similar for commonly encountered species (Figure 4-1). Large colonies defined the general habitat perspective and influenced transect density measurements (9.1% of colonies were greater than 80 cm greatest diameter; 3% greater than 160 cm). Thirty-four percent (± 19 S.E.) of *P. cylindrica* and 36% (± 20 S.E.) of *P. rus* were identified as unattached fragments, suggesting a potentially important role for fragmentation in the population dynamics of these species in this area. Visual sexual recruit densities appeared to be relatively low (which in this area may indicate limited settlement substrate availability) and were exceeded by fragment numbers in *P. rus* (Table 2). Two percent of large colonies (1.3 % ± 1.3 S.E. of all colonies) were completely parted by fission. Complete fission appeared limited to lobate *Porites* species. Size, density and rugosity data suggest high coral habitat complexity and reproductive potential, particularly for species of *Porites*, in this area.

Macro-invertbrates

Thirty-eight species from 28 families of non-coral macro-invertebrates were recorded at this station (Table 3a). Typical of the reef slope stations, ascidians were the most abundant species represented primarily by *Polycarpa* sp and *R. circula*, which had colonized several small boulders. The sessile oysters *C. pacifica*, *Chama* sp, and *Chlamys* sp were observed attached on top of small boulders, and the secretive urchin *H. mammillatus* was relatively rare and observed in a reef crevice.

Reef Fishes

Fifty-one species of reef fish from 17 families were observed at this station (Shannon diversity $H' = 2.35$, Table 4, Figure 6). The damselfish *A. curacao*, the blenny *M. atrodorsalis*, and the snapper (family Lutjanidae) *Lutjanus fulvus* were the three most numerically abundant species, accounting for 58.7 percent of all observations. The most important contributors to the biomass estimate were the snapper *L. fulvus*, the surgeonfish *A. nigrofuscus*, and the wrasse *C. fasciatus*, which made up 45.5 percent of the standing stock of fish present. Only one of these fish is an herbivore, suggesting a fish community that is primarily composed of generalist invertebrate predators and piscivores.

Station7

Substrate

This station was located between the seaplane ramp and Exxon fuel pier across topographically complex (rugosity = 1.60 ± 0.05 S.E.) coral reef slope habitat at a depth of 18 ft (5.49 m) (Figure 2). Hard corals contributed 40.8 percent of the substrate coverage at this station, the second highest contribution by this category recorded at all stations. Macro-algae (26.3%) were relatively wide-spread, and sand (12.8%), turf algae (9.3%), rubble (6.8%), boulders (3.3%), and non-coral macro-invertebrates (1.0%) were lesser contributors (Table 1, Figures 3 and 7).

Algae

Macro-algae composition at this station was primarily represented by the green alga *Halimeda* sp and brown algae, including *P. boryana* and *P. jonesii*. An unidentified slime-forming blue-green alga provided the remainder of the macro-algal composition (Table 1, Figure 3 and 7).

Corals

Four-hundred-sixty-two hard corals (11 species) and 22 soft corals (*Sinularia* sp.) were observed within four 10-m^2 transects (Table 2, Figure 7). Five additional coral species (*P. damicornis*, *Leptoria phrygia*, *Pavona cactus*, *Psammocora nierstraszi* and *Montipora* sp) and a blue coral (*H. coerula*) were observed in the area but did not occur along transects. The Shannon index of diversity was 1.56 (equability = 0.63) based on mean colony numbers. Overall colony densities were high, dominated by *P. rus*, followed by *P. lutea* and *P. lobata* (Table 2). Thirty-nine percent of colonies were ≥20 cm in greatest diameter (3% ≥80 cm) and 22 percent were <5 cm. Size trends varied among commonly encountered species (Figure 4). Thirty-five percent (± 7% S.E.) of *P. rus* were observed as unattached fragments, suggesting a potentially important role for fragmentation in the population dynamics of this species in this area. Recent recruit densities were high and appeared mainly of larval origin (with the exception of *P. rus* for which fragment densities exceeded recruit densities; Table 2). Five percent of large colonies (2.8% ± 1.1 S.E. of all colonies) were completely parted by fission. The proportion of fission-affected colonies relative to total colony numbers appeared highest for *P. lobata*. High proportions of fission were also observed in *Lobophyllia hemprichii* and *Porites* sp, but their overall colony numbers were low (Table 2). Size, density, recruitment and rugosity data suggest high coral habitat complexity, reproductive potential, and functional population dynamics in this *Porites*-dominated area.

Macro-invertebrates

Twenty-three species from 19 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The ascidians *P. julinea*, *Polycarpa* sp, *R. circula*, and *R. crassa*, which were observed in reef crevices and attached to small boulders, were the dominant macro-invertebrates. The sea cucumber *B. argus* was observed on a patch of green algae (*Halimeda*

in small crevices (Table 3b, Figure X). The sessile oysters *C. pacific* and *Chama* sp were less abundant and seen attached to small boulders. The mobile sea cucumber *B. argus*, which was relatively rare, was observed foraging on the reef.

Reef Fishes

Fifty five fish species in 20 families were observed at this station (Shannon diversity $H' = 2.58$, Table 4, Figure 6). The most frequently observed species were *A. curacao*, a schooling damselfish, and *M. atrodorsalis*, a small and common blenny. These two species accounted for 57.7 percent of all fish observations. The three most important contributors to the fish biomass estimate for this station were the surgeonfish *A. nigrofuscus*, and the parrotfishes *C. sordidus* and *S. psittacus*, which together accounted for 61.5 percent of the standing stock estimate. Numerical observations and biomass estimates suggest a fish community composed primarily of larger-bodied herbivores and small generalist invertebrate predators.

Station 3

Substrate

This station was located between Outhouse Beach and Hotel Wharf at a depth of 14 ft (4.57 m) (Figure 2). The substrate at this station was topographically complex (rugosity = 1.37 ± 0.01 S.E.) and was dominated by macro-algae (69.3%), more so than any other reef slope station. Turf algae (11.5%), hard corals (9.0%) sand (8.3%), non-coral macro-invertebrates (1.3%), and rubble (0.8%) made lesser contributions to substrate cover (Table 1, Figures 3 and 7).

Algae

The macro-algal composition was dominated by the brown algae *P. boryana* and *P. jonesii*, which together contributed 56.75% of total substrate cover at the station. Other less common algae included green algae, especially *Halimeda* sp, brown algae including *D. bartayresii*, red coralline algae, and blue-green algae (Table 1, Figures 3 and 7).

Corals

One-hundred-forty-six hard corals (8 species) and 21 soft corals (*Sinularia* sp) were recorded within four 10-m^2 transects (Table 2, Figure 7). No additional coral species were noted in the immediate area. The Shannon index of diversity was 1.64 (equability = 0.75) based on mean colony numbers. Colony densities were dominated by *P. rus*, *P. lobata* and *P. lutea*. Variability was relatively high among transects and species. Forty-three percent of colonies were >20 cm in greatest diameter, with 14 percent <5 cm. Size trends were similar among commonly encountered species (Figure 4). Twenty-nine percent (±9 S.E.) of *P. rus* colonies were identified as unattached fragments (which exceeded recent visible sexual recruit densities), suggesting a potentially important role for fragmentation in the population

dynamics of this species in this area. Recent sexual recruitment appeared low. Six percent of large colonies (3.5 ± 1.2 S.E. of all colonies) were completely parted by fission. Size, density and rugosity data suggest relatively high habitat complexity and reproductive potential for *P. rus*, *P. lutea*, *P. lobata* and *Sinularia* sp in the area.

Macro-invertbrates

Thirty-four species from 21 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The most abundant macro-invertebrates were the ascidians *P. julinea*, *Polycarpa* sp, and *R. circula*, which were attached to many small boulders. The sessile oyster *C. pacifica* was observed attached to several small boulders. Several new recruits of the mobile snail *S. luhuanus* suggested good reproductive capacity for mollusks at this station. The boring urchin *Echinostrephus acciculatus* was observed in low numbers on the reef substrate and the sea cucumber *B. argus* was relatively rare and observed foraging on a sand patch.

Reef Fishes

Fifty-seven species of reef fish from 19 families were found at this station (Shannon diversity $H' = 2.87$, Table 4, Figure 6). Four species accounted for 48.4 percent of all fish observed, and these were the damselfish *A. curacao*, the blenny *M. atrodorsalis*, and the parrotfishes *S. psittacus* and *C. sordidus*. Of these, *S. psittacus* and *C. sordidus* contributed 50.2 percent of the biomass estimate. These numerical observations and biomass estimates indicate a fish community primarily composed of robust-bodied herbivores and smaller invertebrate predators.

Station 5

Substrate

This station was located north of the Exxon fuel pier across a topographically complex (rugosity = 1.55 ± 0.09 S.E.) upper coral reef slope at a depth of 20 ft (6.1 m) (Figure 2). Hard corals made up 81 percent of the substrate observations at this site, by far the largest of any station surveyed. This was primarily due to large colonies of corals in the genus *Porites* (see below). Other contributions to substrate cover were provided by macro-algae (8.0%), turf algae (7.3%), rubble (2.5%), and non-coral macro-invertebrates (1.3%) (Table 1, Figures 3 and 7).

Algae

The relatively small amount of macro-algae at this station was primarily represented by the green alga *Halimeda* sp. The brown alga *P. boryana* and *P. jonesii* were not encountered within any of the quadrat placements at this station, although these species were sparsely

(45%), turf algae (14.8%), sand (6%), hard coral (9%), other macro-invertebrates (2.5%) and rubble (0.8%) (Table 1, Figure 3 and 7).

Algae

The macro-algal composition at this station consisted primarily of *P. boryana* and *P. jonesii* (26.5%) and an unidentified blue-green alga, which formed a low-growing slime over much of the substrate. The brown alga *Turbinaria ornata* was present but in lesser amounts (Table 1, Figure 3 and 7).

Corals

Thirty hard corals (5 species), 75 soft corals (*Sinularia* sp) and one blue coral (*H. coerulea*) were observed within four 10-m^2 transects (Table 2, Figure 7). Four additional hard coral species (*L. corymbosa*, *P. varians*, *P. sinensis* and *P. cylindrica*) were noted in the area. Diversity was low (Shannon index = 1.01, equability = 0.52). Mean colony numbers were dominated by a large stand of *Sinularia* sp that occurred along a single transect (Table 2, Figure 4). Forty-one percent of colonies were ≥20 cm in diameter and 9 percent were <5 cm. Recent visible recruitment appeared low. No live fragments were observed (Table 2). Complete fission was identified in the single observed colony of *H. coerulea*. Size, density, recruitment and rugosity data suggest high reproductive potential for the large single stand of *Sinularia* sp, but low reproductive and recovery capacity for hard corals in this area. This station was selected for potential monitoring of sediment impacts.

Macro-invertebrates

Thirty-one species from 23 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The ascidians *P. julinea*, *Polycarpa* sp, *R. circula*, and *R. crassa* were observed to occupy vertical spaces between small boulders and coral colonies and were the most numerous non-coral macro-invertebrates. The sea cucumbers *B. argus*, *B. vitiensis*, and *B. paradaxa* were observed throughout the area. A large adult octopus *Octopus cyanea* was observed in a large cave. Other observations of macro-invertebrates included the sessile oysters *Chama* sp and *Chlamys* sp, the mobile snail *S. luhuanus*, and the boring urchin *Echinometra mathaei*.

Reef Fishes

Fifty-eight species of reef fish from 19 families were observed at this station (Shannon diversity $H' = 2.06$, Table 4, Figure 6). The damselfish *A. curacao* and the parrotfish *C. sordidus* accounted for 64.1 percent of all fish observed. The parrotfish *C. sordidus* alone accounted for 37.8 percent of the biomass estimate. Other fish that contributed significantly to the standing stock estimate either due to their large size or numbers were the butterflyfish *C. ulietensis*, the surgeonfish *A. nigrofuscus* and the small pufferfish (family Tetraodontidae) *Canthigaster solandri*. Observations at this station indicate a fish community composed of a mix of both herbivores and generalist invertebrate predators.

Reef Slope Habitat (Station 1, 3, 5, 7, 8)

Station 1

Substrate

This station was located off of Outhouse Beach at a depth of 14 ft (4.27 m) (Figure 2). The topography at this station was fairly complex (rugosity = 1.33 ± 0.06 S.E.) and dominated by macro-algae (63.0%). Lesser contributions to substrate cover were made by turf algae (12.8%), hard corals (9%), sand (8.3%), rubble (3.8%), macro-invertebrates (2.5%), soft coral (0.5%), and boulders (0.3%). (Table 1, Figures 3 and 7).

Algae

Macro-algal composition was dominated by the brown algae *P. boryana* and *P. jonesii*, which together contributed 56.75 percent of the total substrate cover. Among all stations, this was the highest coverage contributed by these two species recorded during this investigation. Other, less common algae included the green alga *Halimeda* sp, the brown alga *D. bartayresii*, and relatively rarer green and red algae (Table 1, Figure 3 and 7).

Corals

One-hundred-sixty-three hard coral colonies (9 species) were recorded within four 10-m^2 transects at this station (Table 2, Figure 7). Two additional coral species (*A. myriophthalma* and *P. damicornis*) and the blue coral *H. coerulea* were noted in the area. No species regionally considered rare were observed. The Shannon index of diversity was 1.52 (equability = 0.69) based on mean colony numbers. Colony densities were dominated by *P. lobata*, *P. rus*, and *P. lutea*. Variability was relatively high among transects and species. Sixty-nine percent of colonies were <20 cm in greatest diameter, with 31 percent <5 cm. Size trends were fairly similar among commonly encountered species (Figure 4). Five percent (± 5 S.E.) of *P. rus* colonies were identified as unattached fragments. The majority of recent recruitment appeared to have resulted from larval settlement and was low. Twenty-one percent of large colonies (10.9 ± 2.4 S.E. of all colonies) were completely parted by fission. Fission was proportionately high in *P. cylindrica*, *P. rus* and *P. lobata* (Table 2). Size, density and rugosity data suggest limited coral reproductive potential and habitat complexity in this area. However, neighboring habitats (silt bench with widely distributed coral-sponge outcrops offshore and algae covered reef flat inshore) likely increase relative habitat value. The area appears to be heavily utilized by local businesses for dive class instruction.

Macro-invertbrates

Twenty-one species from 17 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The most abundant macro-invertebrates were the ascidians *Polycarpa* sp., *P. julinea*, *R. circula*, and *R. crassa*, which were observed in reef crevices and among macro-algae (*e.g.*, *Halimeda*). The mobile snails *Fulvia australis* and *Cypraea talpa* were observed

Macro-invertebrates

Thirty-three species from 23 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The most common macro-invertebrates at this station were the ascidians *P. julinea*, *Polycarpa* sp, *R. circula*, and *R. crassa*, which were observed to occupy reef crevices and overhangs, in and among a variety of other filter-feeding organisms. The sea cucumber *B. vitiensis* was observed in a patch of brown algae and the sea cucumber *E. godeffroyi* was observed foraging in rubble. Other less common macro-invertebrates observed at this station were the sessile oyster *Chama* sp, the mobile snail *S. luhuanus*, and an *Octopus* sp.

Reef Fishes

Fifty-six fish species representing 15 families were recorded at this station (Shannon diversity $H' = 2.14$, Table 4, Figure 6). The parrotfish *C. sordidus* was by far the most commonly observed fish. This species alone made up 46.1 percent of all fish observations and contributed 65.1 percent to the estimate of total fish biomass. Other frequently seen fish at this station included the blenny (family Blenidae) *Meiacanthus atrodorsalis*, the parrotfish *S. psittacus*, the damselfish *Pomacentrus vaiuli* and the surgeonfish *C. strigosus*, which accounted for 28.5 percent of the total fish observations. The wrasse (family Labridae) *Cheilinus fasciatus*, the surgeonfish *A. nigrofuscus*, the parrotfish *S. psittacus* and the butterflyfish (family Chaetodontidae) *Chaetodon trifascialis* together contributed 22.5 percent of the standing stock estimate of total biomass. This station was clearly dominated by robust-bodied herbivorous fish.

Station 10

Substrate

This station was located between the seaplane ramp and Mobile fuel pier along mainly algae covered reef flat with low topographic complexity (rugosity = 1.22 ± 0.03 S.E.) a depth of 8 ft (2.44 m) (Figure 2). Substrate cover at this station was provided primarily by macro-algae (55.3%), with lesser contributions from turf algae (22.5%), sand (11.8%), coral (6.3%), other macro-invertebrates (3%) and rubble (1.3%) (Table 1, Figure 3 and 7).

Algae

The macro-algal composition at this station consisted mainly of *P. boryana* and *P. jonesii* (49.75%). Other less common algae included the red alga *T. cylindrical* and red coralline algae (Table 1, Figure 3 and 7).

Corals

One-hundred-ten hard corals (7 species) and one soft coral (*Sinularia* sp) were observed on four 10-m^2 transects (Table 2, Figures 1, 4-a, 4-b). *Millepora* sp was also observed in the area. The Shannon index of diversity was 1.35 (equability = 0.65) based on mean colony numbers. Colony densities were dominated by *P. lutea*. Eighty percent of colonies were <20 cm in greatest diameter, with 36 percent <5 cm. Size trends varied among commonly encountered species (Figure 4). Recruitment was low and appeared to be of larval origin. No live unattached fragments were observed along transects. Approximately 19 percent of large colonies (8.4% ± 3.1 S.E. of all colonies) were completely parted by fission. Fission was only observed in *P. lutea* and *P. rus* (Table 2). Size, density and rugosity data suggest coral habitat complexity and reproductive potential are relatively low in this area.

Macro-invertebrates

Thirty species from 26 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The ascidians *P. julnea*, *Polycarpa* sp, *R. circula* and *R. crassa* were the most numerous macro-invertebrates and were observed to occupy reef crevices and overhangs. The sea cucumbers *B. argus* and *B. vitiensis* were observed foraging on hard reef and sand habitats. Other macro-invertebrates observed at this station were the mobile top-shell snail *Trochus niloticus*, the sessile oyster *Chama* sp, and the mobile snails *C. flavidus* and *S. luhuanus*.

Reef Fishes

Sixty species of reef fish from 17 families were recorded at this station (Shannon diversity $H' = 2.21$, Table 4, Figure 6). The damselfish *Amblyglyphidodon curacoa*, the blenny *M. atrodorsalis* and the parrotfish *C. sordidus* were all seen with approximately the same relative frequency (each represented approximately 22 percent of the observations) and together accounted for 67.8 percent of all fish seen. The combined observations of the parrotfish *C. sordidus* and *S. psittacus* contributed 53.7 percent of the biomass estimate for this station. These observations indicate a fish community composed of herbivores and generalist invertebrate predators.

Station 11

Substrate

This station was located off Family Beach across topographically complex (rugosity = 1.31 ± 0.09 S.E.) and mainly algae covered reef flat at a depth of 3 ft (0.91 m) (Figure 2). This station is located outside of the area of direct impacts but within the area of potential indirect impacts due to construction. Macro-algae made up 70.3 percent of the bottom composition, and among the categories used in this investigation, this was the highest single contribution to substrate cover seen ay any station. The remaining substrate components were soft corals

Reef Fishes

Fifty-one species of reef fish from 15 families were found at this station (Shannon diversity $H' = 2.68$, Table 4, Figure 6). The two parrotfish *Scarus psittacus* and *C. sordidus* were the most frequently observed fish and were the most significant contributors to the biomass estimate at this station (35.2 % of all fish counted and 49.6 % of the biomass). At this station, both the numerical observations and biomass estimates suggest a fish community composed primarily of larger bodied, mobile herbivores.

Station 4

Substrate

This station was located between Outhouse Beach and Hotel Wharf across a topographically complex (rugosity = 1.30 ± 0.07 S.E.) algae-covered reef crest at a depth of 6 ft (1.83 m) (Figure 2). Substrate coverage at this station consisted of macro-algae (56%), turf algae (25.7%), rubble (9.8%), sand (5%), non-coral macro-invertebrates (0.8%) and coral (0.5%). This station had the highest representation of turf algae of all stations (Table 1, Figures 3 and 7).

Algae

The macro-algal composition at this location was dominated by the brown algae *P. boryana* and *P. jonesii*. Also present was the green alga *Codium edule* (Table 1, Figures 3 and 7).

Corals

A total of 21 coral colonies representing seven species were recorded within four 10-m^2 transects (Table 2, Figure 7). Three additional coral species (*Diploastrea heliopora*, *Pavona decussata* and *P. varians*) were observed off-transect in the nearby area. No species that might be considered regionally rare was encountered. The Shannon index of diversity was 1.64 (equability = 0.84) based on colony numbers. *Leptastrea purpurea* dominated colony densities, which for all species were low. Ninety percent of colonies were <20 cm in greatest diameter, with 48 percent <5 cm. Size trends were similar among most species (Figure 4). No fragmentation was observed. Recent visible sexual recruitment was low. No complete fission of colonies was observed along transects (Table 2). Size, density and rugosity data suggest coral reproductive potential and habitat complexity in this area are low.

Macro-invertebrates

Sixteen species from 11 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The most commonly encountered macro-invertebrates were the ascidians *P. juline*, *Polycarpa* sp, *R. circula*, and *R. crassa*. The sea cucumbers *B. vitiensis* and *E. godeffroyi* were observed foraging throughout the station on the reef substrate. Other macro-

invertebrates observed at this station were the sessile oysters *C. pacifica*, *Chama* sp and *Spondylus* sp, and the sea urchins *Mespilia globulus* and *H. mammillatus*.

Reef Fishes

Fifty-two species representing 16 families were found at this station (Shannon diversity $H' = 2.75$, Table 4, Figure 6). The damselfish (family Pomacentridae) *Amblyglyphidodon curacao* and parrotfish *C. sordidus* were the most frequently seen fish, accounting for 39.7 percent of the observations. Three larger mobile herbivores, the surgeonfish *Acanthurus nigricauda*, and the parrotfishes *S. psittacus* and *C. sordidus* together made up 65.4 percent of the biomass estimate. Both the numerical observations and biomass estimates indicate a fish community consisting primarily of herbivores.

Station 9

Substrate

This station was located between the seaplane ramp and Exxon fuel pier across mainly algae-covered reef crest with low topographic complexity (rugosity = 1.27 ± 0.07 S.E.) at a depth of 8 ft (2.44 m) (Figure 2). The substrate at this station was composed of macro-algae (55.3%), turf algae (25.3%), coral (10%), sand (7.3%), rubble (2.3%) and boulders (0.3%). (Table 1, Figure 3 and 7).

Algae

The macro-algal composition at this station consisted primarily of *P. boryana* and *P. jonesii*, which made up 47.25 percent of the substrate cover. Other, less common algae included observations of the red alga *Tricleocarpa cylindrical* and red coralline algae (Table 1, Figure 3 and 7).

Corals

Eighty hard corals (7 species) and five soft corals (*Stereonephotaya* sp.) were observed within four 10-m^2 transects (Table 2, Figure 7). Two additional hard coral species (*Lobophyllia corymbosa* and *A. myriophthalma*) were observed off-transect in the nearby area. The Shannon index of diversity was 1.41 (equability = 0.68) for mean colony numbers. Colony densities were dominated by *P. lutea* and *P. lobata* (Table 2). Seventy-four percent of colonies were <20 cm in greatest diameter, with 32 percent <5 cm. A few *P. lutea* colonies exceeded 80 cm in diameter. Size trends varied among commonly encountered species (Figure 4). Fragmentation was limited and only observed in *P. rus* (12% ± 1.2 S.E.). Recent sexual recruitment appeared low. Thirty-three percent of large colonies (15.8 ± 3.2 S.E. of all colonies) were completely parted by fission. Fission was proportionately high and only observed in lobate species of *Porites* and *P. rus* (Table 2). Size, density and rugosity data suggest coral habitat complexity and reproductive potential are low in this area.

Algae

Macro-algal composition consisted primarily of brown algae dominated by *Padina boryana* and *P. jonesii*, which together provided 12.25 percent of total substrate cover. The green alga *Halimeda* sp was also present (Table 1, Figures 3 and 7). The seagrass *Enhalus acoroides* was noted nearby (in shallower depths) but did not occur on the transect line.

Corals

Only five hard coral colonies representing two species were observed within four 10-m^2 areas along the reef flat transects (Table 2). One additional coral species, *Pocillopora damicornis*, was observed in the area but did not occur within the transect boundary. The surrounding habitat was primarily sand with small areas of calcareous rubble. All coral colonies were <5 cm in diameter and attached to rubble (Figure 4). No complete fission was observed. Corals were a minor marine community constituent throughout this station.

Macro-invertebrates

Twenty-six species from 20 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The mobile snail *Strombus luhuanus*, which was seen in sandy areas, was among the most numerous macro-invertebrates observed at his station. The sea urchins *Echinothrix calamaris* and *Diadema savignyi* were observed on rubble and dead coral. Other macro-invertebrates included juvenile *Octopus* sp, the secretive sea urchin *Heterocentrotus mammillatus*, the sea cucumbers *Bohadschia argus* and *Euapta godeffroyi*, and the sessile ascidians *Phalusia julinea*, *Polycarpa* sp, *Rhopalaea circula*, and *R. crassa*.

Reef Fishes

Thirty-five reef fish species from 17 families were observed at this station (Shannon diversity index $H' = 2.62$, Table 4, Figure 6). The most commonly observed fish species were the parrotfish (family Scaridae) *Chlorurus sordidus* and surgeonfish (family Acanthuridae) *Ctenochaetus binotatus*, which together accounted for 41.2 percent of all fish seen. The parrotfish *C. sordidus* and the goby (family Gobiidae) *Amblygobius phalaena* together contributed 42 percent of the estimated biomass. Gobies, particularly shrimp gobies, were frequently encountered at this station and clearly represented an important part of the reef flat fish fauna. The two most numerically abundant gobies accounted for 17.6 percent of all fish observations and made up 23.2 per cent of the total biomass estimate. The size classes of mobile, herbivorous reef fish such as parrotfishes and surgeonfishes were small, indicating substantial fishing pressure. These small fish were also numerous, indicating that the shallow reef flats in the project area have functional value as nursery habitat for juvenile fish.

Reef Crest Habitat (Stations 2, 4, 9, 10, 11)

Station 2

Substrate

This station was located off of Outhouse Beach across relatively low relief (rugosity = 1.24 ± 0.05 S.E.) and mostly algae-covered reef crest at a depth of 8 ft (2.4 m) (Figure 2). Non-living substrate was minimal at this station. Substrate cover was dominated by macro-algae (62.5%), with turf algae (25%), rubble (7.8%), sand (2.8%), and boulders (1%) being represented to lesser extents (Table 1, Figures 3 and 7).

Algae

Macro-algal composition consisted primarily of *P. boryana* and *P. jonesii*, which together accounted for 50 percent of all substrate observations. Other less common macro-algae included the brown algae *Lobophora variegata* and *Dictyota bartayresii* and the green alga *Halimeda* sp (Table 1, Figures 3 and 7).

Corals

Forty-four hard coral colonies representing six species were observed within four 10-m^2 transects. (Table 2, Figure 7). One additional coral species, *Astreopora myriophthalma*, was observed in the area. The Shannon index of diversity was 1.64 (equability = 0.91) based on mean colony numbers. *Porites lobata* and *P. lutea* dominated colony densities. Variability was high among transects and relatively low among species due to distribution patchiness and low overall coral presence. Eighty-four percent of colonies were <20 cm in greatest diameter, with 34 percent <5 cm. Size trends were similar among species (Figure 4). Four percent (±4%) of *Porites rus* colonies were identified as unattached fragments. Recent recruitment appeared low and mainly of larval origin (Table 2). No complete fission of colonies was observed along transects. Size, density, and rugosity data suggest that coral reproductive potential and habitat complexity are low in this area.

Macro-invertebrates

Thirty-six species from 26 families of non-coral macro-invertebrates were recorded at this station (Table 3a). The most common invertebrates were the ascidians *P. julinea*, *Polycarpa* sp, *R. circula*, and *R. crassa*. The sea cucumbers *B. argus* and *E. godeffroyi* were observed actively foraging on the reef substrate. Other macro-invertebrates observed along transects at this station were the cone snail *Conus flavidus*, the sessile ark clam *Arca* sp, and the sessile oysters *Chama pacifica* and *Spondylus* sp.

Reef Fish

Divers collected reef fish data using a belt-transect protocol that has been used widely in a variety of marine environments, particularly coral reef habitats (Freidlander et al 2003, Gulko *et al.* 2002). Fish observations were made by two divers swimming side-by-side on a 25-m belt transect. Two transects were replicated per station. Divers recorded both the number of fish by species and the size of all individuals encountered. Timed-swim surveys were subsequently conducted throughout each station after transect observations were completed The timed-swim was used to compile a more complete list of species present throughout the station, especially by adding relatively rare or particularly wary species, but the numbers or sizes of observed fish were not recorded during these timed-swims.

During the deployment leg of each belt transect, the divers recorded the number of individuals and lengths of all fishes greater than 10 cm within 2 m on each side of the transect line. Small (<10 cm) and more cryptic fish within 1 m on each side of the line were counted during the "swim-back" or return leg. The divers swam each transect at a constant speed (approximately 10 minutes per transect) and identified each fish to the species level. As a result, the divers obtained a density estimate for all fishes greater than 10 cm within a 25-m long x 4-m wide (100 m²) area on the "swim-out" or deployment leg, followed by a density estimate of fishes less than 10 cm within a 25-m long x 2-m wide (50 m^2 area) on the subsequent "swim-back leg," on both of the transects deployed at each station. Thus, for each station, the two transects provided totals of large mobile reef fish species over an area of 200 m^2 and of small, site-attached species over an area of 100 m^2. After completion of each belt transect, divers swam the area surrounding the transect lines in a meandering pattern, noting all species present. Depth and air permitting, the timed-swim observation was conducted for 20 to 40 minutes throughout each site.

For each fish species, a length-weight conversion, $W = a*SL^b$, was used to estimate the weight of all fish present at a site (where parameters a and b are constants, SL is Standard Length in millimeters, and W is the estimated weight in grams). This biomass estimate (expressed as metric tons per hectare) is a combined representation of both fish numbers and fish size per unit area and is widely used in fishery science. These results are useful for comparison with studies of coral reef habitat elsewhere in the western and central Pacific. Size and length information for over 150 fish species were obtained from a variety of literature and agency sources (Freidlander, pers. comm., DAWR pers. comm.) In cases where length-weight conversions were not readily available for a given species, the values developed for species of the same genus with similar morphological characteristics were used.

The number of different fish species is reported as S. This simple measure of diversity does not account for the relative contribution of individuals representing each species. Data collected during the timed-swim surveys were used to determine S. Reef fish diversity was also calculated using the Shannon index (H', described above), which does incorporate the number of individuals of each taxa observed. Belt transect observations, for which numbers of each species encountered were recorded, were used to derive H'.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

Existing Marine Resources

Four broad habitat types, characterized by benthic substrate components and topography, were observed within and adjacent to the proposed project site. These habitat types closely follow near-shore bathymetric contours, and can be delineated by depth throughout most of the area. They are: *reef flat*, characterized by sand and rubble substrate, with abundant macro-algae, seagrass and low coral cover along the shoreline and in shallow depths; *reef crest*, characterized by boulders and debris (historical fill from the creation of Glass Breakwater) on a calcareous reef matrix, with ample macro-algal cover and low to moderate amounts of live coral; *reef slope*, characterized by a mix of boulder/rubble fill and natural calcareous reef material, also with ample algal coverage and generally high but variable live coral coverage; and *deep sand*, characterized by large expanses of flat or gently sloping sand and silt, with widely scattered outcrops of live and dead coral, and with some rubble/boulder areas at depths greater than 12 m. Within the project area, the latter two zones are littered with solid waste (*e.g.*, metallic debris, discarded batteries, cables, commercial fishing line, and other material). The reef flat areas are primarily confined to embayments situated between the filled wharf, pier, and parking areas.

One survey station was placed in reef flat habitat (Station 6) and five stations each were located in reef crest (Stations 2, 4, 9, 10, 11) and reef slope (Stations 1, 3, 5, 7, 8) habitats. Selection of stations was intended to provide a description of important marine resources, especially corals and fish. Station selection was accomplished by visually identifying representative habitats in the project area and placing transects within representative areas within each habitat type. Deep sand habitat was not surveyed due to time and logistical constraints. Quantitative data for substrate, marine plants, corals, other macro-invertebrates, and reef fishes are presented in Tables 1 through 5, in Figures 3 through 7, and in the appendices.

Survey stations were numbered in the chronological order each was surveyed during the field investigation (Figure 2). However, in this report, the station descriptions are grouped to represent the marine habitat types at the project site.

Reef Flat Habitat (Station 6)

Station 6

Substrate

This station was located in a reef flat area north of the Exxon fuel storage tank farm where topographic complexity was very low (rugosity = 1.12 ± 0.01) at a depth of 8 ft (2.44 m) (Figure 2). Substrate was a mixture of sand (36.3%), macro-algae (24.8%), turf algae (21.8%), calcareous rubble (17%), and macro-invertebrates (0.25%) (Table 1, Figures 3 and 7).

as among piles of metallic or plastic debris) and to select representative station locations that exhibited an average condition within a habitat type.

The marine resource survey techniques employed for the biological assessment consisted of area-based quantitative enumeration of fish, invertebrates, plants, and substrate characteristics conducted along two or more replicate transects at each station. Area-based data collection at each station was augmented by diver observations of the general area performed in a standardized, semi-quantitative manner. Ancillary information was collected during these "timed-swim" periods, which lasted between 20 and 40 minutes depending on depth and diver air consumption.

Substrate

Two 25-m transects lines were placed on the bottom at each station to quantitatively sample substrate. A 0.5 m^2 quadrat, with 49 evenly spaced points was used to sample the substrate along the transect lines. Of these 49 points, 20 were randomly selected for observation. Two quadrats were placed at 5-m intervals along each 25-m transect line, one on each side of the transect line. This provided a total of 10 replicate 0.5 m^2 areas observed for each transect, and 20 replicate 0.5 m^2 observations at each station. The result was a total of 200 points observed on each transect and a total of 400 point observations at each station. Each point observation was assigned a descriptive category for the purpose of substrate characterization. Descriptive categories included: boulder, rubble, sand, hard coral, soft coral, macro-invertebrate (non-coral) and macro-algae.

Algae

The community composition of macro-algae at each station was documented as a subset of the quadrat data described above. Brown (Phaeophyta), green (Chlorophyta), red (Rhodophyta), and blue-green (Cyanophyta) macro-algae were identified to the species level wherever possible. In cases where species identification was not possible in the field, generalized descriptive categories were used. The descriptive category "turf algae," for example, consisted of dense coverage of unidentified upright algae of less than 1 cm in height. Coralline algae were not identified to the species level.

Corals

Hard corals (scleractinian and helioporan corals) and soft corals (alcyonacean corals) were censused along four 10-m line transects at each station and were identified to the species level. All visible hard and soft coral colonies with centers located within 0.5 m of each side of each transect line were identified, counted and visually assigned to one of eight categories (0 to <2 centimeters [cm], 2 to <5 cm, 5 to <10 cm, 10 to <20 cm, 20 to <40 cm, 40 to <80 cm, 80 to <160 cm, and >160 cm in greatest diameter) at each station. Unattached coral fragments and coral colonies exhibiting a growth pattern resulting in subdivision (fission) were identified and considered as separate individuals. A digital image of benthic substrate was collected from an elevation of 0.5 m distance above the substrate every 0.5 m along each

10-m transect line. Representative photographs of habitat along each transect were also collected.

Mean colony densities, densities of fragments and recent visible sexual recruits, percentages of large colonies subdivided by fission (colonies ≥10 cm in diameter) are reported. The Shannon index of diversity was determined for species occurrence and mean colony numbers at each survey station, with data from the separate transects at each station used as replicates. The Shannon index was calculated as:

$$H' = \Sigma (p_i \ln p_i) \qquad \text{where } p_i \text{ is the proportion of all individuals of species } i$$

This index uses the natural log of the proportion of each species observed to represent both *numbers of species* and *numbers of colonies* present. The Shannon index ranges from 0 (low diversity) to S (which equals the total number of each species present). The related index value of equability was also calculated. Equability varies from 0 to 1, with communities in which all species are equally abundant have an index of 1. Equability is calculated as:

$$J = H' / H_{max} = \Sigma p_i \ln (p_i) / \ln (S) \qquad \text{where } S = \text{number of species}$$

Recent sexual recruits were defined as observed colonies less than 5 cm in greatest diameter that did not appear to result from processes of fission or fragmentation. Sexual recruits within this size range are considered to have settled within the previous five years under favorable conditions (Kolinski 2004, in review, unpub. data). Data from all four transects at a station were combined for graphical presentation of size distributions. Rugosity (a measure of fine-scale benthic topography or substrate "roughness") was measured for each 10-m transect using methods described in Kolinski and Jokiel (2002).

Macro-invertebrates

Marine invertebrates were observed and recorded within 0.5 m on each side of four 10-m belt transects. Species targeted for observation included the following: cnidarians (*e.g.*, zoanthids and sea anenomes), echinoderms (*e.g.*, sea urchins, sea cucumbers, and sea stars), mollusks (e.g., clams, oysters, sea snails, and octopus), and crustaceans (*e.g.*, hermit crabs, lobsters, large crabs, guard crabs, and shrimp). Along each transect, a 1-m^2 area was measured at 1-m intervals, for a total of 10 replicates per transect and 40 replicates per survey station. These data were used to calculate population densities of both mobile (*e.g.*, sea urchin) and sessile (*e.g.*, giant clam) species. Afterwards, qualitative timed-swim surveys were conducted to record observations of macro-invertebrate species within a larger area of about 5 m on each side of the four 10-m belt transects. This was accomplished by swimming in a non-overlapping zigzag search pattern and recording species present within that area. Depth and air permitting, the timed-swim was conducted for approximately 20 minutes at each station.

natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines.

The resource categories are as follows:

1. Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the eco-region;

2. Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis on in the eco-region;

3. Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis; and

4. Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

Coral reef habitat, and closely-associated habitat types that are directly adjacent to coral reef habitat within the proposed project site, represent the habitats of major concern. The institutional significance of U.S. coral reefs has been established through their designation as Special Aquatic Sites under the CWA (40 CFR Part 230 §230 44/FR v 45n 249) and as a Federal Trust Resource (Executive Order [E.O.] 13089 on Coral Reef Protection). These areas possess special ecological characteristics of diversity, productivity, habitat, wildlife protection, easily disrupted biological integrity, and contribute to the general overall environmental health or vitality of an entire ecosystem of a region.

Coral reefs are relatively scarce on a national basis and are currently in a world-wide state of decline (Waddell 2005). In Guam, coral reefs have been subjected to extensive historical and recent adverse impacts, and the extent of healthy and productive coral reefs has declined on a local and regional basis. The Service considers most coral reef habitat in the U.S. Pacific to fall under either the Resource Category 1 or 2 designations. The coral reef at the proposed project site is considered Resource Category 2 habitat. The Service's resource goal for Category 2 habitat is no net loss of in-kind habitat values. Under this designation, the Service will recommend ways to mitigate losses, through measures to avoid or minimize significant adverse impacts. In the event losses are unavoidable, measures to immediately rectify, reduce, or eliminate losses commensurate with project permitting, licensing or implementation will be recommended under the FWCA as necessary compensation for the replacement of in-kind habitat values. An effective and verifiable mitigation program planned and executed by the project proponent is required under the NEPA and CWA, as well as territorial law.

For the purpose of this report and analysis, "coral reef habitat" at the proposed project site is represented by *reef slope*, *reef crest* and *reef flat* habitat types. "Deep sand" is a habitat type within the project footprint directly adjacent and ecologically inter-related to coral reef habitat

within the larger coral reef ecosystem of Apra Harbor. As a result of this proximity, the deep sand habitat within the project site is also considered Resource Category 2 habitat.

Corals were selected as a primary evaluation species for this analysis. Although corals are very small and sensitive organisms, healthy coral colonies are fundamentally important in providing the basic foundation for habitat that supports diverse communities of other highly specialized marine biological organisms. Corals contribute the bulk of the calcareous raw materials that form and maintain the basic structural framework of the reef. Coral colonies add significantly to the submarine topographic relief in which a large number of fish and invertebrate species find shelter and food. Coral polyps themselves are an important food source for some fishes and other marine life.

Reef fish, algae, and invertebrates were also selected as evaluation species for the habitats that may be affected by the proposed project. The species assemblages selected for study are known to be sensitive to land and water use actions, play roles in nutrient cycling and energy flow, utilize common environmental recourses, and may serve as "early warning" or indicator species for the affected fish and wildlife community at the proposed project site. Selection of a diverse assemblage of organisms allows an evaluation at the community level to provide a broader ecological perspective of the project site's relative contribution to the overall coral reef resources that occur within Apra Harbor.

EVALUATION METHODOLOGY

Marine Biological Assessment

In May 2006, the Service led a team of marine biologists, representing six federal and territorial natural resource agencies, that conducted a marine biological investigation within and adjacent to the site of the proposed Apra Wharf Expansion and Land Reclamation Project. The purpose of the investigation was to assess potential project-related impacts to fish and wildlife resources from project design alternatives under consideration at that time. Eleven survey stations were established in accordance with anticipated potential impacts associated with the proposed port expansion (Figure 2). Survey stations 1-10 are locations within the project footprint and, therefore, representative of areas that may be subject to direct impacts. Station 11 was selected to represent an area subject to offsite indirect sediment transport and deposition impacts. Data were collected to document the distribution and abundance of reef fishes, corals and other macro-invertebrates, algae, and to describe the reef substrate characteristics at each station.

Stations were surveyed using SCUBA in an east-to-west orientation, parallel to the shoreline. Station locations were selected to represent "shallow" areas characteristic of the reef flat or reef crest habitat types along 3-9 ft (1-3 m) depth contours, and "deep" areas representative of the reef slope habitat were surveyed along 9-33 ft (3-10 m) depth contours (Figure 2). Professional judgment was used to ensure stations were not located in anomalous areas (such

Guam's weather is generally warm and humid with little seasonal temperature variation. The average mean temperature is 86 degrees Fahrenheit (30° Centigrade) with an average annual rainfall of 86 inches (2,180 millimeters). Guam lies within the tradewind belt, and during frequent and prolonged periods of tradewind weather, the winds generally come from the east-northeast and blow between 10 and 20 mi per hour (16 and 32 km per hour). The months from December through June are generally drier than the remaining months. On average, three tropical storms and one typhoon pass within 180 nautical mi (330 km) of Guam each year. Typhoon formation occurs with greatest frequency in October and November. The most intense typhoon to pass over Guam in recent years was Typhoon Pongsona, which struck Guam in December 2002.

Fringing coral reefs are found along most of Guam's exposed shorelines. Barrier coral reefs surround Cocos Lagoon at the south end of Guam and protect Apra Harbor north of the Orote Penninsula on the central western coastline of the island. Barrier coral reefs can be geologically older than fringing reefs and can occur at varying distances from the shoreline, enclosing lagoons that may contain coral patch reefs and pinnacles rising above the lagoon floor. The lagoon-facing portions of barrier reefs, such as the reefs that extend into Apra Harbor from Glass Breakwater at the proposed project site, are generally low-energy environments that can support unique coral-reef adapted species assemblages.

Apra Harbor is a large, natural, deep-water harbor that is approximately 3 mi by 1.2 mi (5 km by 2 km) in size. Water in central Apra Harbor generally ranges between 100 and 150 ft (30.5 and 45.7 m) deep. The northern margin of the barrier reef that forms the harbor has been extensively modified by the construction of the 2.8-mi (4.5-km) Glass Breakwater, which was built on Luminao Barrier Reef in the 1940s and extends from Cabras Island westward to a historically emergent reef and sand spit area called Spanish Rocks. The harbor is physically divided into an outer harbor and inner harbor. Apra Harbor has played a prominent role in western Pacific geo-political developments and commerce from the colonial period to the present. Colonial administration of Guam was initiated by Spain in the late 1500s and subsequently has passed to Germany, Japan, and the U.S. A prominent focus of the post-World War II American presence on Guam has been the operation and expansion the Apra Harbor Naval Reservation located along the southern margin of Apra Harbor. In addition to naval operations, Apra Harbor serves as a regional center for transshipment of maritime cargo, fuel storage and distribution, electrical power generation, and a base of operations for the offshore commercial fishing industry.

Marine resources in Apra Harbor are described in a number of studies and reports, including site-specific descriptive studies intended to document impacts due to construction of harbor facilities and wharfs (UOG 1977, VTN Pacific 1981) and other reports that describe resources throughout Apra Harbor (Paulay et al, undated report). Coral reefs within Apra Harbor include a range of habitats including: minimally impaired areas with expansive coverage of live stony corals in the Orote Point and Spanish steps area near the harbor entrance; small areas of relatively healthy isolated patch reefs such as Jade Shoals; a shallow mangrove area on the margins of Sasa Bay; and other areas where coral reefs and adjacent habitat types appear degraded to various degrees (inner Harbor, Piti Channel, other areas).

The shoreline within the proposed project area is formed by large areas of older basaltic and calcareous fill and other structures that are used as wharf space (*e.g.*, Hotel Wharf), piers (*e.g.*, Golf Pier), and accessory lands that are used for variety of water-dependent purposes, such as recreational fishing, diving, boating and beach access (*e.g.*, Seaplane Ramp, Outhouse Beach, and adjacent areas). The easternmost land margin of the project area is used by the islands petroleum supply companies for fuel storage and transshipment. The marine environment in this area is calm and largely protected from either wind-driven or deep ocean wave energy. Surface water motion in this area is driven along the shoreline by trade winds in an east-to-west direction. Tidally-driven currents play a secondary role and are more readily detected in deeper harbor waters (SEI 2005).

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

With regard to the proposed action, the Service is primarily concerned with the project's potential to impact endangered species and other significant fish and wildlife resources and their habitats from dredging and filling in the marine environment. Specific Service planning objectives are to maintain and enhance the existing significant habitat values at the proposed project site by (1) obtaining basic biological data for the proposed project site, (2) evaluating and analyzing the impacts of proposed project alternatives on fish and wildlife resources and their habitats, (3) identifying the proposed project alternative least damaging to fish and wildlife resources, and (4) recommending mitigation measures to offset project-related negative impacts to fish and wildlife resources. These measures include avoidance, minimization, and, if necessary, compensation for unavoidable negative impacts consistent with the FWCA and the Service's Mitigation Policy.

Under the authority of the Endangered Species Act (ESA), the Department of the Interior (DOI) and the Department of Commerce (DOC) share responsibility for the conservation, protection and recovery of federally listed endangered and threatened species. Section 7(a)(2) of the ESA requires Federal agencies, in consultation with and with the assistance of the Service or NMFS, to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats. Authority to conduct ESA consultations has been delegated by the Secretary of the Interior to the Director of the Service and by the Secretary of Commerce to the Assistant Administrator for Fisheries of the National Oceanic and Atmospheric Administration. The Biological Opinion is the document that states the opinion of the Service or NMFS as to whether the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The Service's Mitigation Policy (Service, 1981) outlines internal guidance for evaluating impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under the NEPA, FWCA, and Clean Water Act (CWA). The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating activities that may affect this nation's

INTRODUCTION

Authority, Purpose and Scope

This is the U.S. Fish and Wildlife Service's (Service) draft report on plans by the U.S. Army Corps of Engineers (Corps) to expand commercial wharf facilities in Apra Harbor on the island of Guam. This report has been prepared under the authority of the Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661 *et seq.*, 48 Stat. 401), as amended (FWCA), and other authorities mandating Department of the Interior concern for environmental values. This report is also consistent with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*, 83 Stat. 852), as amended (NEPA). The purpose of this report is to document the existing fish and wildlife resources at the proposed project site and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes a detailed assessment of the significant fish and wildlife resources at the proposed project site, an evaluation of potential impacts associated with the proposed project design alternatives, and preliminary guidance on development of mitigation measures commensurate with anticipated fish and wildlife impacts.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the Port Authority of Guam (PAG) is undertaking the Apra Wharf Expansion and Land Reclamation Project for the purpose of increasing commercial wharf and container storage and handling space for the island of Guam. Funding to undertake the engineering, design and environmental documentation for this proposed project was provided by the PAG to the Corps' Civil Works Branch in the Honolulu Engineer District.

When implemented, the project will expand commercial deep-draft wharf capacity and create associated container handling and storage space to meet the rising demand for maritime cargo. The population of Guam, and the western Pacific region for which Guam serves as the center of maritime commercial activity, is increasing rapidly. Also, an increasing worldwide proportion of maritime trade is utilizing "post-panamax" class container ships and bulk carriers with lengths and beams that exceed the maximum dimensions for ships using the Panama Canal. Post-panamax ships require berth depths of 50 feet (ft) (15.2 meters (m)) or greater and a minimum berth length of 1100 ft (335.5 m). In addition, because of Guam's increasing importance as a U.S. military base in the western Pacific, the PAG is cooperating with the U.S. Navy to plan for contingency berthing of Nimitz-class aircraft carriers, which require a minimum berth depth of 50 ft (15.2 m) and a minimum berth length of 1300 ft (396.2 m).

Coordination with Federal and Territorial Resource Agencies

Service biologists have reviewed the proposed project in detail with staff of the National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (USEPA), the

Guam Division of Aquatic and Wildlife Resources (DAWR), and the Guam Environmental Protection Agency (GEPA). Many concerns relative to the protection and conservation of important fish and wildlife resources in Apra Harbor expressed by these agencies were incorporated into this report. Copies of this report are being provided to the NMFS, USEPA, DAWR, and GEPA.

Prior Fish and Wildlife Meetings, Studies and Reports

- February 2, 2005. The Corps published in the Federal Register a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) and provided copies of the NOI to the Service.
- May 6, 2005. The Service provided a brief FWCA Planning Aid Letter to the Corps, which included a scope of work and proposed budget for conducting a FWCA section 2(b) investigation for the proposed project.
- June 10, 2005. In response to the NOI, the Service provided a brief NEPA guidance letter to the Corps, which described fish and wildlife resource concerns, particularly those regarding potential unavoidable and permanent impacts to the marine environment.
- February 24, 2006. A Military Interdepartmental Purchase Request transferring funds to the Service to conduct a FWCA section 2(b) field investigation and provide a written report on the findings was approved.
- May 22 – 26, 2006. A field study to examine potential marine resource impacts was conducted at the proposed project site by a Service-led team of resource agency biologists.

DESCRIPTION OF THE PROJECT AREA

Guam is located approximately 3,800 miles (mi) (6,080 kilometers (km)) west southwest of Hawaii and 6,000 mi (9,600 km) southwest of Los Angeles at 13°26'31"N latitude and 144°46'35"E longitude. It is the southernmost island of the Mariana Archipelago, which is politically divided into the Territory of Guam and the Commonwealth of the Northern Mariana Islands. Guam is the largest island in Micronesia with an area of 212 mi^2 (549 km^2). It lies along the Mariana Trench, a deep subduction zone at the edge of the Pacific plate. The Challenger Deep, the deepest submerged point on earth, is southwest of Guam at 35,797 ft (10,911 m) deep. The northern part of the island is a coralline limestone plateau and the southern portion consists of eroded volcanic peaks. Guam experiences occasional earthquakes, in recent years, significant quakes with epicenters near Guam have had magnitudes ranging from 7.0 to 8.2.

TABLE OF CONTENTS

INTRODUCTION 1
- Authority, Purpose and Scope 1
- Coordination with Federal and Territorial Resource Agencies 1
- Prior Fish and Wildlife Meetings, Studies and Reports 2

DESCRIPTION OF THE PROJECT AREA 2

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES 4

EVALUATION METHODOLOGY 6
- Marine Biological Assessment 6

DESCRIPTION OF FISH AND WILDLIFE RESOURCES 10
- Existing Marine Resources 10
- Future Without the Project 24

DESCRIPTION OF ALTERNATIVES EVALUATED 25
- Alternative 1 (Preferred) 25
- Alternative 2 27
- Alternative 3 28

PROJECT IMPACTS 29
- Alternative 1 (Preferred) 29
- Alternative 2 30
- Alternative 3 31
- Direct Impacts 32
- Indirect Impacts 33
- Overall Impacts 34

FISH AND WILDLIFE SERVICE RECOMMENDATIONS 36
- Compensatory Mitigation 36
- Best Management Practices 38
- Harbor Sediment Risk Analysis 39
- Invasive Species 39

SUMMARY AND FISH AND WILDLIFE SERVICE POSITION 40

REFERENCES 43

LIST OF FIGURES

Figure 1. Pacific Area Map 49

Figure 2a. Proposed Apra Harbor Expansion and Land Reclamation project site (Alternatives 1 and 2) 50

Figure 2b. Proposed Apra Harbor Expansion and Land Reclamation project site (Alternative 3) 51

Figure 3a-f. Substrate composition 52

Figure 4a-k. Size distributions of coral species 55

Figure 5a-k. Macro-invertebrate abundance 61

Figure 6a-d. Reef fish diversity and abundance 67

Figure 7a-k. Transect photographs 69

Figure 8. Maximum extent of indirect impacts due to suspended sediment 74

LIST OF TABLES

Table 1a-k. Algae and substrate 75

Table 2a-k. Coral diversity and abundance 78

Table 3a-b. Macro-invertebrate diversity and abundance 84

Table 4. Reef Fish diversity 91

LIST OF APPENDICES

APPENDIX I. *Muristentor dinoferus* studies at Outhouse Beach. 97

APPENDIX II. Macroinvertebrate photo sequences for marine survey stations 98

We appreciate the opportunity to provide early input on the proposed project and look forward to continuing coordination with the Corps as the planning process proceeds. If you have any questions regarding our FWCA investigation and report, please contact Fish and Wildlife Biologist Gordon Smith at either gordon_smith@fws.gov or (808) 792-9457.

Sincerely,

Patrick Leonard
Field Supervisor

cc USEPA, Region IX, Honolulu
NMFS, PIRO, Honolulu
GEPA, Guam
DAWR, Guam
GCMP, Guam

Draft

FISH AND WILDLIFE COORDINATION ACT REPORT

APRA COMMERCIAL WHARF EXPANSION AND LAND RECLAMATION PROJECT ISLAND OF GUAM

Prepared by:
Gordon Smith
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Prepared for:

U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii

August 2006



Draft
FISH AND WILDLIFE COORDINATION ACT REPORT

APRA COMMERCIAL WHARF EXPANSION
AND LAND RECLAMATION PROJECT

ISLAND OF GUAM

August 2006

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In reply refer to
PN-06-353
PN-05-283

Lieutenant Colonel Charles H. Klinge
Honolulu District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lieutenant Colonel Klinge:

The Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended (FWCA), was established to provide a basic procedural framework for fish and wildlife conservation measures to be incorporated into Federal water resources development projects. In coordination with your staff, the U.S. Fish and Wildlife Service (Service) is providing this Draft FWCA report for the proposed Apra Wharf Expansion and Land Reclamation Project.

This report has been prepared under the authority of and in accordance with provisions of the FWCA; the Federal Clean Water Act of 1977 [33 U.S.C. 1251 et seq.; 62 stat. 1155], as amended (CWA); and the Endangered Species Act of 1973 [16 U.S.C. 1531 et seq.; 87 Stat. 884], as amended (ESA). This report is also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended (NEPA), and other authorities mandating concern for environmental values.

The enclosed report presents our detailed investigation of the significant fish and wildlife resources in the project area. As described in the document, the construction and operation of the project would result in the permanent loss of approximately 20 acres of marine habitat. This area includes coral reefs and adjacent areas which are of special concern. The impact analysis in the report identifies the nature and extent of these anticipated impacts and provides preliminary recommendations to avoid and minimize these impacts. As specified in the FWCA, the goal of protecting fish and wildlife resources should remain a co-equal purpose of plans to expand Apra Commercial Wharf.

APPENDIX I

Fish and Wildlife Coordination Act Report (Draft)

Although Quays A, B, and C, the Sea Plane Ramp and 11 Wharf, meet the age requirement for the National Register, the deteriorated nature and remodeling of these features in the past have somewhat affected their integrity. Therefore, the Archaeological Documentation conducted by MARS on these features should suffice as mitigation of the potential Adverse Effect on them by this undertaking. Additionally, the roles these features played during WWII and later military operations should be described in a plaque or plaques and placed in an area within the newly improved wharf.

The Oil Dock, also known as Gorco Pier which was originally built in 1941 has seen numerous remodeling over the years. The original structure would have been eligible for inclusion to the National Register of Historic Places, but since it has been rebuilt and repaired several times it has lost its original integrity. Accordingly, it does not meet the National Register eligibility criteria.

Since no underwater survey was conducted during MARS investigation, reconnaissance survey in the water should be performed in advance of the dredging activities. The results of the survey and assessment of significance of the findings will determine the level of any further archaeological work that may be required.

With regards to your determination of No Adverse Effect, we perhaps can wait until we know the results of the underwater survey so we can address everything at one time rather than by piecemeal basis.

Lastly, please address all NHPA Section 106 matters and consultations to the State Historic Preservation Officer.

If you have further questions please contact Vic April, Territorial Archaeologist, or Rich Olmo, Consultant Archaeologist at (671) 475-6294/6295 or 6272.

Sincerely,

LYNDA BORDALLO AGUON
State Historic Preservation Officer

cc: DPW, CQC
BSP, GCZM
Guam Dept. of Agriculture, DAWR
ACOE, Guam Regulatory Branch

Section 106 Contact List for Apra Harbor Wharf Improvements

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Guam Historic Preservation Officer

Ms. Adrienne Loerzet
Governor's Special Assistant
on the Environment
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Commission on De-Colonization

Colonized Chamorro Coalition

Mr. Thomas Morrison
Deputy Director
Department of Parks and Recreation

Mr. Michael Makto
Chairman
Guam Preservation Trust
Guam Historic Preservation Review Board

Mr. Frank Aguon
Vice Speaker
Guam Legislature

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Guam Fisherman's Cooperative

Enclosure 2

SENT BY: 10-13- 6 ;10:50AM ; GUAM HPO/DPR- CCITT ECM# 1

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Thomas A. Morrison
Director

Gregory A. Matanane
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In reply refer to:
RC2005-152

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August 1, 2006

Curtis Yokoyama, S.E., P.E.
Chief, Engineering and Construction Division
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Subject: Section 106 Consultation
Project: Wharf Improvements and Fill at Apra Harbor, Guam

Attention: Mr. James Hatashima

Dear Mr. Yokoyama:

We have reviewed your determination of No Adverse Effect for the proposed wharf improvements as well as the Archaeological Investigation Report by Micronesian Archaeological Research Services (MARS) and have the following comments.

Based on the documents submitted for our review, it appears that some of the identified submerged resources such as Nichiyu Maru, Cormoran and Tokai Maru, Japanese Tugboat and Kitsugawa Maru are within close proximity to the project area but will not be affected by the proposed undertaking. The five sunken vessels identified within the project area that are less than fifty years old do not meet the eligibility criteria for the National Register of Historic Places. Accordingly, no further archaeological work will be required for them.

The Japanese Tugboat has not been recorded nor has its significance been determined as per National Register criteria. If for any reason the tugboat will be affected directly or indirectly by this undertaking, it needs to be fully documented and evaluated prior to any decision made with regards to its treatment.

The G Wharf which was built in the 1960s does not meet the National Register eligibility requirements, thus, no further archaeological documentation will be required before its demolition.



Figure 10. Map of Apra Harbor showing the location of features on the Glass Breakwater and the submerged cultural resources south of the Breakwater (taken from Lotz and Lotz 2001:51). **145** = the Glass Breakwater, **146** = the Sea Plane Ramp (G Wharf is not numbered on this figure but it is located between **146** and **147**), **147** = Outhouse Beach, **148** = H Wharf, **149** = Dog Leg Pier, **150** = Family Beach, **151** = *Nichiyu Maru*, **152** = *Tokai Maru*, **153** = S.M.S. *Cormoran*, **154** = Japanese Tugboat, **155** = *Kitsugawa Maru*, **156** = the *Vel*, **157** = American Tanker and sunken barges, **158** = *Scotia*, **159** = Western Shoals, **160** = Hourglass Reef.

Archaeological Investigations
Proposed Harbor Wharf Project
Apra Harbor, Guam
May 2005

Figure 4 Map of Terrestrial Resources at Apra Harbor (from MARS 2005 report)

Cover of MARS Archaeological Investigations Report Dated May 2005

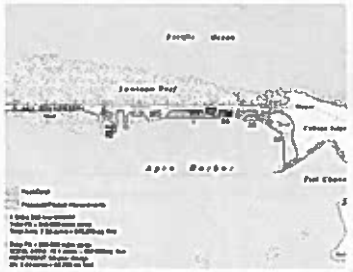
Pacific Legacy
Incorporated
Cultural Resources Consultants

Archaeological Investigations for the
Proposed Harbor Wharf Project
Apra Harbor, Guam
(DACA83-00-D-0012, Task Order 0057)

By

Darlene R. Moore
Rosalind L. Hunter-Anderson
Micronesian Archaeological Research Services
Mangilao, Guam

May 2005



Enclosure 1

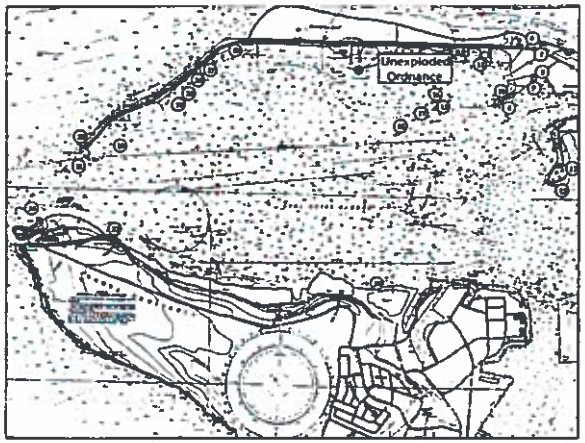


Figure 9. Map of Apra Harbor showing the location of underwater cultural resources in the vicinity of the project area (adapted from Lauter-Reinman 1998:Management Map 23). The numbers in the project area are: 5=*Nichiyu Maru*, 6=Marianas Yacht Club (MYC) private yacht *Whisper*, 7=MYC private yacht, 8=MYC private yacht *Explorer*, 9=MYC private fishing boat, 10=MYC private yacht *Ondine*, 11=tug. While the numbers 15-18 are outside the immediate project area they may be vulnerable to ships and equipment accessing the project area. They are 15=*SMS Cormoran*, 16=*Tokai Maru*, 17=Japanese tug, 18=*Kitsugawa Maru* (information taken from Table 3 [Craib and Yoklavich 1996:43]). An occurrence of unexploded ordnance is shown in the water south of Dog Leg Pier (outside the project area).

Figure 2 Map of Submerged Vessels in Apra Harbor (from MARS 2005 Report)

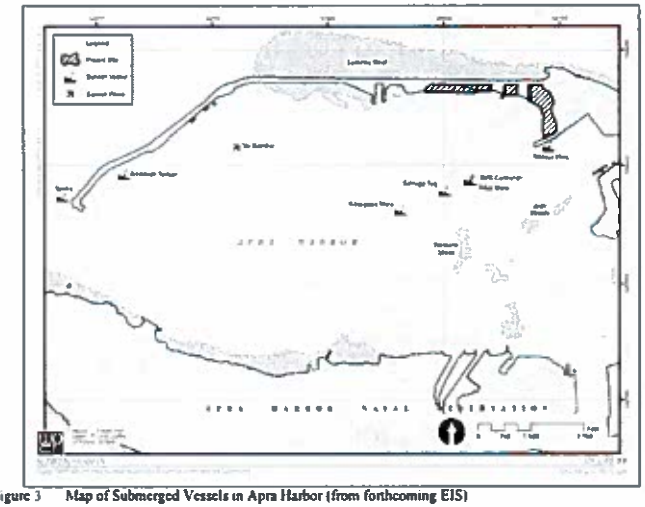


Figure 3 Map of Submerged Vessels in Apra Harbor (from forthcoming EIS)

The three original docking features built on the Glass Breakwater during the 1940's (quays A-C), are deteriorated and in poor condition, they have endured remodeling and modification, and have lost much of their integrity. As such, we have determined that they are not eligible for listing on the NRHP. We believe that the documentation included in the MARS 2005 Archaeological Investigations report is adequate to mitigate the loss of the quays from the archaeological record. The Sea Plane Ramp and H (Hotel) Wharf may be eligible for listing on the National Register for their possible association with WWII. We believe that the documentation included in MARS 2005 Archaeological Investigations report is adequate to mitigate the loss of these features from the archaeological record. G Wharf, built in the 1960's, is not eligible for listing on the NRHP.

We believe that the documentation and references cited in the MARS 2005 Archaeological Investigations report is sufficient mitigation for the potential loss of features from the archaeological record resulting from wharf improvements at Apra Harbor. No archaeological monitoring is recommended. We are asking for your concurrence with our significance evaluations, NRHP eligibility determinations, and our "no adverse effect to historic properties" determination for the project.

We are continuing to consult with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project please contact Mr. James Hatashima at the address above, or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone in his Honolulu office at (808) 438-2264. As always, we look forward to further discussion and consultation on this, and future actions.

Sincerely,

Curtis Yokoyama, S.E., P.E.
Chief, Engineering and
Construction Division

2 Enclosures

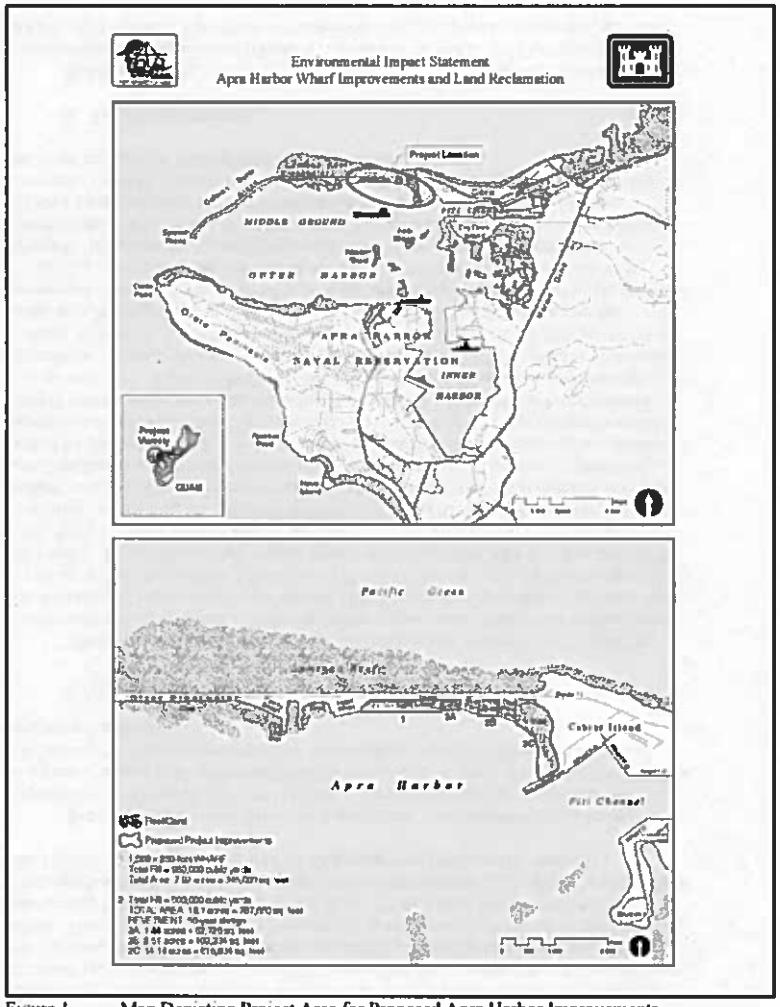


Figure 1 Map Depicting Project Area for Proposed Apra Harbor Improvements

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

July 6, 2006

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

Ms. Lynda Aguon
Guam Historic Preservation Officer
Department of Parks and Recreation
Guam Historic Preservation Division
490 Chalan Palasyo
Hagåtña, GU 96910

Dear Ms. Aguon:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to continue Section 106 consultation with your office concerning the proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam. This correspondence follows our letter opening consultation dated March 9, 2005.

As a reminder, POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam. Proposed modifications would occur within outer Apra Harbor along the southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island (Figure 1). The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include (Figure 1):

1. Construction of a new 1,500-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities;

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

We appreciate the comments received from your office in a letter dated March 25, 2005. Thank you for bringing to our attention the proximity of Guam Site 3-1155, the wreck of the Nichiyu Maru (also known as the Gorco Wreck). We believe that the location of Guam Site 3-1155, on the south side of Gorco Pier, will not be impacted by proposed project activities. In your letter, you stated that you have been in contact with MARS concerning this project, and we appreciate your working relationship with their office. The only other comments we received in response to our March 9, 2005 opening letter, came from the Guam Preservation Trust. In an e-mail dated April 14, 2005, Ms. Rosanna Barcinas deferred the identification of cultural/historic properties to your office (the Historic Resources Division of the Department of Parks and Recreation).

Archaeological investigations of Apra Harbor were conducted by Micronesian Archaeological Research Services (MARS). They found that this project had the potential to impact both submerged and land resources. A copy of the May 2005 MARS Archaeological Investigation report on Apra Harbor is enclosed for your review and comment (Enclosure 1).

1. Submerged Resources:

Through archival research, MARS identified seven sunken vessels inside the project area and four sunken vessels outside the project area. One of the sunken vessels MARS included within the project area actually lies outside the proposed affected area. As stated earlier, the Nichiyu Maru (Guam Site 3-1155) is not expected to be impacted by the project. Five of the six submerged vessels were registered with the Marianas Yacht Club (MYC). These vessels are less than 50 years old, and therefore are not old enough to be listed on the National Register of Historic Places (NRHP). The one remaining sunken vessel within the project area is described only as "tug". This sunken vessel is not identified as a significant cultural resource. Therefore, the six vessels potentially within the project area that may be impacted by construction activities are not considered significant cultural resources. It is expected that the five underwater cultural resources located outside the project area, including Guam Site 3-1155, will not be impacted by project activities. A map from the MARS report with vessel locations and descriptions is included as Figure 2. A similar map from the forthcoming EIS also depicts vessels of concern (Figure 3). Construction Contractors will be made aware of, and instructed to avoid the submerged resources indicated in Figure 3. An additional concern for submerged resources is the possibility of exposure during dredging. Due to the nature of the activity, it would be difficult for an archaeologist to examine the material being dredged. Therefore, we are not recommending archaeological monitoring during construction/dredging activities. Dredging Contractors will be advised of the potential for their work to expose significant cultural resources spanning many centuries. Contractors will be directed to contact the Guam (State) Historic Preservation Officer in the event anything of cultural interest is discovered.

2. Terrestrial Resources:

MARS identified several features on the Glass Breakwater that should be considered in our consultation (Figure 4). Quays A, B, and C, the Sea Plane Ramp, G Wharf, and H (Hotel) Wharf may be destroyed during proposed construction activities.

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

Per 36 CFR 800.4, we ask for your assistance in the identification of historic properties, cultural resources and/or traditional cultural properties within the Area of Potential Effect (see Figure 1) for the proposed project. To better assist us with the EIS document, we would also appreciate any comments specific to potential project alternatives, potential impacts to other resources, and potential mitigation measures for unavoidable impacts. We have contracted Micronesian Archaeological Research Services (MARS) to conduct the cultural surveys and assessments for this project. We anticipate providing you with survey results and a determination of effect on historic properties this Summer (2005).

We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

for James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

Department of Parks and Recreation
Dipattamenton Plaset Yan Dibuetsion
Government of Guam
490 Chalan Palasyo Road
Hagåtña, Guam 96910
Director's Office: (671) 475-6296/97
Facsimile: (671) 477-0997
Parks Division: (671) 475-6288/89
Guam Historic Resources Division: (671) 475-6294/95/6272
Facsimile: (671) 477-2822

Felix P. Camacho
Governor

Kaleo S. Moylan
Lt. Governor

Thomas A. Morrison
Director

Gregory A. Matanane
Deputy Director

In reply refer to:
RC2005-152F

25 March 2005

James L. Bersson, P.E.
Chief, Engineering and Construction Division
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Subject: Section 106 Consultation: Apra Harbor Wharf Improvements and Land Reclamation
Port Authority of Guam and U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH)

Dear Mr. Bersson,

This letter is in response to your March 9, 2005 letter. Thank-you for initiating the National Historic Preservation Act (NHPA) Section 106 consultation for the above referenced project. We appreciated being able to meet in February with Ms. Cindy Barger, from your staff, to establish a working relationship and to obtain an overview of the project. At that time we understood that you had already contracted for historical resources consulting with MARS, and we have had contact with them concerning the project. We look forward to receiving their report.

A review of our records indicates at least one site, a WWII shipwreck that could be potentially impacted by the proposed development. This is Guam Site 3-1155, the wreck of the Nichiyu Maru, also known as the Gorco Wreck. The Nichiyu Maru is a Japanese merchant cargo ship, built in 1938 at Nagasaki. Site 3-1155 is described as being located "directly adjacent to the Gorco Pier" and "at the northern corner of the entrance to Commercial Port of Guam, directly adjacent to and touching the eastern most support pilings of the Guam Oil and Refining company fuel off-loading pier." A more complete description is available at our offices in the site files.

While we await the report from MARS, if there is any further information you require from us do not hesitate to contact either Vic April (Territorial Archaeologist) or Richard Olmo (Staff Archaeologist) at 475-6294/5

Sincerely,

LYNDA B. AGUON
Guam (State) Historic Preservation Officer

Cc: James K. Hatashima, U.S. ACOE, POH
Darlene Moore, President, MARS
BSP, GCZM
ACOE, Guam Regulatory Branch
Guam Department of Agriculture, DAWR

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

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We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

for James L. Berisson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Rufo Lujan
Organization of People for Indigenous Rights (OPIR)
Fax: ~~(617)~~ 734-6569
671

Dear Mr. Lujan:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

The harbor is located near the center of the western coast of Guam (see Figure 1). It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include:

1. Construction of a new 1,500-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities;

2. Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; and

3. Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

Per 36 CFR 800.4, we ask for your assistance in the identification of historic properties, cultural resources and/or traditional cultural properties within the Area of Potential Effect (see Figure 1) for the proposed project. To better assist us with the EIS document, we would also appreciate any comments specific to potential project alternatives, potential impacts to other resources, and potential mitigation measures for unavoidable impacts. We have contracted Micronesian Archaeological Research Services (MARS) to conduct the cultural surveys and assessments for this project. We anticipate providing you with survey results and a determination of effect on historic properties this Summer (2005).

We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Mr. Ronald T. Laguana
Nasion Chomoru
Fax: (617) 475-0595
671
Dear Mr. Laguana:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

The harbor is located near the center of the western coast of Guam (see Figure 1). It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels. Harbor improvements under consideration include:

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To solicit public input, we will be combining the public notification and consultation process for NHPA Section 106 consultation with the public process for National Environmental Policy Act (NEPA) per 36 CFR 800.8. The Port Authority of Guam and the POH are preparing an Environmental Impact Statement (EIS) for the modifications to Apra Harbor. The POH issued a Notice of Intent in the February 2, 2005 Federal Register announcing the proposed EIS. In addition, a public scoping meeting with the Port Authority was held on February 23, 2005. The public scoping period for this project is open until March 25, 2005. Enclosed is the handout from the public scoping meeting that describes the proposed project and the EIS process (Enclosure 1).

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We are also consulting with 23 additional parties on this matter (Enclosure 2). If you have any questions about this project, please contact Mr. James Hatashima at the address above or via e-mail at james.k.hatashima@usace.army.mil. Mr. Hatashima may also be contacted by telephone at his Honolulu office at (808) 438-2264.

Sincerely,

James L. Bersson, P.E.
Chief, Engineering and Construction Division

2 Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

Environmental Technical Branch
Engineering & Construction Division

March 9, 2005

Ms. Jacquelyn Quitugua Ronan
KGTF-TV
P.O.Box 21449
GMF, Guam 96921

Dear Ms Quitugua Ronan:

The U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu District (POH) is writing to open the National Historic Preservation Act (NHPA) Section 106 consultation with your office concerning a proposed undertaking that involves wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the POH, in partnership with the Port Authority of Guam, is proposing to modify Apra Harbor for the purpose of improving maritime access and services to the island of Guam.

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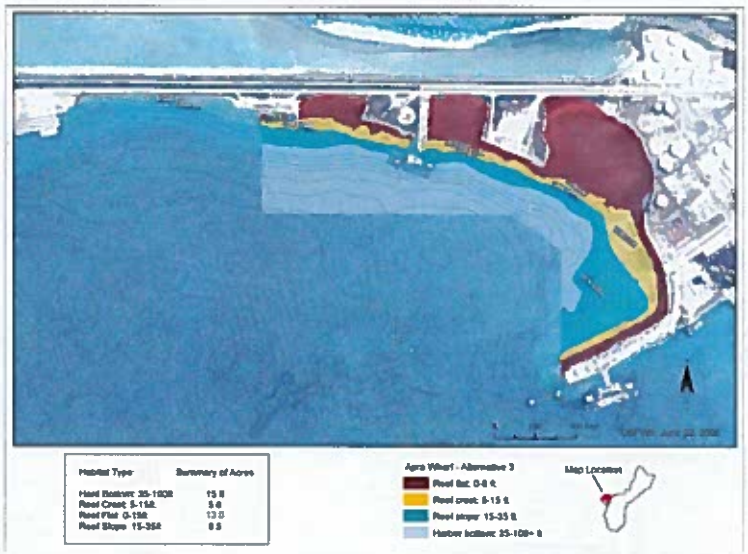


Figure 2b. Proposed Apra Harbor Expansion and Land Reclamation project site. Alternative 3

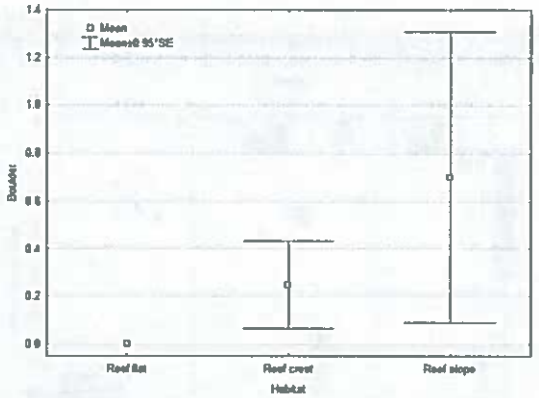


Figure 3-a. Substrate composition (percent) – boulder (reef flat n = 1, reef crest n = 5, reef slope n = 5).

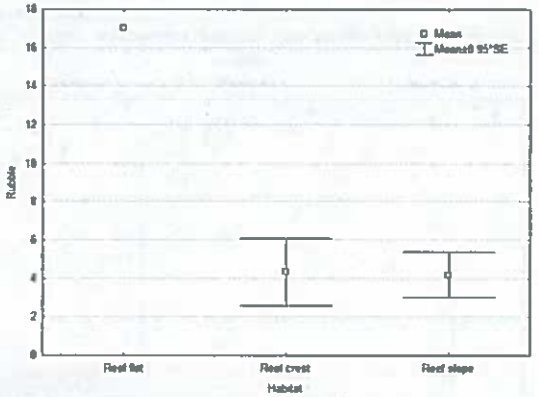


Figure 3-b. Substrate composition (percent) – rubble (reef flat n = 1, reef crest n = 5, reef slope n = 5).

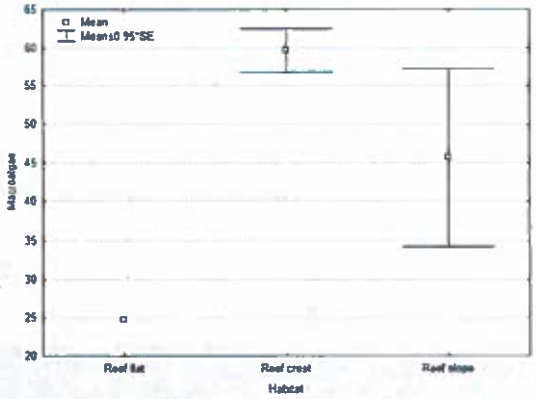


Figure 3-c. Substrate composition (percent) – all macroalgae (reef flat n = 1, reef crest n = 5, reef slope n = 5). Refer to Figure 3-e for composition of macroalgae by subgroup.

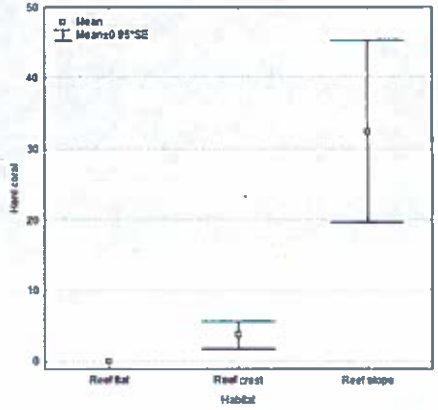


Figure 3-d. Substrate composition (percent) – hard coral (reef flat n = 1, reef crest n = 5, reef slope n = 5).

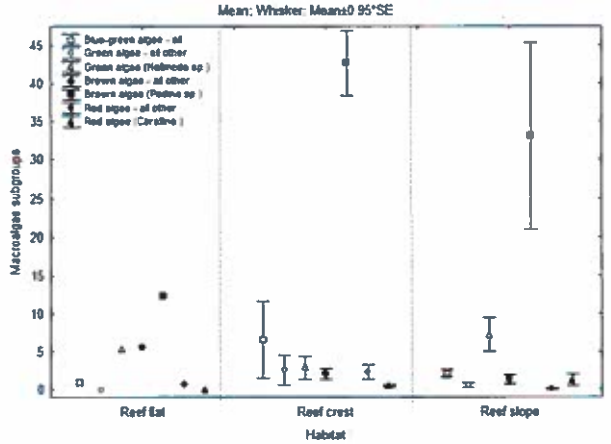


Figure 3-e. Substrate composition (percent) – macroalgae subgroups (reef flat n = 1, reef crest n = 5, reef slope n = 5).

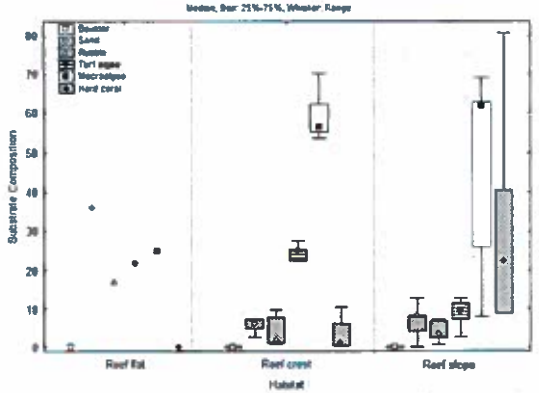


Figure 3-f. Substrate composition illustrated with box-plots showing the median, 25-75th percentile and range for all sites within each habitat type (reef flat n = 1, reef crest n = 5, reef slope n = 5).

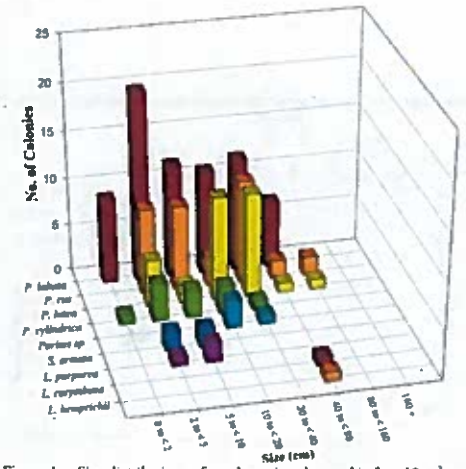


Figure 4-a. Size distributions of coral species observed in four 10 m^2 transects at Station 1.

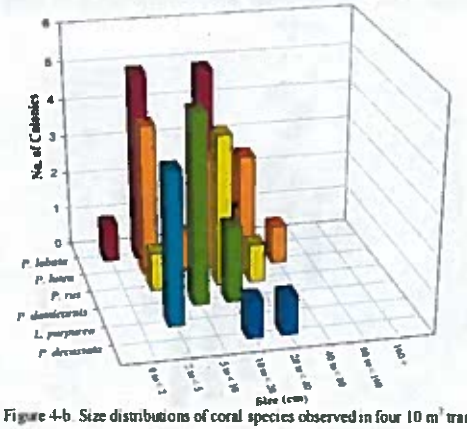


Figure 4-b. Size distributions of coral species observed in four 10 m^2 transects at Station 2.

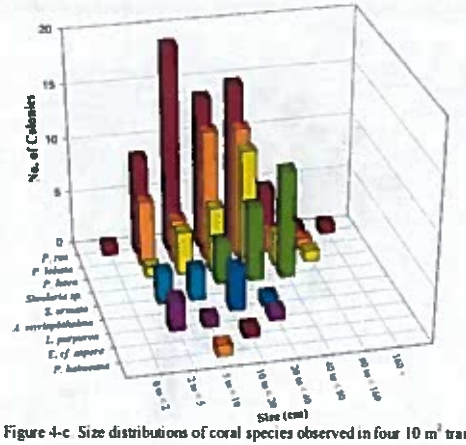


Figure 4-c. Size distributions of coral species observed in four 10 m^2 transects at Station 3.

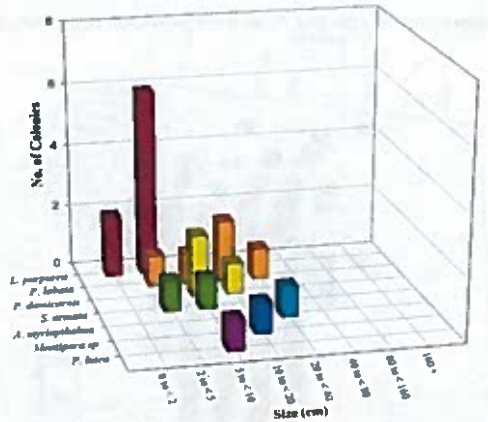


Figure 4-d. Size distributions of coral species observed in four 10 m^2 transects at Station 4.

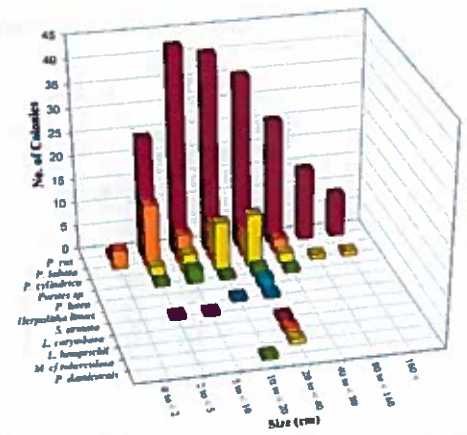


Figure 4-e. Size distributions of coral species observed in four 10 m^2 transects at Station 5

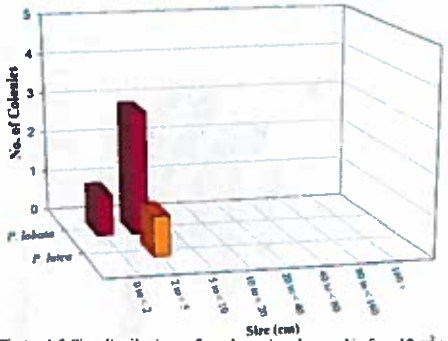


Figure 4-f. Size distributions of coral species observed in four 10 m^2 transects at Station 6

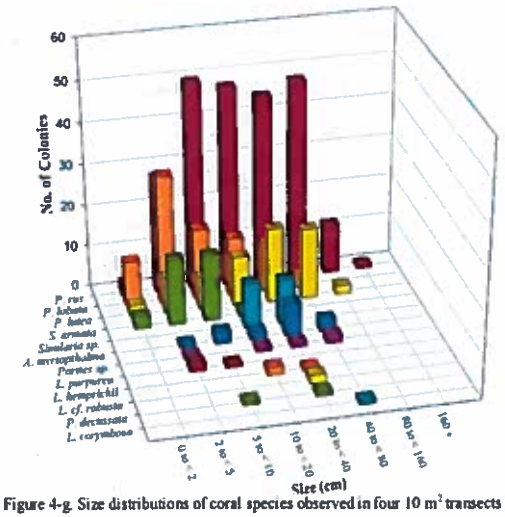


Figure 4-g. Size distributions of coral species observed in four 10 m^2 transects at Station 7

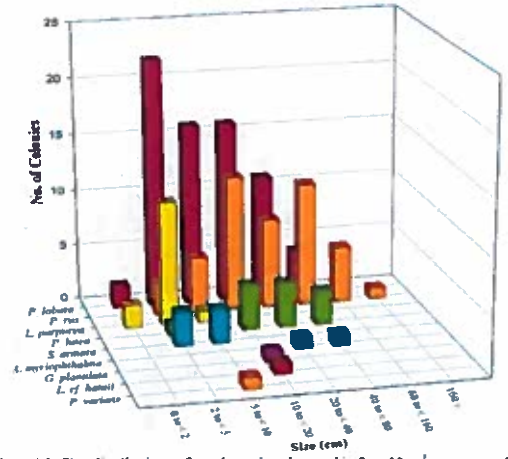


Figure4-h. Size distributions of coral species observed in four 10 m^2 transects at Station 8

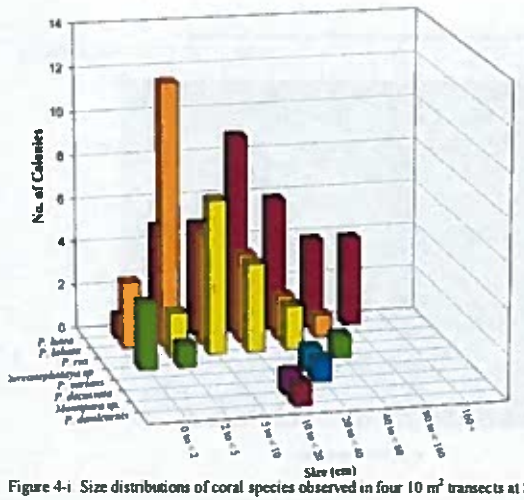


Figure 4-i Size distributions of coral species observed in four 10 m^2 transects at Station 9

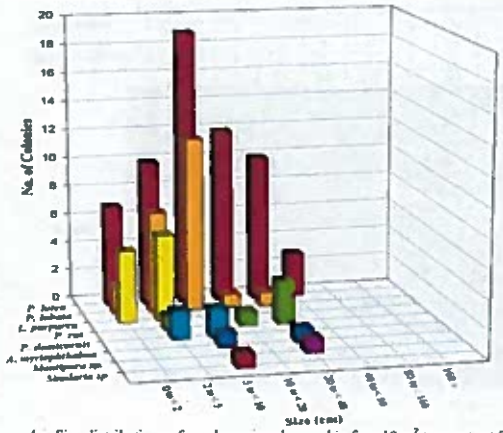


Figure 4-j Size distributions of coral species observed in four 10 m^2 transects at Station 10

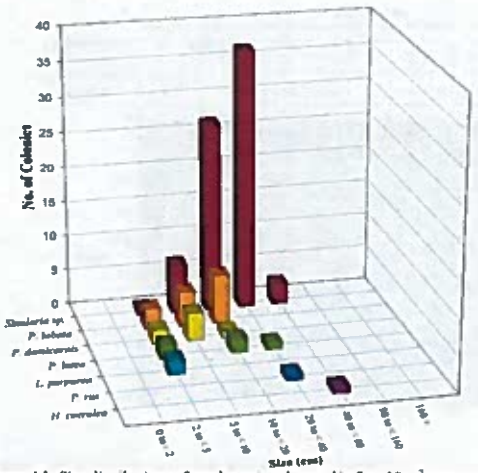


Figure 4-k Size distributions of coral species observed in four 10 m^2 transects at Station 11

Figure 5-a. Macroinvertebrate abundance: mollusks.

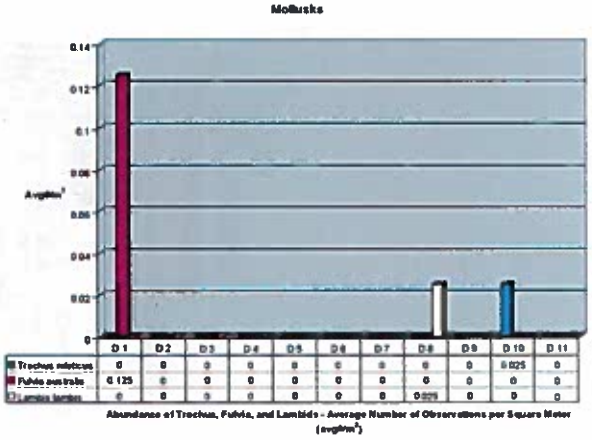


Figure 5-b. Macroinvertebrate abundance: *Strombus luhuanus*.

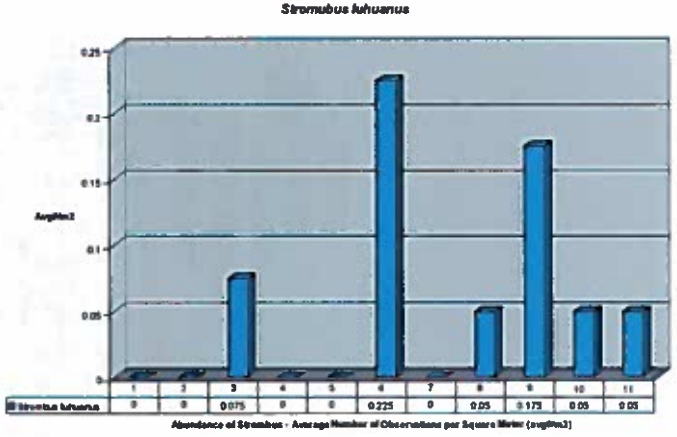


Figure 5-c. Macroinvertebrate abundance: mollusks.

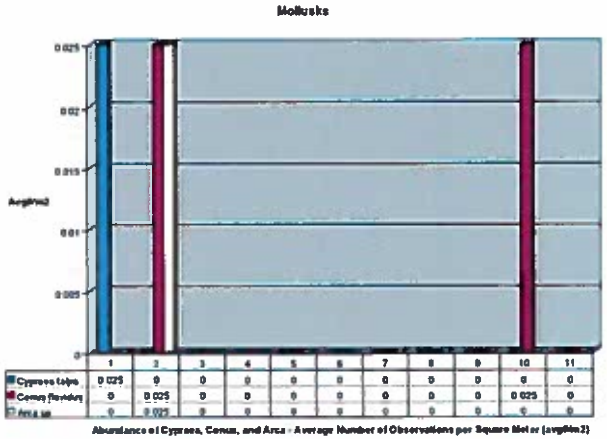


Figure 5-d. Macroinvertebrate abundance: oysters.

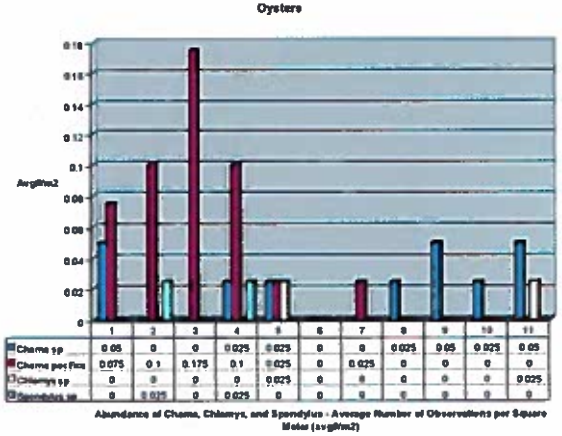


Figure 5-e. Macroinvertebrate abundance.

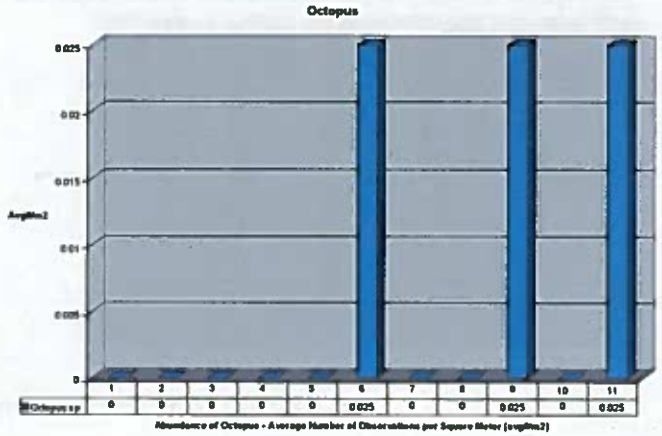


Figure 5-f. Macroinvertebrate abundance.

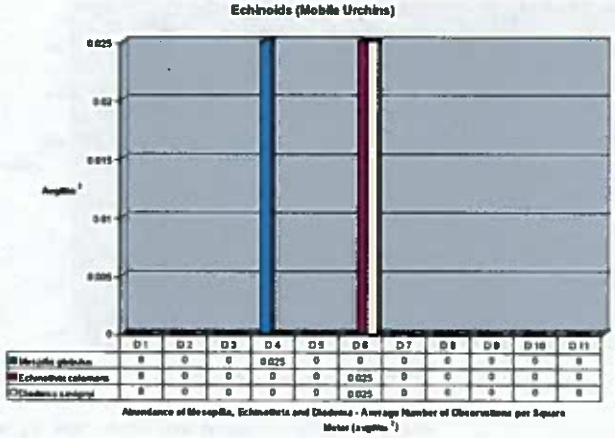


Figure 5-g. Macroinvertebrate abundance.

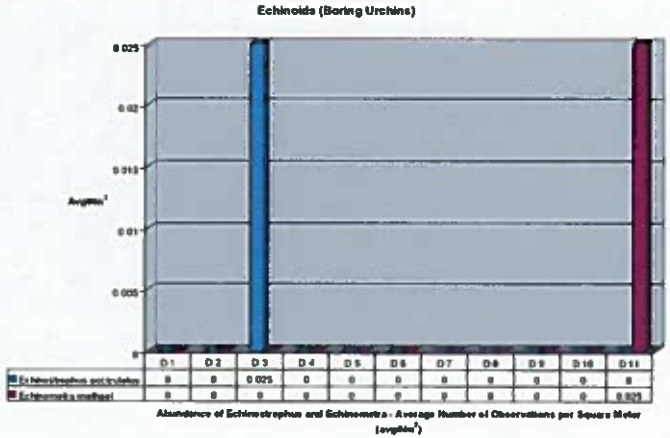


Figure 5-h. Macroinvertebrate abundance: *Heterocentrotus mammillatus*.

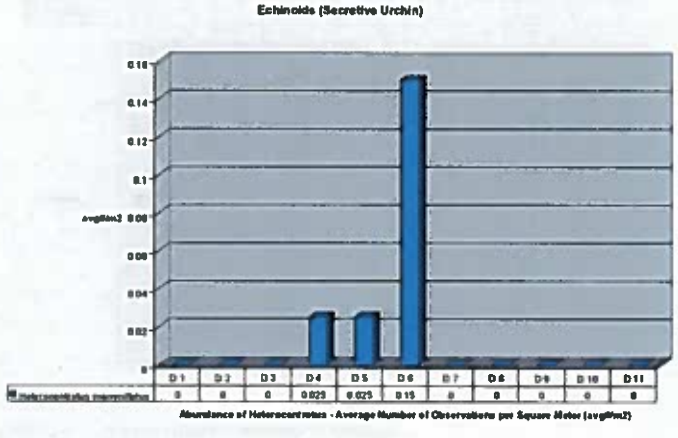


Figure 5-i. Macroinvertebrate abundance: *Eupata godeffroyi*.

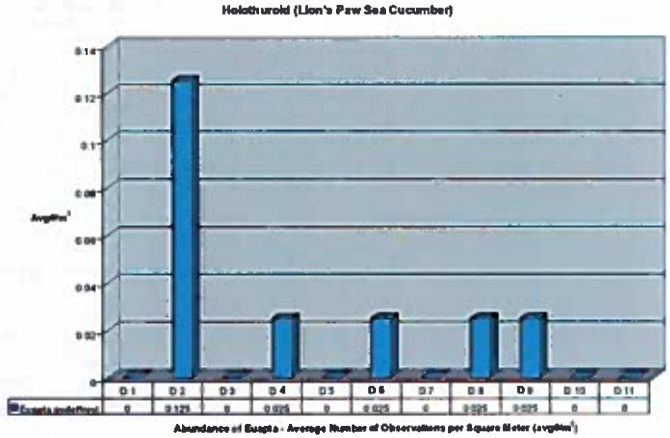


Figure 5-j. Macroinvertebrate abundance: Ascidia.

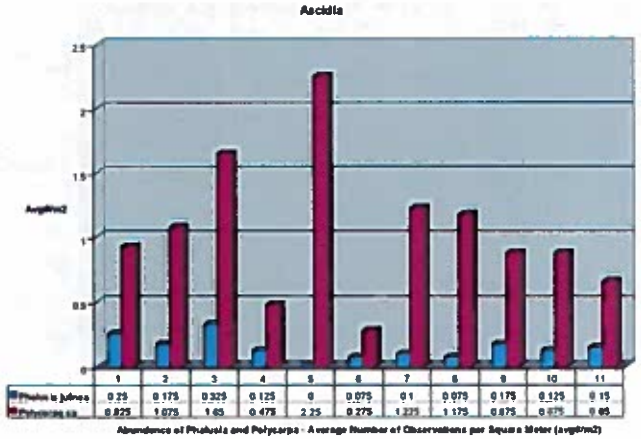
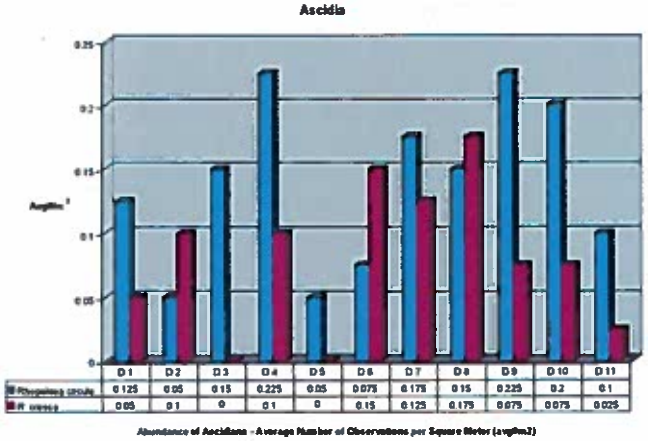


Figure 5-k. Macroinvertebrate abundance: Ascidia.



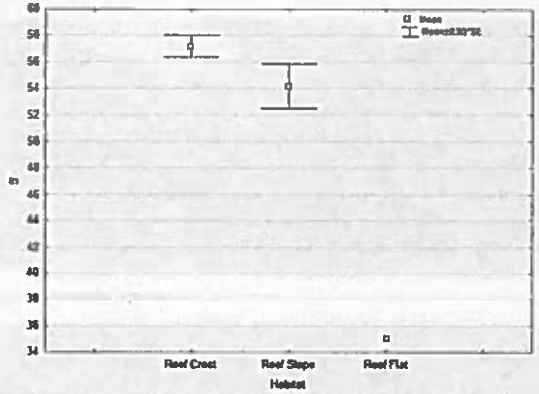


Figure 6-a. Reef fish diversity S (number of species). Data from timed-swim surveys at 11 sites (reef crest n = 5, reef slope n = 5, reef flat n = 1).

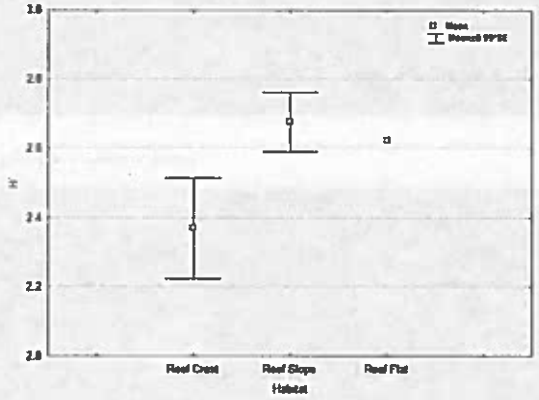


Figure 6-b. Reef fish diversity H' (Shannon index). Data from belt transect surveys at 11 sites (reef crest n = 5, reef slope n = 5, reef flat n = 1).

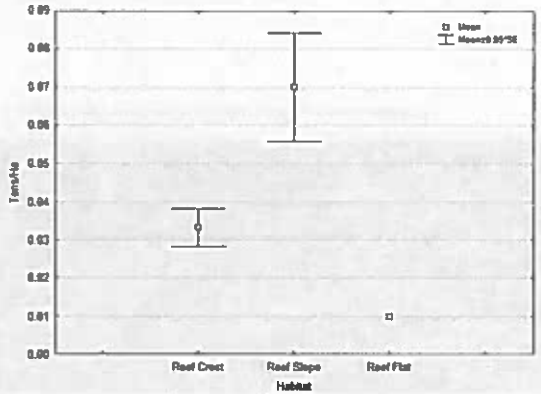


Figure 6-c. Reef fish total standing stock (biomass). Data from belt transect surveys at 11 sites (reef crest n = 5, reef slope n = 5, reef flat n = 1).

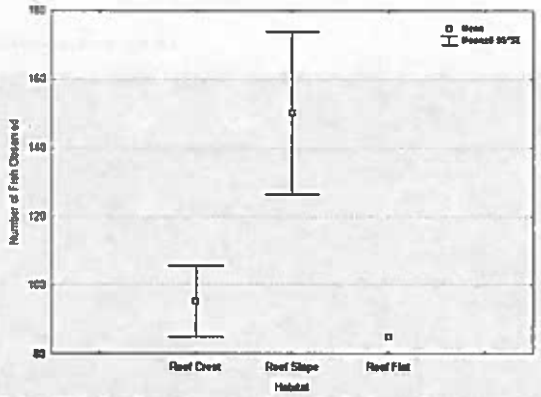


Figure 6-d. Reef fish abundance (mean numbers of fish observed per transect). Data from belt transect surveys at 11 sites (reef crest n = 5, reef slope n = 5, reef flat n = 1).



Figure 7-a. Reef slope community, Station 1.



Figure 7-b. Reef crest habitat, Station 2.



Figure 7-c. Reef slope, Station 3.

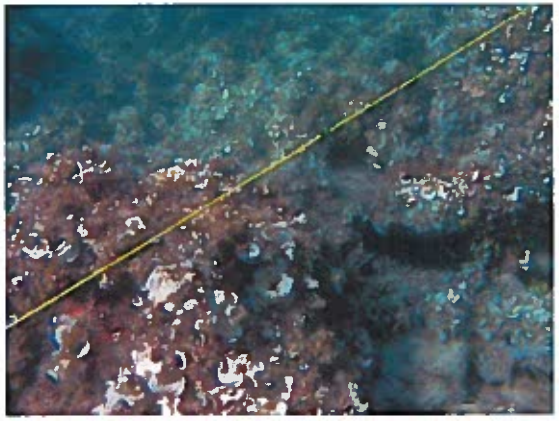


Figure 7-d. Reef crest habitat, Station 4.

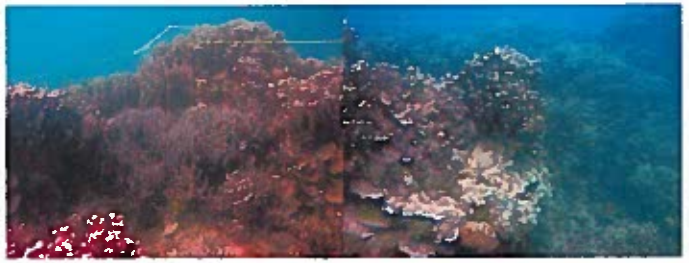


Figure 7-e. Topographically complex *Porites* dominated community, Station 5.



Figure 7-f. Reef flat habitat, Station 6.

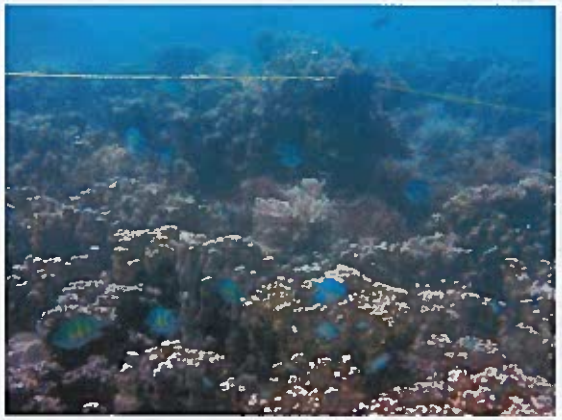


Figure 7-g. Reef slope habitat, Station 7.

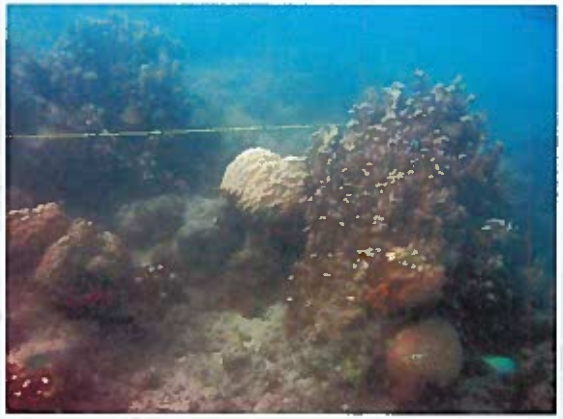


Figure 7-h. Topographically complex reef slope, Station 8.

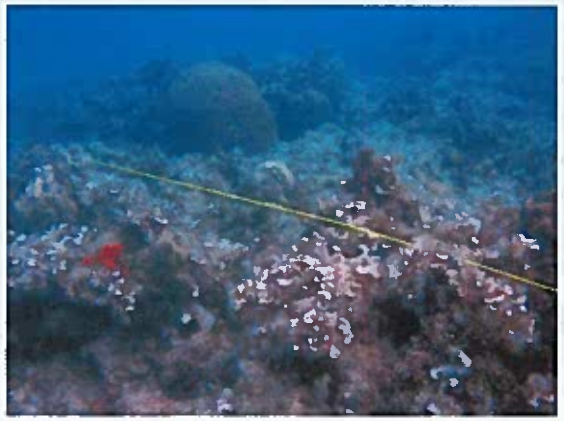


Figure 7-i. Reef crest habitat, Station 9.



Figure 7-j. Reef crest habitat at Station 10



Figure 7-k. Stand of *Sinularia* sp. at Station 11

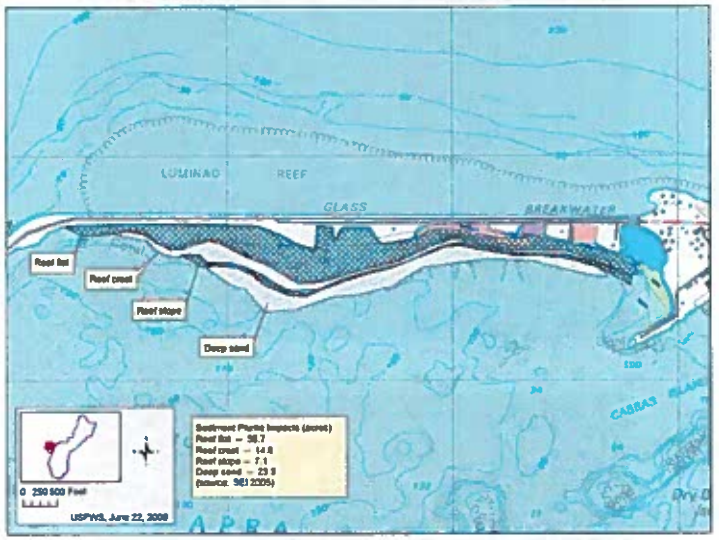


Figure 8. Maximum extent of indirect impacts due to suspended sediment

Table 1. Algae and substrate observations (%) from 22 transects at 11 survey stations at the Proposed Apra Wharf Expansion and Land Reclamation project site, Apra Harbor Guam, May 22 – 26, 2006

	Reef Flat		Reef Crest										Reef Slope									
SURVEY STATION	6	6	2	2	4	4	9	9	10	10	11	11	1	1	3	3	5	5	7	7	8	8
TRANSECT	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Rock			1	1			0.5						0.5						6.5			
Sand	50.5	20	0.5	5	4	6	6	8.5	7.5	16	6	6	11.5	5	10	6.5			15.5	10	2	6.5
Rubble	3.5	29	10.5	5	6	13.5	2	2.5		2.5		1.5	5.5	2		1.5		5		13.5	7.5	7
Cyanophyta																						
Schizothrix sp.							1											1				
Lyngbya sp.			0.5												0.5				4		0.5	2.5
Und yellow brown	0.5						0.5			2				0.5						4.5		1
Und Red slime		1.5														3.5						
Und Blue-green slime				0.5	2	3		0.5		0.5	24.5	31		2			1.5	0.5				
Chlorophyta																						
Caulerpa filicoides													0.5		2							
Codium edule			2		7.5	14						2.5										1
Halimeda opuntia			1	4		0.5	0.5	2		3	6	12	4	1.5	2.5	3.5			2	10.5	4	2
Halimeda sp.																	4	5.5	3.5	12.5	8	8.5
Halimeda sp. cf *H. macroloba*	2.5	8																				
Phaeophyta																						
Dictyota bartayresii			0.5	1	1.5		0.5				3	4		2	2	0.5						
Dictyota sp.	3	2						1		0.5		0.5							3	5		

Table 1 (cont.). Algae and substrate observations (%) from 22 transects at 11 survey stations at the Proposed Apra Wharf Expansion and Land Reclamation project site, Apra Harbor Guam, May 22 – 26, 2006

	Reef Flat		Reef Crest										Reef Slope									
SURVEY STATION	6	6	2	2	4	4	9	9	10	10	11	11	1	1	3	3	5	5	7	7	8	8
TRANSECT	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Phaeophyta (cont.)																						
Lobophora variegata		8	1	2	0.5	0.5	1.5	0.5	0.5								1	1	5			
Padina boryana & *P. pavonia*	14	10.5	49	51	44.5	35	42	52.5	52	47	31.5	21.5	44	69.5	50	63.5				3.5	63	31
Hydroclathrus clathratus	1	1																				
Turbinaria ornata											2											
Rhodophyta																						
Galaxaura fasciculata			6.5	3.5	1.5	0.5																
Tricleocarpa cylindrica			0.5		0.5		2	2	3.5	1		0.5										
Und. Gelid?	1.5												0.5									
Gracilaria salicornia			1	0.5																		
Encrusting coralline			0.5		1	0.5		0.5		0.5		1	0.5	1	5	3	1	0.5				1
Branched coralline								0.5				0.5			0.5							
Other																						
Turf, thick, Rhodophyta	4		9	1.5	4.5		5.5	3.5	6.5	6.5	14	6			1.5	0.5			2			
Turf, thin, silt covered	19.5	19	15.5	24	25	25.5	19	22.5	18	14	2.5	7	14	11.5	9.5	13.5	0.5	14	16		5	1.5

Table 1 (cont). Algae and substrate observations (% cover) from 22 transects at 11 survey stations at the Proposed Apra Wharf Expansion and Land Reclamation project site, Apra Harbor Guam, May 22 – 26, 2006.

	Reef Flat		Reef Crest										Reef Slope									
SURVEY STATION	6	6	2	2	4	4	9	9	10	10	11	11	1	1	3	3	5	5	7	7	8	8
TRANSECT	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Other (cont)																						
Hard Coral				0 5	1		18 5	2	8	4 5		2	15 5	2 5	16	1 5	9 1	70 5	41 5	39 5	7	38
Soft Coral											9		1									
Sponge		0 5	1	0 5		1	0 5	1 5	3	1	1 5	4	2	2 5	0 5	1 5		2		1	0 5	1
Strombus gastropod										0 5												
Marsdrator													0 5			0 5	0 5		0 5		1	
Oyster					0 5																	
Solitary Ascidian									0 5	0 5							0 5		0 5		1	
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 2-a Coral species parameters (mean ± S E) measured in four 10 m^2 transects at Station 1

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Leptastrea								
L. purpurea	0	0	1	2	0.08 ± 0.05	0	0.03 ± 0.03	
Lobophyllia								
L. corymbosa	0	1	0	0	0.03 ± 0.03	0	0	0
L. hemprichii	1	0	0	0	0.03 ± 0.03	0	0	0
Porites								
P. cylindrica	9	3	0	0	0.30 ± 0.21	0	0.13 ± 0.13	50.0 ± 35.4
P. lobata	19	31	17	4	1.78 ± 0.55	0	0.73 ± 0.41	30.6 ± 11.2
P. lutea	8	13	8	2	0.78 ± 0.23	0	0.13 ± 0.13	10.3 ± 3.4
P. rus	10	9	2	15	0.90 ± 0.27	0.05 ± 0.05	0.23 ± 0.10	40.0 ± 24.5
P. sp.	2	2	0	0	0.10 ± 0.06	0	0	0
Stylocoeniella								
S. armata	3	1	0	0	0.10 ± 0.07	0	0.05 ± 0.03	
Total	**52**	**60**	**28**	**23**	**4.08 ± 0.90**	**0.05 ± 0.05**	**1.28 ± 0.55**	**20.6 ± 4.6**

Table 2-b Coral species parameters (mean ± S E) measured in four 10 m^2 transects at Station 2

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Leptastrea								
L. purpurea	0	1	0	3	0.10 ± 0.07	0	0.10 ± 0.07	
Pocillopora								
P. damicornis	1	0	0	6	0.18 ± 0.14	0	0	0
Pavona								
P. decussata	0	0	1	1	0.05 ± 0.03	0	0	0
Porites								
P. lobata	5	1	0	7	0.33 ± 0.17	0	0.15 ± 0.06	0
P. lutea	2	1	2	7	0.30 ± 0.14	0	0.10 ± 0.04	0
P. rus	0	0	0	6	0.15 ± 0.15	0.03 ± 0.03	0.03 ± 0.03	0
Total	**8**	**3**	**3**	**30**	**1.10 ± 0.64**	**0.03 ± 0.03**	**0.38 ± 0.17**	**0**

Table 2-c. Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 3

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Astreopora								
A. myriophthalma	0	1	2	2	0.13 ± 0.05	0	0	0
Echinophyllia								
E. cf aspera	1	0	0	0	0.03 ± 0.03	0	0	0
Leptastrea								
L. purpurea	3	1	0	1	0.13 ± 0.06	0	0.08 ± 0.03	0
Psammocora								
P. haimeana	0	0	0	1	0.03 ± 0.03	0	0	
Porites								
P. lobata	8	17	6	6	0.93 ± 0.26	0	0.15 ± 0.03	0
P. lutea	5	12	4	5	0.65 ± 0.18	0	0.08 ± 0.05	8.33 ± 8.33
P. rus	5	36	22	2	1.63 ± 0.79	0.40 ± 0.24	0.18 ± 0.18	17.50 ± 11.81
Sinularia								
S. sp	0	0	21	0	0.53 ± 0.53	0	0	0
Stylocoeniella								
S. armata	4	2	0	0	0.15 ± 0.10	0	0.08 ± 0.08	
Total	26	69	55	17	**4.18 ± 1.22**	**0.40 ± 0.24**	**0.55 ± 0.20**	5.99 ± 2.29

Table 2-d. Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 4

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Astreopora								
A. myriophthalma	0	1	0	0	0.03 ± 0.03	0	0	0
Leptastrea								
L. purpurea	5	0	1	2	0.20 ± 0.11	0	0.20 ± 0.11	
Montipora								
M. sp.	0	1	0	0	0.03 ± 0.03	0	0	0
Pocillopora								
P. damecornis	0	2	0	1	0.08 ± 0.05	0	0	0
Porites								
P. lobata	2	2	0	1	0.13 ± 0.05	0	0.03 ± 0.03	0
P. lutea	0	0	0	1	0.03 ± 0.03	0	0	
Stylocoeniella								
S. armata	2	0	0	0	0.05 ± 0.05	0	0.03 ± 0.03	
Total	9	6	1	5	**0.53 ± 0.17**	0	**0.25 ± 0.16**	0

Table 2-e. Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 5

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Herpolitha								
H. limax	2	0	0	0	0.05 ± 0.05	0	0	0
Lobophyllia								
L. corymbosa	1	0	0	0	0.03 ± 0.03	0	0	0
L. hemprichii	0	0	0	1	0.03 ± 0.03	0	0	0
Montipora								
M. cf. tuberculosa	0	0	0	1	0.03 ± 0.03	0	0	0
Pocillopora								
P. damecornis	0	0	1	0	0.03 ± 0.03	0	0	0
Porites								
P. cylindrica	1	24	3	3	0.78 ± 0.54	0.13 ± 0.05	0.65 ± 0.43	0
P. lobata	4	4	22	9	0.98 ± 0.43	0	0.43 ± 0.21	6.3 ± 6.3
P. lutea	0	0	0	2	0.05 ± 0.05	0	0	50.0
P. rus	21	45	47	83	4.90 ± 1.28	1.53 ± 0.87	0.65 ± 0.43	0
P. sp	0	0	6	2	0.20 ± 0.14	0	0.03 ± 0.03	50.0 ± 35.6
Stylocoeniella								
S. armata	0	0	1	1	0.05 ± 0.03	0	0.03 ± 0.03	
Total	29	73	80	102	**7.10 ± 1.53**	**1.65 ± 0.91**	**1.18 ± 0.53**	1.56 ± 1.56

Table 2-f. Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 6

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Porites								
P. lobata	1	1	2	0	0.10 ± 0.04	0	0.10 ± 0.04	
P. lutea	0	0	1	0	0.03 ± 0.03	0	0.03 ± 0.03	
Total	**1**	**1**	**3**	**0**	**0.13 ± 0.06**	**0**	**0.13 ± 0.06**	**0**

Table 2-g Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 7

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Astreopora								
A. myriophthalma	0	8	1	8	0.42 ± 0.22	0	0.03 ± 0.03	0
Leptastrea								
L. purpurea	1	0	1	1	0.08 ± 0.02	0	0.03 ± 0.03	
Lobophyllia								
L. corymbosa	0	1	0	0	0.02 ± 0.02	0	0	0
L. hemprichii	0	0	1	2	0.08 ± 0.05	0	0	100
L. cf. robusta	0	0	2	0	0.05 ± 0.05	0	0	0
Pavona								
P. decussata	2	0	0	0	0.05 ± 0.05	0	0.05 ± 0.05	0
Porites								
P. lobata	11	24	21	32	2.20 ± 0.43	0	0.53 ± 0.28	16.1 ± 6.8
P. lutea	9	20	28	12	1.72 ± 0.43	0	1.35 ± 0.96	2.28 ± 2.28
P. rus	66	64	45	60	5.88 ± 0.48	1.83 ± 0.45	0.45 ± 0.13	1.9 ± 1.4
P. sp	1	2	1	1	0.12 ± 0.02	0	0.43 ± 0.33	25.0 ± 25.0
Sinularia								
Sinularia sp.	22	0	0	0	0.55 ± 0.55	0	0.48 ± 0.48	0
Stylocoeniella								
S. armata	11	7	7	12	0.92 ± 0.13	0	1.15 ± 0.66	0
Total	**123**	**126**	**107**	**128**	**12.1 ± 0.48**	**1.83 ± 0.45**	**4.38 ± 2.13**	**5.0 ± 2.4**

Table 2-h Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 8

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Astreopora								
A. myriophthalma	0	0	1	1	0.05 ± 0.03	0	0	0
Gardineroseris								
G. planulata	0	0	0	1	0.03 ± 0.03	0	0	0
Leptastrea								
L. purpurea	0	5	1	8	0.35 ± 0.18	0	0.33 ± 0.18	
Lobophyllia								
L. cf. hataii	0	0	0	1	0.03 ± 0.03	0	0	
Pavona								
P. varians	0	1	0	0	0.03 ± 0.03	0	0	
Porites								
P. lobata	12	2	15	42	1.78 ± 0.85	0	0.60 ± 0.23	3.8 ± 3.8
P. lutea	1	3	5	3	0.30 ± 0.08	0	0.03 ± 0.03	0
P. rus	0	6	8	31	1.13 ± 0.68	0.33 ± 0.26	0.08 ± 0.08	8.5 ± 5.2
Stylocoeniella								
S. armata	0	1	1	4	0.15 ± 0.09	0	0.08 ± 0.05	
Total	**13**	**18**	**31**	**91**	**3.83 ± 1.80**	**0.33 ± 0.26**	**1.10 ± 0.47**	**5.4 ± 3.2**

Table 2-i Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 9

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Montipora								
M. sp.	1	0	0	0	0.03 ± 0.03	0	0	0
Pavona								
P. decussata	0	0	1	0	0.03 ± 0.03	0	0	0
P. varians	1	0	0	0	0.03 ± 0.03	0	0	0
Pocillopora								
P. damicornis	0	0	0	1	0.03 ± 0.03	0	0	0
Porites								
P. lobata	3	4	18	2	0.68 ± 0.38	0	0.38 ± 0.25	83.3 ± 11.8
P. lutea	5	12	8	9	0.85 ± 0.34	0	0.20 ± 0.10	36.1 ± 9.2
P. rus	2	5	7	1	0.38 ± 0.14	0.03 ± 0.03	0.05 ± 0.05	33.3 ± 28.9
Stereonephthaya								
Stereonephthaya sp.	0	0	5	0	0.13 ± 0.13	0	0.10 ± 0.10	0
Total	**12**	**21**	**39**	**13**	**2.13 ± 0.63**	**0.03 ± 0.03**	**0.68 ± 0.31**	**33.0 ± 5.8**

Table 2-j Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 10

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Astreopora								
A. myriophthalma	0	0	0	2	0.05 ± 0.05	0	0	0
Leptastrea								
L. purpurea	1	5	0	5	0.28 ± 0.13	0	0.28 ± 0.13	
Montipora								
Montipora sp.	1	0	0	0	0.03 ± 0.03	0	0	0
Pocillopora								
P. damicornis	1	1	0	2	0.10 ± 0.04	0	0.05 ± 0.03	
Porites								
P. lobata	2	11	7	3	0.58 ± 0.21	0	0.23 ± 0.11	0
P. lutea	22	7	11	21	1.52 ± 0.37	0	0.43 ± 0.17	8.3 ± 5.3
P. rus	3	3	2	0	0.20 ± 0.07	0	0.03 ± 0.03	44.4 ± 25.5
Sinularia								
Sinularia sp.	1	0	0	0	0.03 ± 0.03	0	0	
Total	**31**	**27**	**20**	**33**	**2.28 ± 0.29**	**0**	**1.00 ± 0.23**	**18.5 ± 5.3**

Table 2-k. Coral species parameters (mean ± S.E.) measured in four 10 m^2 transects at Station 11.

Species	Total No. Colonies T1	T2	T3	T4	No. Colonies m^{-2}	No. Fragments m^{-2}	No. "recent" (1 to < 5 cm) visible sexual recruits m^{-2}	% Colonies > 10 cm parted by fission
Heliopora								
H. coerulea	0	1	0	0	0.03 ± 0.03	0	0	100
Leptastrea								
L. purpurea	2	0	0	0	0.05 ± 0.05	0	0.05 ± 0.05	
Pocillopora								
P. damicornis	2	0	1	4	0.18 ± 0.09	0	0.05 ± 0.05	0
Porites								
P. lobata	7	0	5	3	0.38 ± 0.15	0	0.08 ± 0.05	0
P. lutea	3	0	1	1	0.13 ± 0.06	0	0.05 ± 0.05	0
P. rus	1	0	0	0	0.03 ± 0.03	0	0	0
Sinularia								
Sinularia sp.	0	75	0	0	1.88 ± 1.88	0	0.03 ± 0.03	0
Total	15	76	7	8	2.65 ± 1.66	0	0.25 ± 0.13	0.4 ± 0.4

Table 3a. Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
DARWINELLIDAE											
Chelonaplysilla sp (purple)	x	x	x		x	x			x		
Chelonaplysilla sp (orange red)					x						
DRUINELLIDAE											
Aplysinella strongylata					x						
CHALINIDAE											
Adocia sp		x			x				x		x
Haliclona osiris	x	x			x						
AXINELLIDAE											
Acanthella cavernosa		x									
Acanthella sp	x		x		x		x		x	x	
Stylissa sp	x	x	x		x		x	x	x		x
DICTYONELLIDAE											
Liosina granularis	x	x	x		x	x	x	x	x	x	x
NIPHATIDAE											
Amphimedon sp			x								
PLANCTOMYCETACEAE											
Stomatospongia micronesica	x										
HALICHONDRIIDAE											
Axinyssa sp		x	x		x	x		x	x		x
Haliclona sp	x	x	x		x				x	x	x
Stylotella aurantium	x	x	x				x				
Stylissa sp		x	x			x	x	x	x	x	x
CALLYSPONGIIDAE											
Callyspongia sp						x	x		x	x	x
PLAKINIDAE											
Plakina sp		x			x						

Table 3a. (cont) Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
MICROCIONIDAE											
Xestospongia exigua					x						
Clathria eurypa			x							x	x
Clathria sp					x	x			x		x
PHLOEODICTYIDAE											
Aka sp		x	x		x				x	x	
MYXILLIDAE											
Iotrochota baculifera			x		x			x		x	x
RASPAILIIDAE											
Ceratopsion sp	x	x			x			x	x		x
SPONGIIDAE											
Hyrtios altum	x		x								x
Hytrios sp		x			x				x	x	
Pellina sp		x									
DYSIDEIDAE											
Dysidea gramlosa		x	x		x				x		x
Dysidea sp			x	x	x		x		x	x	x
TETILLIDAE											
Cinachyra sp							x				x
Unidentified 'Ascidian' sponge (GP)			x					x			
Unidentified brown sponge					x	x				x	x
Unidentified yellow sponge		x						x		x	
Unidentified cream sponge	x					x		x			
Unidentified crimson sponge									x		
Unidentified red sponge		x						x			x
UI Boring Sponge				x	x						
STICHODACTYLIDAE											
Heteractis sp					x					x	

Table 3a. (cont.) Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
SERPULIDAE											
Spirobranchus giganteus					x						
Unidentified tubeworm					x						
Unidentified marine worm						x					
Unidentified fireworm		x				x					
SABELLIDAE											
Sabellid sp					x				x		
TROCHIDAE											
Trochus niloticus										x	
TURBINIDAE											
Astrea (Astralium) rhodostoma											
Turbo argyrostoma	x								x		
CERITHIIDAE											
Cerithium sp					x		x			x	x
Rhinoclavis sinensis									x		
VERMITIDAE											
Serpulorbis sp					x	x			x	x	
STROMBIDAE											
Lambis lambis								x	x		
L. truncata							x				
Strombus luhuanus		x	x			x		x	x	x	
S. mutabilis			x					x			
MURICIDAE											
Chicoreus torrefactus				x							
THAIDIDAE											
Morula uva	x										
MITRIDAE											
Mitra astulata								x			

Table 3a. (cont.) Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
COSTELLARIIDAE											
Vexillum sp							x				
CONIDAE											
Conus flavidus										x	
CHROMODORIDIDAE											
Hypselodoris sp							x				
AGLAJIDAE											
Philinopsis gardineri					x						
MYTILIDAE											
Lithophaga sp	x	x	x		x		x			x	x
PTERIOMORPHIA											
Arca sp		x					x	x			
CARDIIDAE											
Fulvia australis	x										
ISOGNOMONIDAE											
Isognomon perna		x			x						
PECTINIDAE											
Chlamys sp					x						x
SPONDYLIDAE											
Spondylus sp		x					x			x	
CHAMIDAE											
Chama pacifica	x	x	x				x				
Chama sp	x							x		x	x
OCTOPODIDAE											
Octopus cyanea											x
Octopus sp						x		x		x	
GONODACTYLOIDEA											
Gonodactylus sp						x		x			

Table 3a. (cont.) Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
DIADEMATIDAE											
Diadema savignyi						x					
Echinothrix calamaris						x					
TOXOPNEUSTIDAE											
Mespilia globulus				x							
ECHINOMETRIDAE											
Echinometra mathaei											x
E. oblonga				x	x	x					
Echinostrephus acciculatus			x								
HOTHURIIDAE											
Bohadschia argus		x	x			x	x	x		x	x
B. vitiensis			x	x					x	x	x
B. paradoxa						x					x
SYNAPTIDAE											
Euapta godeffroyi		x	x	x				x	x	x	
Polyplectana sp						x			x		
DIDEMNIDAE											
Didemnum molle			x	x					x		
D. moseleyi			x								
D. nigrum		x		x							
Didemnum sp							x		x		
CIONIDAE											
Rhopalaea circula	x	x	x	x	x	x	x	x	x	x	x
R. crassa	x	x	x	x	x			x	x	x	x
Rhopalaea sp 2 gold spot		x				x					
ASCIDIIDAE											
Ascidium sp			x	x			x				
Phallusia julinea	x	x	x	x	x	x	x	x	x	x	x

Table 3a. (cont) Macroinvertebrate species observed at eleven survey stations at the proposed Apra Wharf Expansion and Land Reclamation project site, May 22 - 26, 2006.

FAMILY Genus/ species	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
STYELIDAE											
Polycarpa sp	x	x	x	x	x	x	x	x	x	x	x
P. argentata		x	x		x	x		x	x		x
P. cryptocarpa		x	x	x	x		x	x		x	
P. papillata			x	x		x			x		
Total Families per Survey Transect.	17	26	21	11	28	20	19	20	23	26	23
Total Species per Survey Transect:	21	36	34	16	38	26	23	26	33	30	31
Meristentor sp (Ciliate)		x	x	x							

Table 3b. Macroinvertebrate species abundance (number of individuals per m^2) from sixteen survey stations at Apra Harbor,Guam, May 22 - 26, 2006.

	Reef Flat	Reef Crest					Reef Slope				
Genus species	S 6	S 2	S 4	S 9	S 10	S 11	S 1	S 3	S 5	S 7	S 8
Mollusca											
Trochus niloticus	0	0	0	0	0.025	0	0	0	0	0	0
Fulvia australis	0	0	0	0	0	0	0.125	0	0	0	0
Lambis lambis	0	0	0	0	0	0	0	0	0	0	0.025
Cypraea talpa	0	0	0	0	0	0	0.025	0	0	0	0
Conus flavidus	0	0.025	0	0	0.025	0	0	0	0	0	0
Arca sp	0	0.025	0	0	0	0	0	0	0	0	0
Chama sp	0	0	0.025	0.05	0.025	0.05	0.05	0	0.025	0	0.025
Chama pacifica	0	0.1	0.1	0	0	0	0.075	0.175	0.025	0.025	0
Chlamys sp	0	0	0	0	0	0.025	0	0	0.025	0	0
Spondylus sp	0	0.025	0.025	0	0	0	0	0	0	0	0
Strombus luhuanus	0.225	0	0	0.175	0.05	0.05	0	0.075	0	0	0.05
Octopus sp	0.025	0	0	0.025	0	0.025	0	0	0	0	0
Echinodermata-Echinoids											
Mespilia globulus	0	0	0.025	0	0	0	0	0	0	0	0
Echinothrix calamaris	0.025	0	0	0	0	0	0	0	0	0	0
Diadema savignyi	0.025	0	0	0	0	0	0	0	0	0	0
Echinostrephus acciculatus	0	0	0	0	0	0	0	0.025	0	0	0
Echinometra mathaei	0	0	0	0	0	0.025	0	0	0	0	0
Heterocentrotus mammillatus	0.15	0	0.025	0	0	0	0	0	0.025	0	0
Bohadschia argus	0.025	0.025	0	0	0.05	0.025	0.025	0.05	0	0.025	0
B. vitiensis	0	0	0.025	0.05	0.025	0.025	0	0	0	0	0
B. paradima	0	0	0	0	0	0.025	0	0	0	0	0
Euapta godeffroyi	0.025	0.125	0.025	0.025	0	0	0	0	0	0	0.025
Ascidea											
Phalusia julinea	0.075	0.175	0.125	0.175	0.125	0.15	0.25	0.325	0	0.1	0.075
Polycarpa sp	0.275	1.075	0.475	0.875	0.875	0.65	0.925	1.65	2.25	1.225	1.175
Rhopalaea circula	0.075	0.05	0.225	0.225	0.2	0.1	0.125	0.15	0.05	0.175	0.15
R. crassa	0.15	0.1	0.1	0.075	0.075	0.025	0.05	0	0	0.125	0.175

Table 4. Reef fish species observed at eleven survey stations at the proposed Apra Wharf and Land Reclamation site, Apra Harbor, Guam May 23-26, 2006

FAMILY	SURVEY STATION (S)										
Genus species	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
MURAENIDAE											
Gymnothorax javanicus	X										
SYNODONTIDAE											
Saurida gracilis	X				X					X	
Synodus variegatus							X				
MUGLIDAE											
Liza vaigiensis						X					
Valamugil seheli	X										
ATHERINIDAE											
Atherinomorus lacunosus				X							
HOLOCENTRIDAE											
Myripristis. berndti	X			X	X		X	X	X	X	X
M. violacea	X		X	X			X				
Neoniphon sammara	X		X	X	X		X	X		X	X
Sargocentron caudimaculatum							X				
S. diadema					X		X				
S. microstoma							X				
S. spiniferum			X	X			X	X	X		
AULOSTOMIDAE											
Aulostomus chinensis					X			X		X	X
FISTULARIIDAE											
Fistularia commersonii			X			X					
SERRANIDAE											
Cephalopholis argus	X										
Epinephelus merra			X				X				
CIRRHITIDAE											
Amblycirrhitus bimacula						X					

Table 4. continued.

FAMILY	SURVEY STATION (S)										
Genus species	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
APOGONIDAE											
Apogon angustatus	X		X		X		X	X		X	
Cheilodipterus artus										X	
C. quinquelineata	X			X	X	X	X	X	X	X	X
MALACANTHIDAE											
Malacanthus latovittatus		X									
CARANGIDAE											
Gnathanodon speciosus						X					
Scomberoides lysan						X					
LUTJANIDAE											
Lutjanus fulvus	X				X		X		X		X
L. gibbus					X						X
CAESIONIDAE											
Pterocaesio tile			X								
GERREIDAE											
Gerres acinaces			X								
LETHRINIDAE											
Lethrinus harak		X	X			X					X
Lethrinus obsoletus							X				X
Lethrinus olivaceous											X
Monotaxis grandoculus	X						X				
NEMIPTERIDAE											
Scolopsis lineata	X	X	X	X	X	X	X	X	X	X	X
Pentapodus caninus			X								
MULLIDAE											
Mulloidichthys flavolineatus	X	X	X							X	
Parupeneus barberinus						X	X	X			
P. ciliatus				X			X	X	X		X
P. cyclostomus				X			X				
P. multifasciatus	X	X	X	X	X	X		X	X	X	X

Table 4. continued

FAMILY / *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
CHAETODONTIDAE											
Chaetodon auriga	X	X	X	X		X	X	X	X	X	X
C. bennetti										X	
C. citrinellus											X
C. ephippium				X	X	X	X		X	X	X
C. kleinii						X					
C. lunula	X									X	X
C. lunulatus	X	X	X		X		X		X	X	
C. ulietensis	X	X	X	X	X	X	X	X	X	X	X
Heniochus accuminatus						X		X	X		
H. chrysostomus	X		X		X		X	X			
H. monoceros	X						X	X	X	X	
POMACANTHIDAE											
Pomacanthus imperator								X		X	
POMACENTRIDAE											
Abudefduf sexfasciatus		X	X		X		X	X	X	X	X
A. sordidus	X	X			X						
Amblyglyphidodon curacao	X	X	X	X	X		X	X	X	X	X
Amphiprion melanopus					X						
A. clarkii							X				
Chromis atripectoralis					X						
C.viridis		X	X	X	X		X	X		X	
C. xanthura				X?							
Chrysiptera brownriggii	X	X	X	X			X	X	X	X	
C. traceyi	X	X	X						X	X	X
Dascyllus aruanus	X	X	X		X	X	X	X	X	X	X
D. trimaculatus	X	X	X		X		X	X		X	
Plectroglyphidodon lacrymatus		X			X						
Pomacentrus philippinus	X	X	X	X	X	X	X	X	X	X	X
P. vaiuli	X	X	X	X	X	X	X	X	X	X	X
Stegastes nigricans	X	X					X	X	X		

Table 4. continued

FAMILY / *Genus species*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
LABRIDAE											
Anampses ceureuleopunctatus			X				X				
Cheilinus chlorurus	X		X	X	X		X	X	X	X	
C. fasciatus	X	X	X	X	X		X	X	X	X	X
C. trilobatus	X	X	X	X	X		X	X	X	X	X
C. undulatus							X		X		
Cheilio inermis		X	X	X							
Epibulus insidiator					X		X	X	X	X	X
Halichoeres biocellatus		X				X					
H. hortulanus										X	X
H. margaritaceus				X							
H. marginatus		X		X							
H. trimaculatus		X	X				X		X		X
Hemigymnus fasciatus		X		X	X	X		X			X
H. melapterus		X	X	X	X		X	X	X	X	
Labroides dimidiatus			X	X	X	X	X	X	X	X	X
Oxycheilinus unifasciatus							X	X			
Stethojulis bandanensis		X	X	X							X
S. strigiventer								X	X		X
Thalassoma hardwicki		X		X					X	X	X
T. quinquevittatum			X								X
SCARIDAE											
C. sordidus	X	X	X	X	X	X	X	X	X	X	X
Hipposcarus longiceps	X	X	X		X		X	X	X	X	X
Scarus altipinnis		X	X		X		X	X		X	X
S. forsteni			X								
S. globiceps	X				X				X	X	X
S. psittacus	X		X	X	X	X	X	X	X	X	X
S. schlegeli	X	X		X				X			X
Scarus sp.	X	X		X						X	X
BLENNIDAE											
Ecsenius bicolor											X
Exallis brevis	X		X	X					X	X	
Meiacanthus atrodorsalis	X	X	X	X	X	X	X	X	X	X	X
Salarias fasciatus						X					

Table 4. continued.

FAMILY / *Genus species*	SURVEY STATION (S) S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
GOBIIDAE											
Amblygobius phalaena	X	X	X	X	X	X	X	X	X		X
Ctenogobiops sp.	X	X		X	X	X		X	X	X	
Eviota sp.				X				X	X	X	
Fusigobius sp.									X		
Gnatholepis sp.									X		
MICRODESMIDAE											
Ptereleotris microlepis						X					
SIGANIDAE											
Siganus spinus		X		X		X					
ZANCLIDAE											
Zanclus cornutus	X	X	X	X	X		X	X	X	X	X
ACANTHURIDAE											
Acanthurus nigricauda	X	X	X	X	X	X	X	X	X	X	X
A. nigrofuscus	X	X	X	X	X		X	X	X	X	X
A. pyroferus			X	X	X			X			
A. thompsoni										X	X
A. triostegus	X	X	X	X	X			X	X	X	X
A. xanthopterus	X	X									
Ctenochaetus binotatus	X	X		X		X		X	X	X	
C. striatus	X	X	X	X	X	X	X	X	X	X	X
Naso annulatus	X					X		X			
N. brevirostris			X				X	X	X	X	
N. lituratus			X	X					X		
N. unicornis			X				X		X		
N. vlamingii									X		
Zebrasoma flavescens			X	X	X					X	
Z. veliferum	X	X	X	X	X		X	X	X	X	X
BOTHIDAE											
Bothus mancus											X
BALISTIDAE											
Balistapus undulatus		X									
Balistoides viridescens						X		X	X	X	
Rhinecanthus aculeatus						X				X	X
Sufflamen chrysoptera	X	X	X	X	X		X	X	X		X

Table 4. continued.

FAMILY / *Genus species*	SURVEY STATION (S) S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
OSTRACIIDAE											
Ostracion cubicus							X	X			X
TETRADONTIDAE											
Arothron nigropunctatus	X	X								X	X
Canthigaster solandri	X	X		X	X			X		X	X
C. valentini	X		X	X				X	X	X	X
Total number of families	20	15	19	16	17	17	18	17	15	17	19
Total number of species	55	51	57	52	51	35	59	58	56	60	58

APPENDIX I

Maristentor dinoferus studies at Outhouse Beach.

The shallow marine waters of Apra Harbor near Outhouse Beach is a significant resource area for the recently discovered symbiotic association between a ciliate protozoan (*Maristentor dinoferus*) and its zooxanthellae (*Symbiodinium* – the symbiotic algae that grows in corals). Outhouse Beach is the "type locality" for the genus, i.e., the place from which the species was first collected for description in the scientific literature and from where the official museum specimen came. The site has been studied by University of Guam researchers Drs. Lobban and Schefter since 1999, in collaboration with scientists worldwide who have contributed expertise in describing the organism and studying its biochemistry and ecology. While *Maristentor* occurs at other sites, it is uniquely abundant at Outhouse Beach, which has easy access in contrast to other sides that are offshore. The access and abundance has made possible chemical studies that would not otherwise have been possible, including determining that the pigment in the cells is structural similar to hypericin (the medicinal ingredient in St. John's Wort). A new species of the ciliate *Euplotes* (*E. uncinatus*), also with symbiotic zooxanthellae, has also been discovered at this site; these are the only two known ciliates with zooxanthellae in the world.

At Outhouse Beach, *Maristentor* occurs and an epiphyste on marine algae from about 5 to 20 feet depths, along the entire stretch of beach between the two capstans, and is most abundant in summer months. Individual cells cluster and appear as black spots on the seaweed and other surfaces. Although these spots may suggest disease to a casual observer, there is no reason to think that the organisms are harmful. Indeed, the black spots may serve as a visual warning to fish not to eat the organism and seaweed it is on. A study is currently underway to determine growth and persistence of the patches of *Maristentor* and the behavioral basis for persistence versus dispersal. Semi-permanent survey markers have been placed to identify patches and these research sites are under study on short- and long-time scales.

References

Lobban, C.S., M. Schefter, A.G.B. Simpson, X. Pochon, J. Pawlowski & W. Foissner. 2001. *Maristentor dinoferus* n. gen., n. sp., a giant heterotrich ciliate (Spirotrichea: Heterotrichida) with zooxanthellae, from coral reefs on Guam, Mariana Islands. *Marine Biology* 140: 411-423 + 141: 207-208.

Miao, W., A.G.B. Simpson, C. Fu & C.S. Lobban. 2005. The giant zooxanthellae-bearing ciliate *Maristentor dinoferus* is closely related to Folliculinidae. *Journal of Eukaryotic Microbiology* 52: 11-16.

Lobban, C.S., L. Modeo, F. Verni & G. Rosati. 2005. *Euplotes uncinatus* (Ciliophora, Hypotrichia), a new species with zooxanthellae. *Marine Biology* 147: 1055–1061.

Mukherjee, P., D.B. Fulton, M. Halder, X. Han, D.W. Armstrong, J. Petrich & C.S. Lobban. 2006. Maristentorin, a novel pigment from the positively phototactic marine ciliate *Maristentor dinoferus*, is structurally related to hypericin and stentorin. *Journal of Physical Chemistry B* 110: 6359–6364.

Sommaruga, R., K. Whitehead, J. M. Shick, C.S. Lobban. 2006. Mycosporine-like amino acids in the zooxanthella-ciliate symbiosis *Maristentor dinoferus*. *Protist* 157: 185-191.



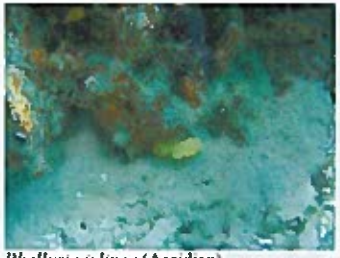
Figure A-1. *Maristentor dinoferus* growth on *Padina* sp.



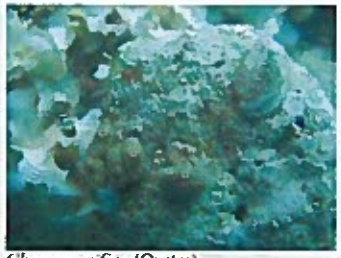
Figure A-2. Close-up of the zoothanthellae-bearing ciliate *Maristentor* sp.

C.S. Lobban, U. Guam.

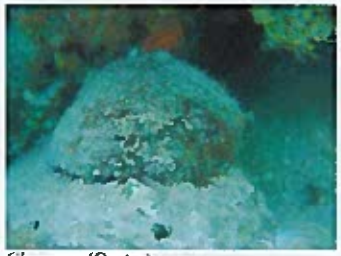
Appendix II-a. Photo sequence for marine survey station 1



Phallusia julinea (Ascidian)



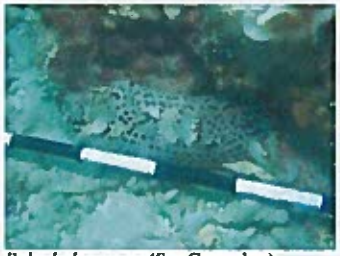
Chama pacifica (Oyster)



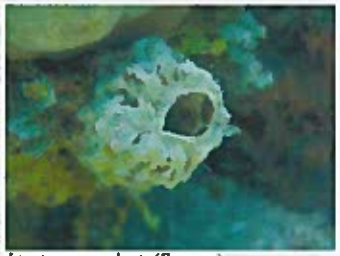
Chama sp (Oyster)



Stylotela aurantium (Sponge)



Bohadschia argus (Sea Cucumber)



Liosina granularis (Sponge)

Appendix II-a. Photo sequence for marine survey station 2



Euapta godeffroyi (Sea Cucumber)



Ascidia sp (Sea Squirt)

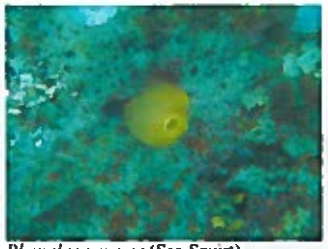


Polycarpa papillata (Sea Squirt)



Stylinos sp (Sponge)

Appendix II-a. Photo sequence for marine survey station 3



Rhopalaea crassa (Sea Squirt)



Hytrios altum (Sponge)



Amphimedon sp (Sponge)



Coral Community



Sinularia sp (Soft Coral)



Chama sp (Oyster)

Appendix II-a. Photo sequence for marine survey station 4



Chicoreus torrefactus (Snail)



Euapta godeffroyi (Sea Cucumber)



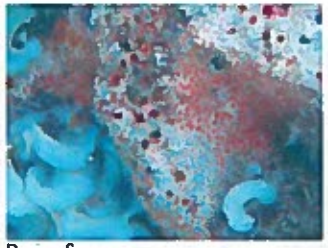
Bohadschia vitiensis (Sea Cucumber)



Mespilia globulus (Sea Urchin)



Echinometra oblonga (Sea Urchin)



Boring Sponge

Appendix II-a. Photo sequence for marine survey station 5



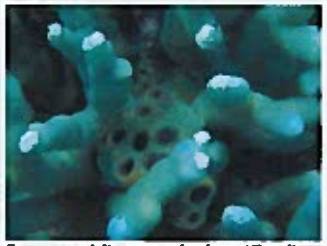
Philinopsis gardineri (Nudibranch)



Dysidea sp (Sponge)



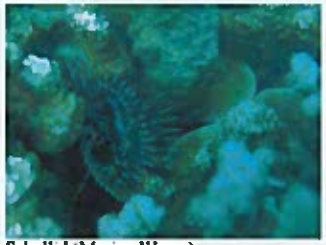
Echinometra oblonga (mortality)



Sponge and *Porites cylindrica* (Coral)



Iotrocha sp (Sponge)



Sabellid (Marine Worm)

Appendix II-a. Photo sequence for marine survey station 6



Diadema savignyi (Sea Urchin)



Echinothrix calamaris (Sea Urchin)



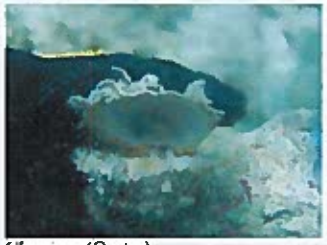
Polyplectana sp (Sea Cucumber)



Chelonaplysilla sp (Sponge)

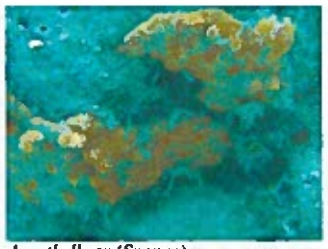


Octopus sp (Juvenile)

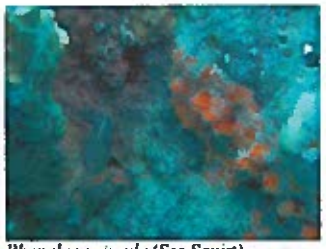


Chama sp (Oyster)

Appendix II-a. Photo sequence for marine survey station 7



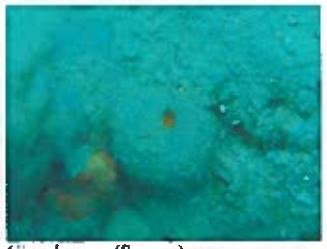
Acanthella sp (Sponge)



Rhopalaea circula (Sea Squirt)



Stylotella aurantium (Sponge)



Cinachrya sp (Sponge)



Polycarpa sp (Sea Squirt)

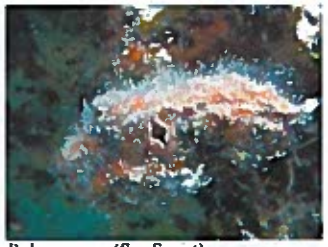


Hypselodoris sp (Nudibranch)

Appendix II-a. Photo sequence for marine survey station 8



Lambis lambis (Finger Conch Snail)



Polycarpa sp (Sea Squirt)



Acanthella sp (Sponge)



Snail

Appendix II-a. Photo sequence for marine survey station 9



Bohadschia vitiensis (Sea Cucumber)



Serpulorbis sp (Vermetid Snail)



Spondylus sp (Oyster)



Callyspongia sp (Sponge)



Ceratopsion sp (Sponge)

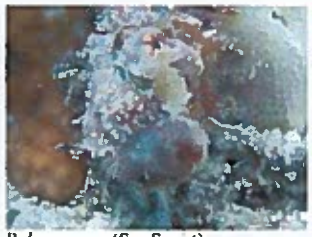


Polyplectana sp (Sea Cucumber)

Appendix II-a. Photo sequence for marine survey station 10



Trochus niloticus (Snail)



Polycarpa sp (Sea Squirt)



Polycarpa crassa (Sea Squirt)

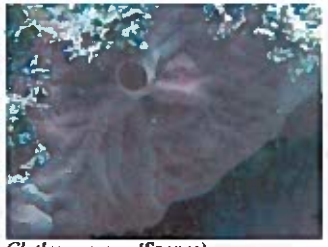


Ceratopsion sp (Sponge)



Unidentified Orange Sponge

Appendix II-a. Photo sequence for marine survey station 11



Clathrya eurypa (Sponge)



Octopus cyanea (Adult)



Bohadschia argus (Sea Cucumber)



Bohadschia paradoxa (Sea Cucumber)



Snail



Stylotella aurantium (Sponge)

APPENDIX J

Endangered Species Act Coordination

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2007-SL-0063

FEB 2 2 2007

Mr. Curtis I. Yokoyama, S.E., P.E.
Chief, Engineering and Construction Division
Environmental Technical Branch
Department of the Army, Fort Shafter
U.S Army Engineer District, Honolulu
Honolulu, Hawaii 96858-5440

Subject: Species List and Critical Habitat for Deep-Draft Wharf Improvement Project at Apra Harbor Commercial Pier, Apra Harbor, Piti, Guam

Dear Mr. Yokoyama:

Thank you for your letter of November 21, 2006, received in our office on December 8, 2006, requesting information on proposed or listed species or critical habitat that may occur in or near the proposed work area on Guam.

In evaluating your request, we reviewed the information you provided and examined pertinent information in our files. Information from these sources show no designated critical habitat in or near the proposed project area. However, there are wetland areas in the vicinity of the project area that may be occupied by both the federally-listed endangered Hawksbill turtle (*Eretmochelys imbricata*) and the threatened green sea turtle (*Chelonia mydas*) which have been documented nesting in Apra Harbor. Our records indicate that one of these nesting attempts was in close proximity to the proposed project site. In addition, the Mariana common moorhen (*Gallinula chloropus guami*) has been reported from Sumay Pond which is adjacent to Apra Harbor. We recommend that you contact the National Marine Fisheries Service regarding potential impacts to turtles in the waters near the proposed project area as the green sea turtle is within their jurisdiction.

We appreciate the opportunity to provide comments on the proposed project. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Dr. Peter Cohen (phone: 808/792-9409; fax: 808/792-9581).

Sincerely,

for Patrick Leonard
Field Supervisor

TAKE PRIDE IN AMERICA

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

November 21, 2006

Environmental Technical Branch
Engineering & Construction Division

Ms. Marily Luipold
NOAA Fisheries
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814

Dear Ms. Luipold:

The Port Authority of Guam with assistance from the U.S. Army Corps of Engineers, Honolulu District, is planning to improve the existing deep-draft wharf at the Apra Harbor Commercial Pier, Apra Harbor, Piti, Guam, for the purpose of accommodating today's largest deep-draft commercial cargo, passenger, and military vessels and to increase operational backland capacity for containerized cargo operations to meet the future demands for these services. Possible measures to be studied and implemented include the construction of a deep draft wharf covering approximately 7.46 acres, dredging approximately 180,621 cubic yards over 7.46 acres to a depth of 55 feet below mean sea level (MSL), and filling approximately 16.67 acres of intertidal habitat for backland. The study area as depicted in the enclosed map is located at approximately latitude 13°27'43" N and longitude 144°39'03" W.

We request a list of species and critical habitat under your jurisdiction as designated under the Endangered Species Act of 1973 as amended and marine mammals protected under the Marine Mammal Protection Act, which may be affected by this project. Should you have any questions, please contact Ms. Cindy Barger, Biologist, at telephone (808) 438-1232 or email cindy.s.barger@usace.army.mil.

Curtis I. Yokoyama, S.E., P.E.
Chief, Engineering and
Construction Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

November 21, 2006

Environmental Technical Branch
Engineering & Construction Division

Mr. Patrick Leonard
U.S. Fish and Wildlife Service
Pacific Islands Ecoregion
300 Ala Moana Blvd., Room 3-122
~~NOAA Fisheries~~
Box 50088
Honolulu, Hawaii 96850

Dear Ms. Leonard:

The Port Authority of Guam with assistance from the U.S. Army Corps of Engineers, Honolulu District, is planning to improve the existing deep-draft wharf at the Apra Harbor Commercial Pier, Apra Harbor, Piti, Guam, for the purpose of accommodating today's largest deep-draft commercial cargo, passenger, and military vessels and to increase operational backland capacity for containerized cargo operations to meet the future demands for these services. Possible measures to be studied and implemented include the construction of a deep draft wharf covering approximately 7.46 acres, dredging approximately 180,621 cubic yards over 7.46 acres to a depth of 55 feet below mean sea level (MSL), and filling approximately 16.67 acres of intertidal habitat for backland. The study area as depicted in the enclosed map is located at approximately latitude 13°27'43" N and longitude 144°39'03" W.

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Curtis I. Yokoyama, S.E., P.E.
Chief, Engineering and
Construction Division

Enclosures

DEPARTMENT OF AGRICULTURE
Division of Aquatic & Wildlife Resources
142 Dairy Road
Mangilao, Guam 96913
Phone: (671) 735-3955/56 Fax: (671) 734-6570

July 19, 2006

MEMORANDUM

To: Acting Fisheries Supervisor

From: Fish & Wildlife Technician II

Subject: Sea Turtle nest at Port Authority confirmed

On July 19th at 1:28pm I had proceeded to the Sea Plane ramp area for a routine check on the possible turtle nest found on May 10th of this year. I had calculated the possible nest to have hatched a week ago or so. As I was inspecting one of the nests I had found what appeared to be sea turtle egg casing fragments above the potential clutch area. Upon further inspection I extracted four sea turtle egg casings no deeper than 14 inches down.

I then stopped and contacted the DAWR administration office informing Mr. Alan Van Aken of the findings as well as the Fisheries staff. I had requested that several equipments be brought to the site for documenting this incident.

Fish & Wildlife Technician I, Renee Franquez arrived at the location approximately 2:23pm with the needed equiptment and started the documentation process as the inspection continued.

We have noticed a total of three possible nests in the vicinity of this short beach stretch. However, we had only confirmed one of the potential nests to have evidence confirming that this is a sea turtle nesting habitat.

Thus, one of the other potential nests was inspected and found to have no remnants of sea turtle egg casings or hatchling remains classifying this activity to be a false or a crawl.

The third potential nest had evidence of heavy foot traffic above the once a mound, and vegetation had been removed along that particular area. This made it very hard to locate the actual chamber (if one) containing egg casings or remains of sea turtle hatchlings which are usually found above this mound.

We had taken four of the carcasses for genetic analysis, including the lower jaw bone for species identification to the DAWR Fisheries office. I furthered the findings and had researched the jaw bone specimen with the NOAA Technical memorandum 470 (Anatomy of Sea Turtles) and deemed the species to belong to *Chelonia mydas* or green sea turtle. I had attached on the second page the comparison and the species identification findings.

In conclusion, Fish & Wildlife Technician Renee Franquez and I had determined one of the activities to be a true or real nest and the other one to be a false or crawl. Our findings are as follows:

GPS Location: N 13 27 86
E 144 39.68.9

Species: ***Chelonia mydas***

Total number of Egg casings (hatched): **79**

Total number of full term embryo's: **10**

Predated eggs: **1 with embryo ½ eaten**

Bringing the total clutch count to **90.**

Our findings during this site visit, and with thorough inspections to the potential nests concludes that it is evident that the displacement of sand, indentation marks on the vegetation and egg casings, including skeletal remains found in the mound (clutch) was created by a sea turtle.

Attachments (1)

Renee Franquez

Shawn Wusstig





APPENDIX K

Acoustical Study

ACOUSTICAL STUDY FOR THE APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION PROJECT

PITI, GUAM

Prepared for

WIL CHEE - PLANNING, INC.

Prepared by

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

JANUARY 2006

TABLE OF CONTENTS

CHAPTER	CHAPTER TITLE	PAGE NO
	List of Figures	ii
	List of Tables	iv
I	SUMMARY	1
II	PURPOSE	4
III	NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY	5
IV	GENERAL STUDY METHODOLOGY	9
V	EXISTING NOISE ENVIRONMENT	16
VI	DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS	36
VII	OTHER NON-TRAFFIC NOISE CONSIDERATIONS	39
	Construction Noise	39
	Vibration from Pile Driving	43
	On-Site Vehicles and Fixed Mechanical Equipment	47
APPENDICES		
A	REFERENCES	50
B	EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE	51
C	SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES	54

LIST OF FIGURES

NUMBER	FIGURE TITLE	PAGE NO.
1	PROJECT LOCATION MAP AND LOCATIONS OF PROPOSED HARBOR IMPROVEMENTS	2
2	LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY-NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED	7
3	LOCATIONS OF NOISE MEASUREMENT SITES IN THE APRA HARBOR ENVIRONS	10
4	HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF ROUTE 1 NORTH OF ROUTE 11 (APRIL 9-10, 2003)	14
5	HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF ROUTE 1 SOUTH OF ROUTE 11 (APRIL 9-10, 2003)	15
6	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "A" (1004 TO 1034 HOURS; 3/21/05)	17
7	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "B" (1050 TO 1150 HOURS; 3/21/05)	18
8	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "C" (1204 TO 1235 HOURS; 3/21/05)	20
9	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "D1" (1500 TO 1600 HOURS; 3/21/05)	21
10	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "D1" (1603 TO 1703 HOURS; 3/21/05)	23
11	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "D1" (1845 TO 1945 HOURS; 3/22/05)	25
12	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "E1" (1554 TO 1654 HOURS; 3/22/05)	27

LIST OF FIGURES (CONTINUED)

NUMBER	FIGURE TITLE	PAGE NO.
13	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "E1" (1854 TO 1954 HOURS; 3/23/05)	29
14	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "F" (0805 TO 0835 HOURS; 3/23/05)	31
15	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "G" (0846 TO 0916 HOURS; 3/23/05)	32
16	RANGES OF CONSTRUCTION EQUIPMENT NOISE LEVELS	40
17	ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE	41
18	RANGE OF MAXIMUM NOISE LEVELS (IN dBA) DURING PILE DRIVING WITHIN PROJECT AREA	42
19	MAXIMUM VIBRATION INTENSITIES EXPECTED FROM PILE DRIVING	46
20	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "YB1" (0850 TO 0906 HOURS; 11/4/03)	48
21	DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "YB2" (0917 TO 0932 HOURS; 11/4/03)	49

LIST OF TABLES

NUMBER	TABLE TITLE	PAGE NO.
1	EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)	6
2	TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS	11
3	EXISTING (CY 2005) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS ROADWAY SECTIONS (PM PEAK HOUR)	33
4	YEAR 2005 AND 2025 SETBACK DISTANCES TO 65 AND 70 DNL CONTOURS	34
5	FUTURE (CY 2025) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS ROADWAY SECTIONS (PM PEAK HOUR, WITH PROJECT)	37
6	CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2025) (PM PEAK HOUR)	38
7	AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE	44
8	SUMMARY OF BUILDING DAMAGE CRITERIA	45

CHAPTER I. SUMMARY

This noise study describes the potential noise impacts associated with implementation of the Apra Harbor Wharf Improvements and Land Reclamation Project. The specific projects included in this study were:

- The construction of a new, 1520 feet x 230 feet, deep draft wharf;
- Harbor dredging to 55 feet as required for the new deep draft wharf; and
- Land reclamation of 18.1 acres of submerged lands in three areas.

Figure 1 depicts the locations of the proposed improvements to Apra Harbor and includes the environs of Apra Harbor. The existing and future traffic noise levels in the vicinity of the harbor improvement project were evaluated for their potential noise impacts. The increases in future traffic noise levels with the implementation of the Apra Harbor Wharf Improvements and Land Reclamation project are predicted to range from 1.4 to 1.6 dB. The largest increases are predicted to occur along Route 1 north of Route 11 and at the harbor entrance gate. The smaller increases of 1.0 to 1.4 dB are predicted to occur along Route 1 south of Route 11 and along Route 11 west of Route 1. Although future traffic noise levels along the Route 1 are predicted to remain above the FHA/HUD standard of 65 DNL along the lots fronting those roadways, the proposed harbor improvement project should not contribute significantly (0.1 DNL) to future traffic noise levels along Route 1 by year 2025. With the proposed harbor improvement project, the high traffic noise levels along Route 1 will be controlled by non-project traffic and will exceed the FHA/HUD noise standard at distances of 157 to 165 feet from the highway centerline. Project traffic will be contributing approximately two percent of the total future traffic noise levels along Route 1. Because no significant traffic noise impacts are expected to result from the harbor improvements, traffic noise mitigation measures should not be required.

Other noise sources emanating from the site, such as from fixed mechanical equipment, gantry cranes, heavy trucks, mobile harbor equipment, and vessels have the potential for being audible at adjoining properties. The adjoining properties do not contain noise sensitive land uses. The available buffer distances between the harbor noise sources and the more distant residential areas are relatively large (approximately two miles), such that risks of adverse noise impacts from the harbor noise sources are considered to be low.

Unavoidable, but temporary, noise impacts may occur during the construction periods. Because noise from construction activities are predicted to be audible at adjoining properties where water sports activities are conducted, the quality of the acoustic environment may be degraded to unacceptable levels during periods of construction. Mitigation measures to minimize noise during the dredging, land reclamation, and wharf construction work at the harbor project sites are recommended.

PROJECT LOCATION MAP AND LOCATIONS OF PROPOSED HARBOR IMPROVEMENTS

FIGURE 1

Mitigation measures to reduce construction noise to inaudible levels may not be practical in all cases. Compliance with the Hawaii State Department of Health (DOH) noise regulations and applicable construction curfew periods are recommended to minimize construction noise impacts.

CHAPTER II. PURPOSE

The overall objective of this study was to describe the potential noise impacts associated with the proposed Apra Harbor Wharf Improvements and Land Reclamation Project, and to recommend noise mitigation measures as required. The specific projects included in this study were:

- The construction of a new, 1520 feet x 230 feet, deep draft wharf;
- Harbor dredging to 55 feet as required for the new deep draft wharf; and
- Land reclamation of 18.1 acres of submerged lands in three areas.

The additional objectives of this study were to describe the existing and future noise environment in the vicinity of the proposed Apra Harbor projects. Traffic noise level increases and impacts associated with the harbor improvement projects were to be determined within the project site as well as along the public roadways expected to service the project traffic. A specific objective was to determine future traffic noise level increases associated with both project and non-project traffic, and the potential noise impacts associated with these increases. Recommendations for minimizing these traffic noise impacts were also to be provided as required.

Assessments of future noise impacts from the proposed harbor activities and from temporary construction activities at the project sites were also included in the noise study objectives. Noise and vibration impacts during construction of the planned improvements, which could involve pile driving operations, were also to be evaluated. Evaluations of special noise mitigation measures associated with potential mechanical equipment noise emissions from the project site were also included in this study.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted Sound Levels as read on a standard Sound Level Meter. By definition, the minimum averaging period for the DNL descriptor is 24 hours. Additionally, sound levels which occur during the nighttime hours of 10:00 pm to 7:00 am are increased by 10 decibels (dB) prior to computing the 24-hour average by the DNL descriptor. A more complete list of noise descriptors is provided in Appendix B to this report.

Table 1, derived from Reference 1, presents current federal noise standards and acceptability criteria for residential land uses, which are located at relatively large distances (1.5 to 2 miles) from the Apra Harbor project areas. Land use compatibility guidelines for various levels of environmental noise as measured by the DNL descriptor system are shown in Figure 2. In general, the recommended noise levels for residences are lower than those for commercial and industrial uses. In the areas surrounding Apra Harbor, existing DNL levels generally range from 55 to 70 DNL, and are influenced by surf noise, motor vehicle traffic, and harbor vessels and equipment. These estimates of existing background ambient noise levels were based on noise measurements obtained during the month of March 2005.

For the purposes of determining noise acceptability for funding assistance from federal agencies [Federal Housing Administration/Housing and Urban Development (FHA/HUD) and the Veterans' Administration (VA)], an exterior noise level of 65 DNL or lower is considered acceptable. This standard is applied nationally (Reference 2), including Guam. Where naturally ventilated dwellings are used, relatively low exterior-to-interior sound attenuation result from these naturally ventilated structures, and an exterior noise level of 65 DNL does not eliminate all risks of noise impacts. Because of these factors, and as recommended in Reference 3, a lower level of 55 DNL is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 DNL, government agencies such as FHA/HUD and VA have selected 65 DNL as a more appropriate regulatory standard.

For commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL. The Apra Harbor and its immediately adjacent land areas include existing land uses and activities which fall within the commercial and industrial categories. These land uses and activities are not considered to be noise sensitive, and risks of adverse noise impacts within the harbor and its immediately adjacent areas are considered to be small.

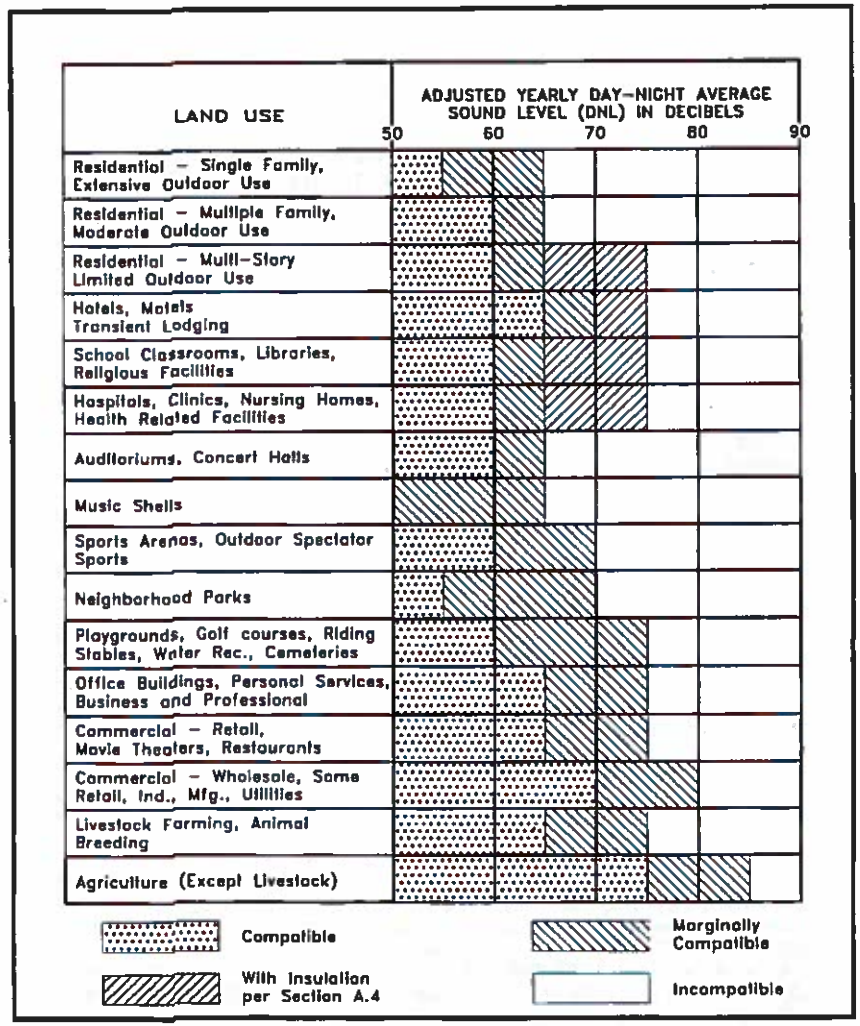
TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But Not Above 65 DNL	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 DNL But Not Above 75 DNL	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.



LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY–NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED.
(Source: American National Standards Institute S12.9–1998/Part 5)

FIGURE 2

In Hawaii, the State Department of Health (DOH) regulates noise from stationary mechanical equipment and from construction activities (see Reference 4). The Hawaii State DOH noise regulations (Reference 4) are considered to be an appropriate reference for regulation of noise during construction activities and for the regulation of noise from fixed mechanical equipment. The noise from ships and small water craft are not regulated by the DOH. Hawaii State DOH noise regulations concerning stationary mechanical equipment are expressed in maximum allowable property line noise limits rather than DNL (see Reference 4). For agricultural or industrial lands, the allowable limits are 70 dBA for daytime and nighttime periods along the property boundaries. The daytime period is defined to be from 7:00 am to 10:00 pm, and the nighttime period is considered to be the remaining hours by the DOH rules. For properties zoned for apartment, hotel, or business uses, the applicable DOH property line noise limits are 60 and 50 dBA during the daytime and nighttime periods, respectively. For single family residences, public and open spaces, and preservation zoned lands, the daytime and nighttime DOH limits are 55 and 45 dBA, respectively. Although they are not directly comparable to noise criteria expressed in DNL, Hawaii State DOH noise limits for residential, commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively. In general, the lower noise limits would only apply to harbor lands which are zoned for activities other than industrial or agricultural uses.

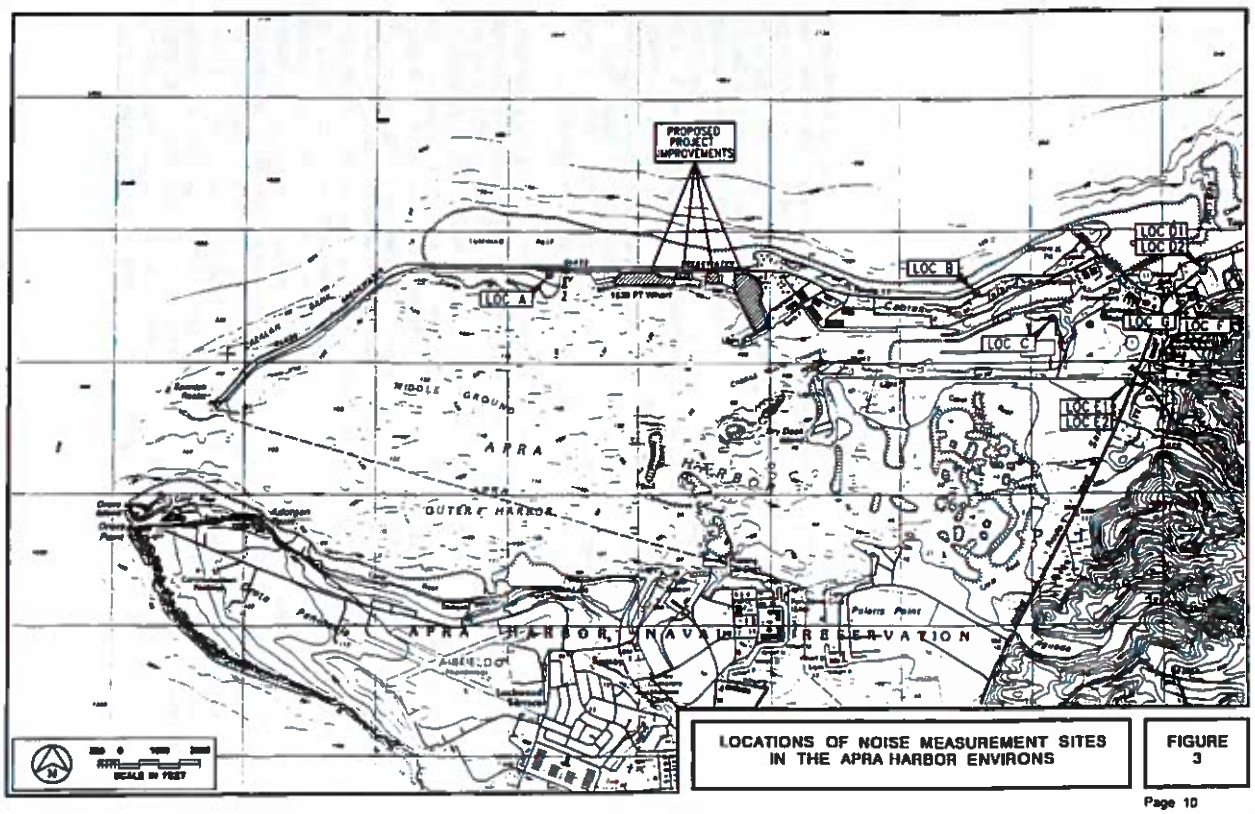
It should be noted that the noise compatibility guidelines and relationships to the DNL noise descriptor may not be applicable to impulsive noise sources. The use of penalty factors (such as adding 10 dB to measured sound levels or the use of C-Weighting filters) have been proposed. However, the relationships between levels of impulsive noise sources and land use compatibility have not been as firmly established as have the relationships for non-impulsive sources. Impulsive noise sources tend to be more detectable and are more likely to cause noise complaints than steady noise sources, particularly if they are repetitive. Examples of impulsive noise sources are impact pile drivers, back-up warning alarms, and hoe rams. The Hawaii State DOH limits for impulsive sounds which exceed 120 impulses in any 20 minute period are 10 dB above the limits for non-impulsive sounds. If impulsive sounds do not exceed 120 impulses in any 20 minute time period, there are no regulatory limits on their sound levels under the Hawaii State DOH regulations.

CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing traffic and background ambient noise levels were measured at nine locations in the Apra Harbor environs to provide a basis for describing existing noise levels and for developing the project's traffic noise contributions along the public roadways which will service the proposed harbor project. The locations of the measurement sites are shown in Figure 3. Noise measurements were performed during the month of March 2005.

The traffic noise measurement results at Locations "B," "D1," "D2," "E1," and "E2" and their comparisons with computer model predictions of the corresponding traffic noise levels for the traffic volumes observed are summarized in Table 2. At these five traffic noise measurement locations, the results of the noise measurements were compared with model calculations of existing traffic noise levels as shown in Table 2 so as to validate the computer model used. Traffic noise calculations for the existing conditions as well as noise predictions for the year 2025 following implementation of the proposed Apra Harbor Project were performed using the Federal Highway Administration (FHWA) Noise Prediction Model, Version 2.5 (Reference 5). Traffic data entered into the noise prediction model were: hourly traffic volumes, average vehicle speeds, and estimates of traffic mix. The traffic assignments for the project (Reference 6) and Guam Department of Public Works, Highway Planning traffic counts on Route 1 north and south of the Route 11 intersection (Reference 7) were the primary sources of data inputs to the model. For existing and future traffic without the project, it was assumed that the pm peak hour Leq(h) [Equivalent Sound Level] was 0.5 dB less than the 24-hour DNL. This assumption was based on computations of the hourly Leq and 24-hour DNL of traffic noise along Route 1 north and south of the Route 11 intersection (see Figures 4 and 5). Traffic noise levels for existing and future conditions in the project environs were developed for the worst case condition of a receptor without the benefit of shielding effects. The projected increases in traffic noise levels attributable to project-related traffic were calculated, and noise impact risks evaluated. The relative contributions of non-project and project-related traffic to the total noise levels were also calculated, and an evaluation of possible traffic noise impacts was made.

The possibility of adverse noise impacts from planned harbor activities were also evaluated. Measured background noise levels at a tourist jet ski area, small boat harbor, middle school, and residential area of Piti were obtained at Sites "A," "C," "F," and "G" where shown in Figure 3. Predicted sound levels from harbor activities at these receptor locations were compared with the noise limits of the State Department of Health (DOH) noise regulation (Reference 4). Additionally, noise levels from on-site construction activities were also estimated to assess the risks of adverse noise impacts at the neighboring properties due to short-term construction activities.



LOCATIONS OF NOISE MEASUREMENT SITES IN THE APRA HARBOR ENVIRONS

FIGURE 3

Page 10

TABLE 2
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A At Vacant Charles Marine Sport Club (West of Family Beach) (3/21/05)	1004 TO 1034	N/A	N/A	N/A	N/A	54.5	N/A
B 50 FT from the centerline of Route 11 (3/21/05)	1050 TO 1150	40	231	19	49	66.1	66.1
C At Small Boat Harbor (East End of Apra Harbor) (3/21/05)	1204 TO 1235	N/A	N/A	N/A	N/A	52.8	N/A
D1. 50 FT from the centerline of Route 1 North of Route 11 (3/21/05)	1500 TO 1600	50	1,601	20	68	73.8	73.6
D2. 100 FT from the centerline of Route 1 North of Route 11 (3/21/05)	1500 TO 1600	50	1,601	20	68	65.5	65.5
D1. 50 FT from the centerline of Route 1 North of Route 11 (3/21/05)	1603 TO 1703	48	2,282	26	47	74.8	74.8

TABLE 2 (CONTINUED)
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
D2. 100 FT from the centerline of Route 1 North of Route 11 (3/21/05)	1603 TO 1703	48	2,282	26	47	66.4	66.4
D1. 50 FT from the centerline of Route 1 North of Route 11 (3/22/05)	0645 TO 0745	50	2,084	12	16	74.3	73.2
D2. 100 FT from the centerline of Route 1 North of Route 11 (3/22/05)	0645 TO 0745	50	2,084	12	16	66.8	65.3
E1. 50 FT from the centerline of Route 1 South of Route 11 (3/22/05)	1555 TO 1655	50	2,068	27	20	73.0	73.1
E2. 100 FT from the centerline of Route 1 South of Route 11 (3/22/05)	1555 TO 1655	50	2,068	27	20	65.2	65.3
E1. 50 FT from the centerline of Route 1 South of Route 11 (3/23/05)	0655 TO 0755	50	1,956	13	23	74.6	73.8

TABLE 2 (CONTINUED)
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
E2. 100 FT from the centerline of Route 1 South of Route 11 (3/23/05)	0655 TO 0755	50	1,956	13	23	66.7	65.6
F. West of Jose L.G. Rios Middle School (3/23/05)	0805 TO 0834	N/A	N/A	N/A	N/A	51.0	N/A
G. 255 FT from the center-line of Hwy. 1 at Piti (3/23/05)	0846 TO 0915	N/A	N/A	N/A	N/A	59.7	N/A

FIGURE 4

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF ROUTE 1 NORTH OF ROUTE 11 (APRIL 9 – 10, 2003)

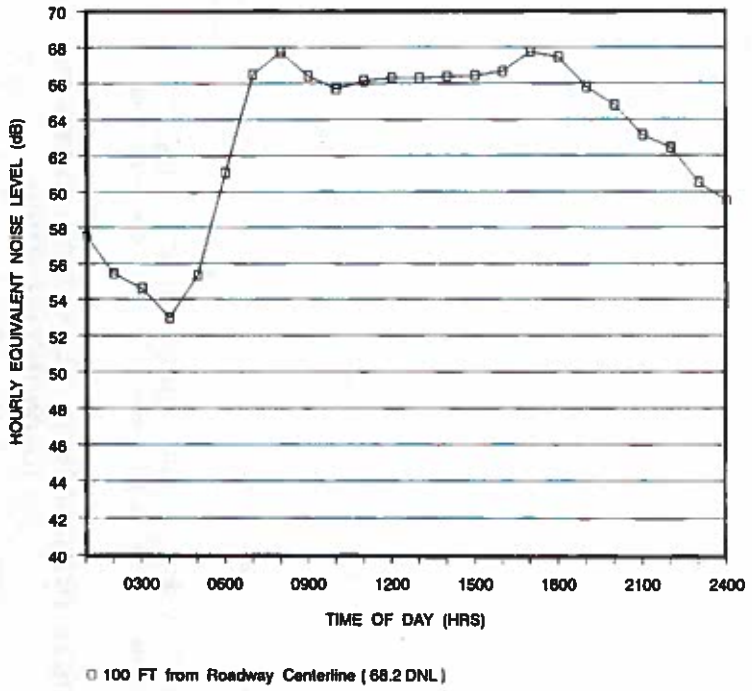
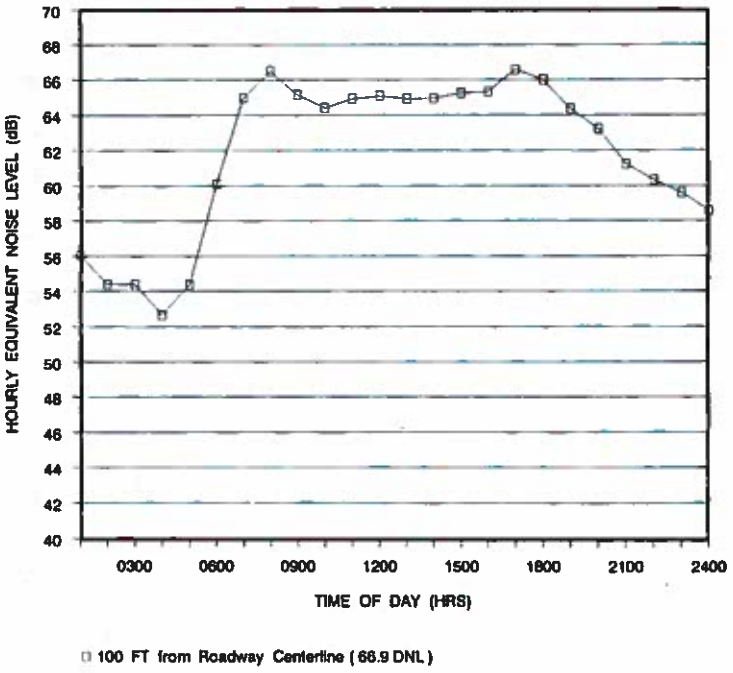


FIGURE 5

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF ROUTE 1 SOUTH OF ROUTE 11 (APRIL 9 – 10, 2003)



CHAPTER V. EXISTING NOISE ENVIRONMENT

The existing traffic noise levels in the project environs are in the "Significant Exposure, Normally Unacceptable" category for noise sensitive activities at the lots which front Route 1. For commercial and industrial uses, existing traffic noise levels along Route 1 are in the "Compatible" and "Marginally Compatible" categories. Along Route 11, where existing uses are primarily commercial and industrial, existing traffic noise levels are also in the "Compatible" and "Marginally Compatible" categories. Traffic noise levels along the Right-of-Way of a roadway generally represent the worst case (or highest) levels due to the proximity of the Right-of-Way to the noise sources.

Table 2 and Figures 6 through 15 present the traffic and background noise levels measured in the environs of Apra Harbor and along the primary access roads to Apra Harbor. Typically, instantaneous traffic noise levels from passing vehicles exceed 70 dBA at 50 feet distance, and those from the louder vehicles (such as diesel trucks) exceed 80 dBA. Along Route 1, the louder heavy trucks, motorcycles, pickup trucks, cars, and sirens exceeded 90 dBA at 50 feet distance from the highway centerline. At 100 feet distance from the centerline of Route 1, traffic noise levels were approximately 8 dBA less than those measured at 50 feet distance. At locations removed from Route 1 and Route 11, existing background noise levels range from 45 to 50 dBA during the quiet periods. At these locations, where highway noise is not a dominant noise source, the sounds of jet skis, local motor vehicle traffic, roosters, and birds are audible at sound levels ranging from 60 to 75 dBA.

Calculations of existing traffic noise levels during the pm peak traffic hour at 50, 100, and 200 feet from the centerlines of the various roadways are presented in Table 3. The hourly Leq (or Equivalent Sound Level) contribution from each roadway section in the project environs was calculated for later comparison with forecast traffic noise levels with and without the project. In Table 3, the existing mixes of the automobile (Autos), medium truck (M Trucks) and heavy vehicle (H Trucks) traffic components are shown in the table. The existing setback distances from the roadways' centerlines to their associated 65 and 70 DNL contours were also calculated as shown in Table 4. The contour line setback distances do not take into account noise shielding effects or the additive contributions of traffic noise from intersecting street sections. However, as indicated previously, the setback distances to the 65 DNL (or FHA/HUD noise standard) contour lines are very large for Route 1 and Route 11.

Existing background ambient noise levels at noise sensitive receptor locations closest to Apra Harbor are controlled by traffic noise because they are located along Route 1. Average traffic noise levels in the project environs typically remain relatively steady during the daylight hours from 6:00 am and through the evening hours until 6:00 pm. After 6:00 pm, average traffic noise levels decline to their lowest levels at about 3:00 am the next morning. The traffic noise level during the daytime hours typically ranges between 64 to 68 dB at 100 feet from the roadway centerline, and declines to a

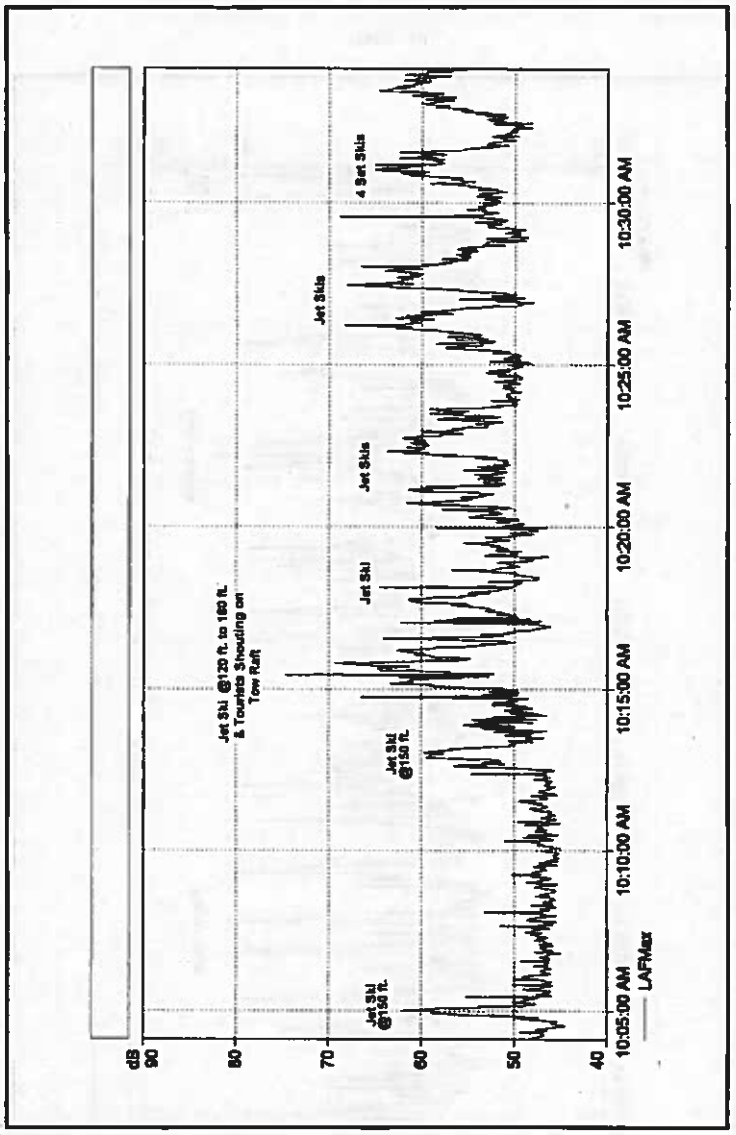
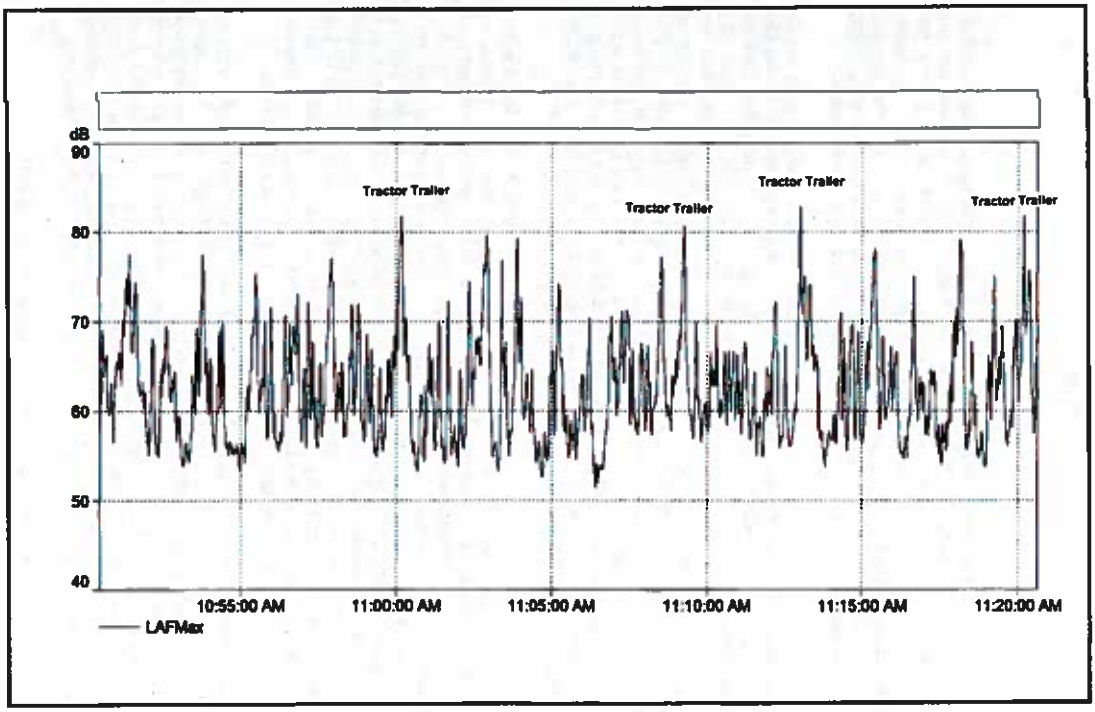


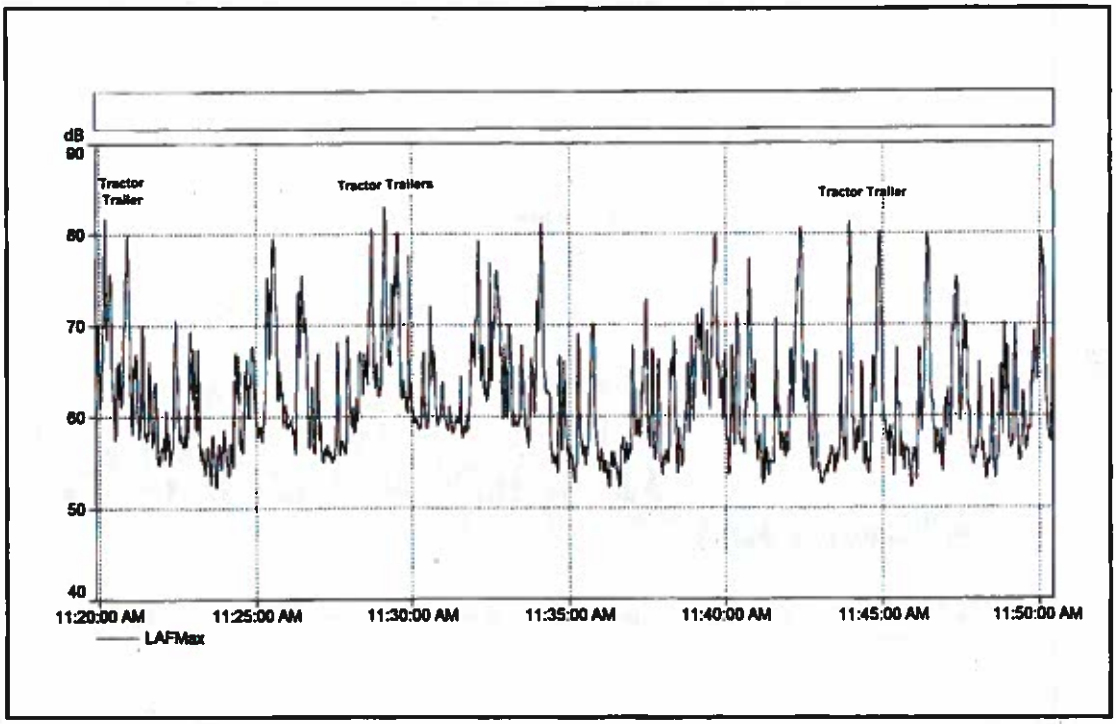
FIGURE 6

DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "A" (1004 TO 1034 HOURS; 3/21/05)



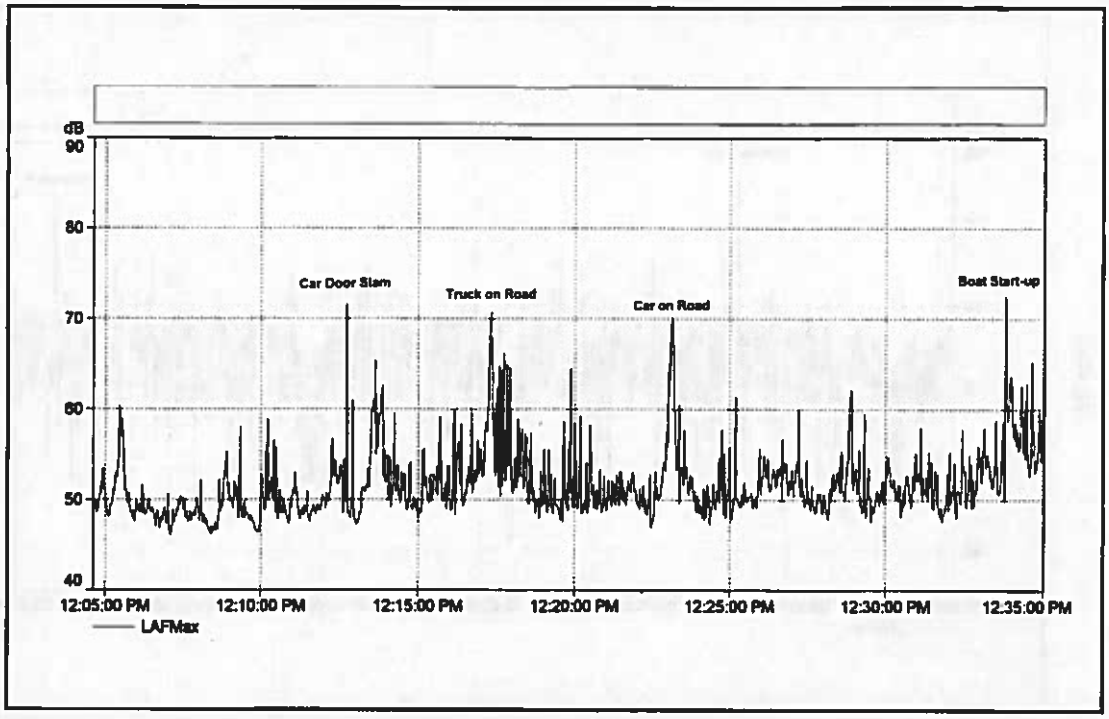
DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "B" (1050 TO 1150 HOURS; 3/21/05)

FIGURE 7



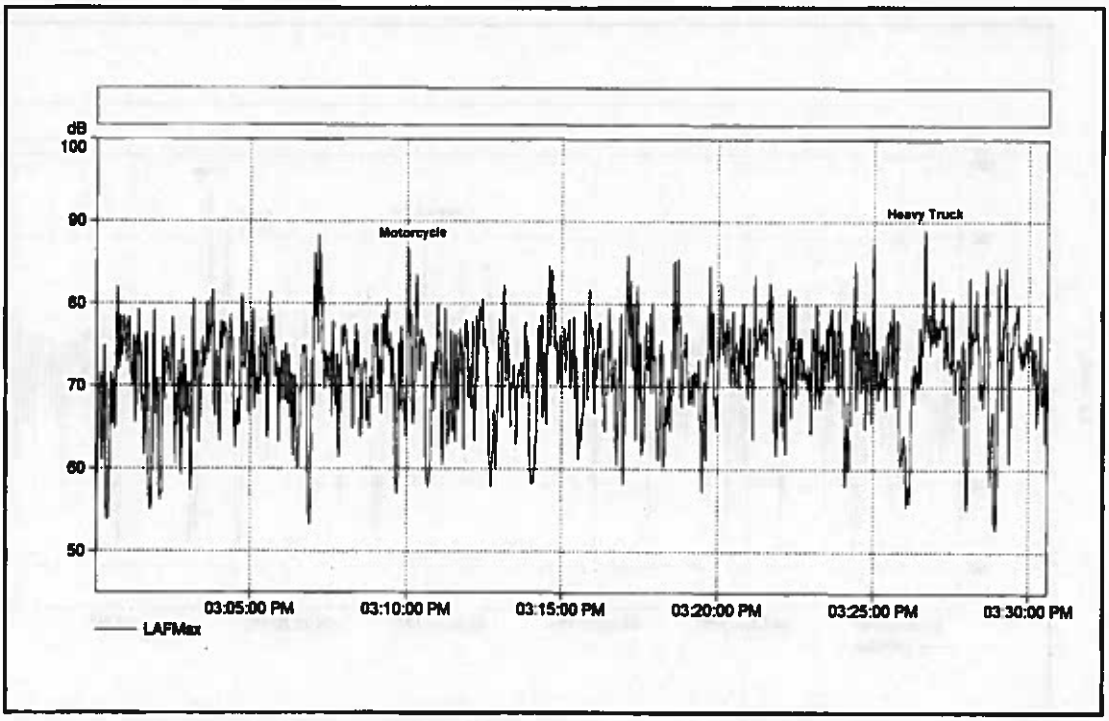
DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "B" (1050 TO 1150 HOURS; 3/21/05)

FIGURE 7(CONT.)



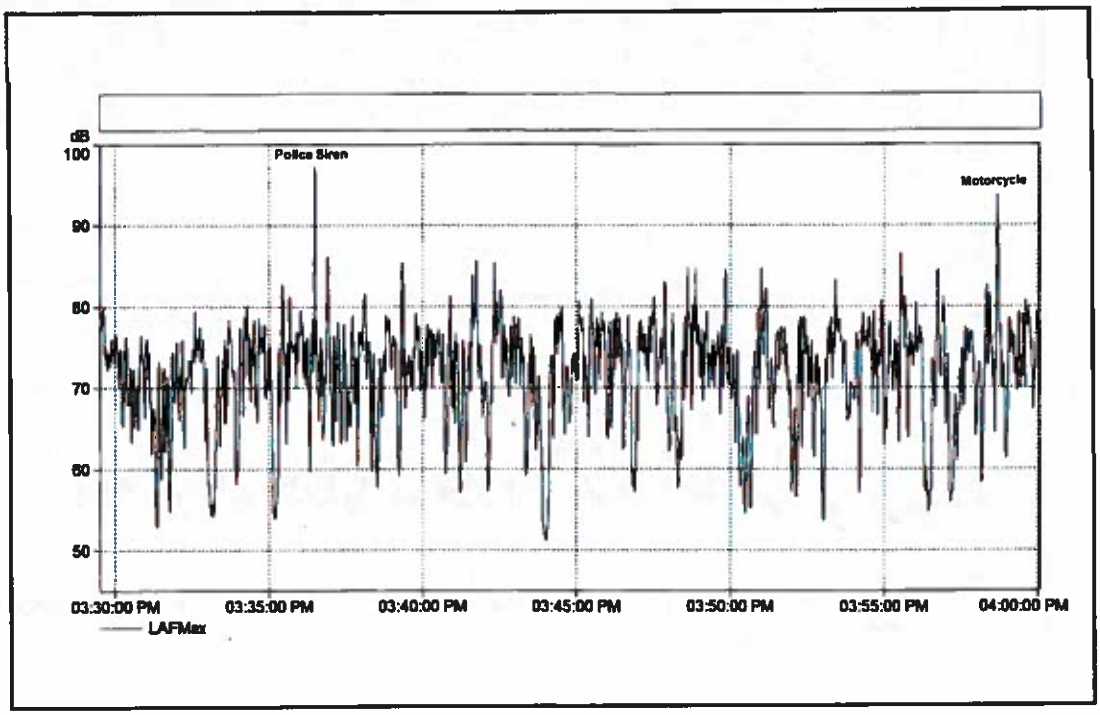
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "C" (1204 TO 1235 HOURS; 3/21/05)

FIGURE 8



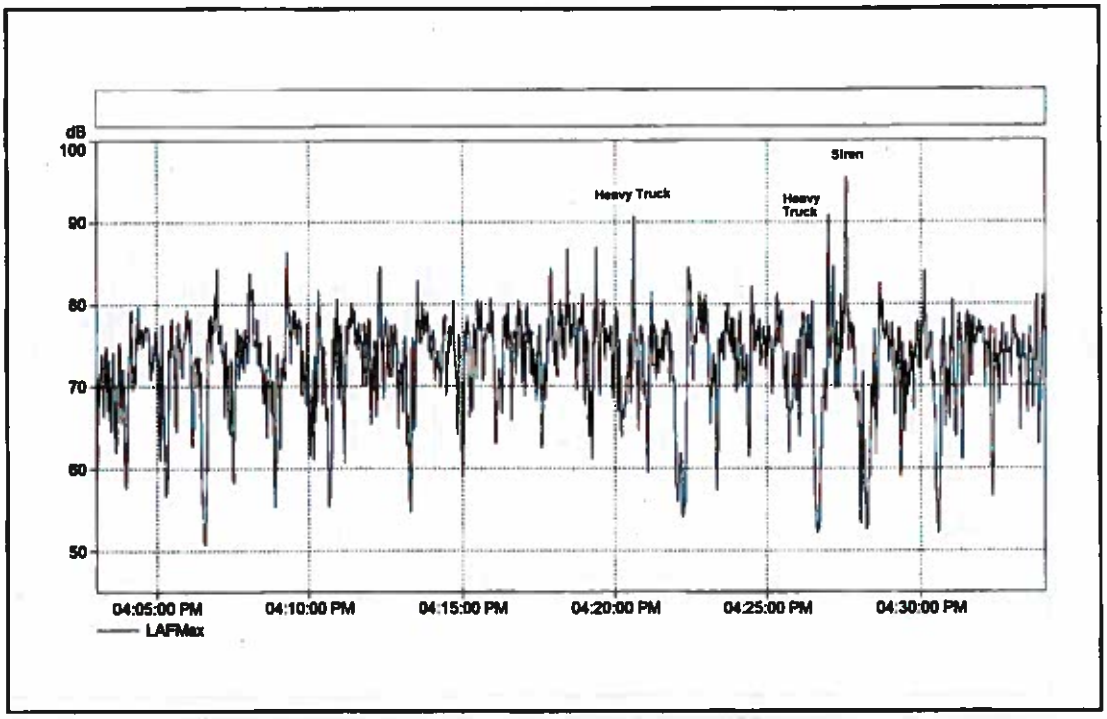
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1500 TO 1600 HOURS; 3/21/05)

FIGURE 9



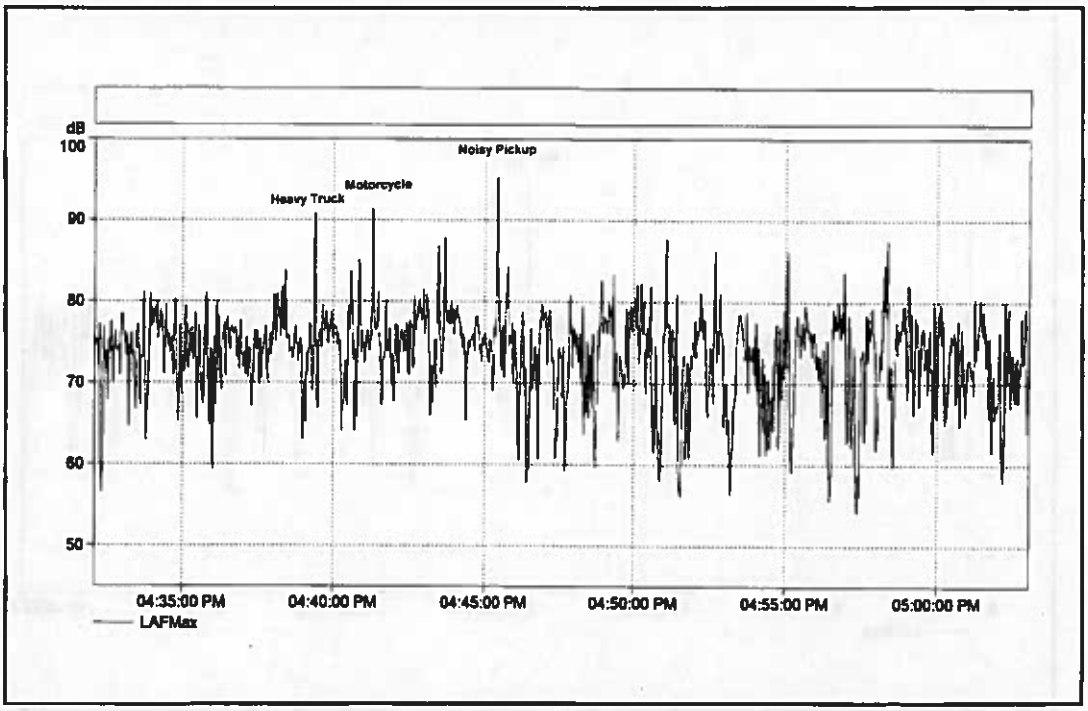
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1500 TO 1600 HOURS; 3/21/05)

FIGURE
9(CONT.)



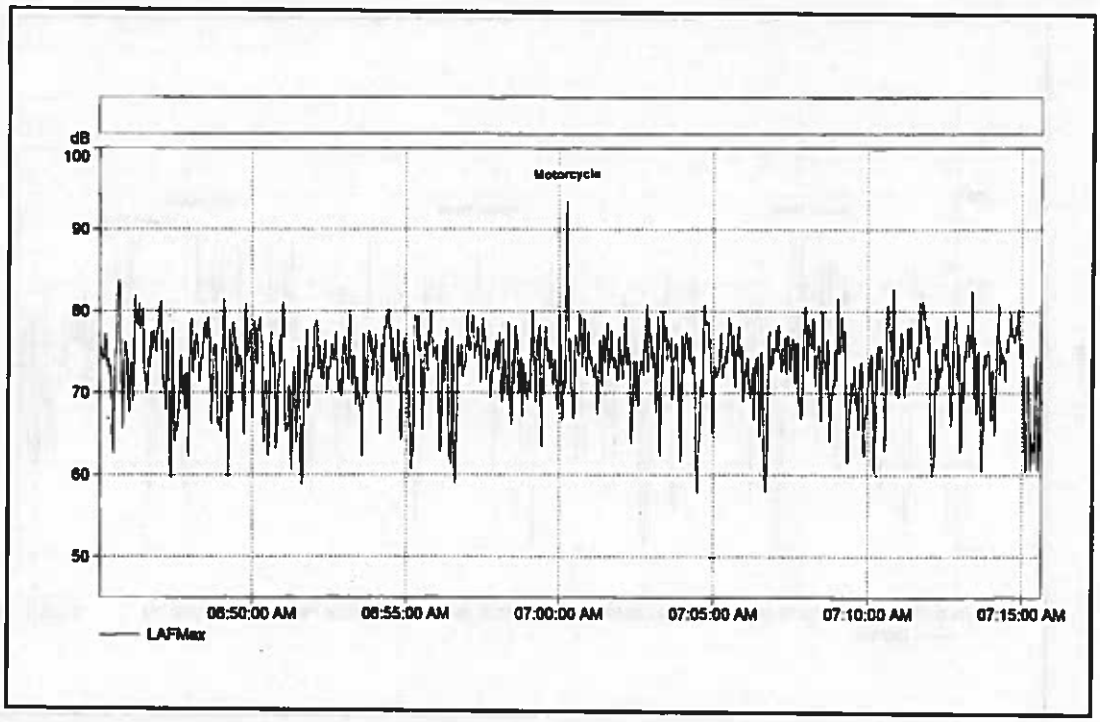
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1603 TO 1703 HOURS; 3/21/05)

FIGURE
10



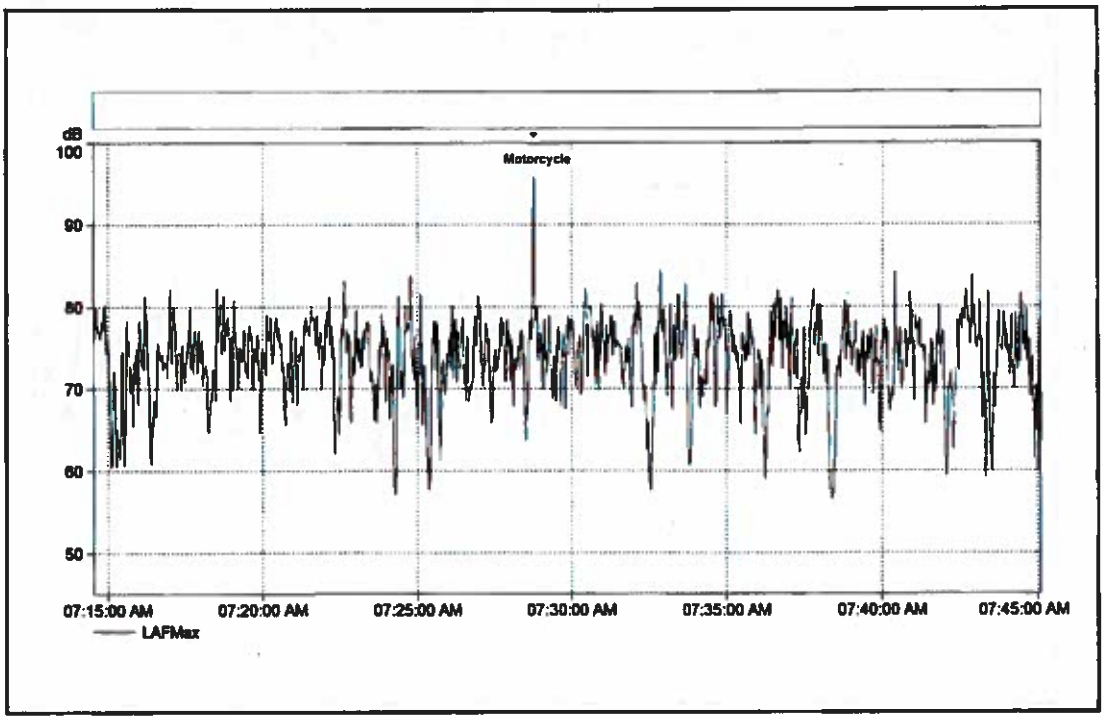
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1603 TO 1703 HOURS; 3/21/05)

FIGURE
10(CONT.)



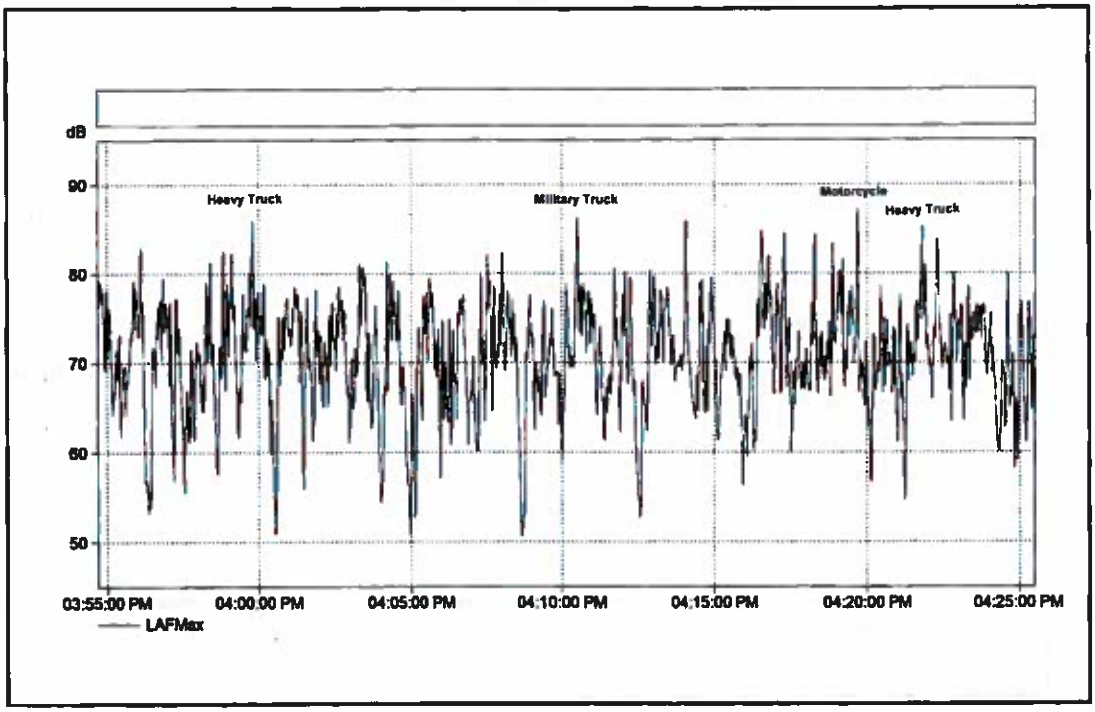
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1845 TO 1945 HOURS; 3/22/05)

FIGURE
11



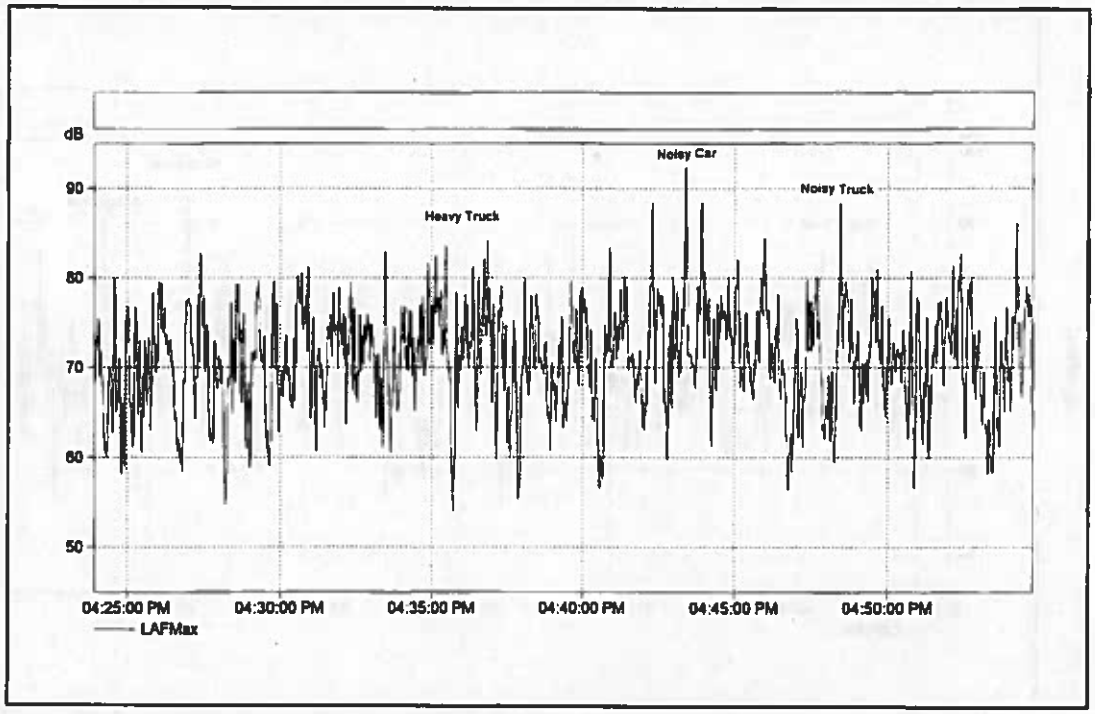
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1845 TO 1945 HOURS; 3/22/05)

FIGURE
11(CONT.)



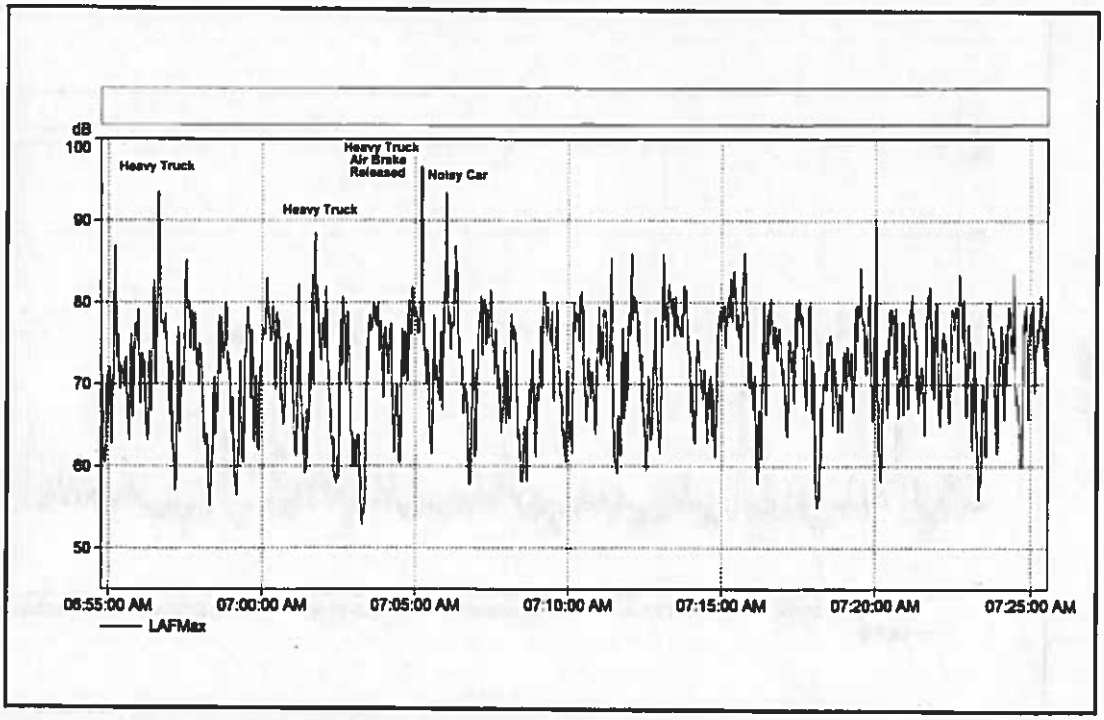
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "E1" (1554 TO 1654 HOURS; 3/22/05)

FIGURE
12



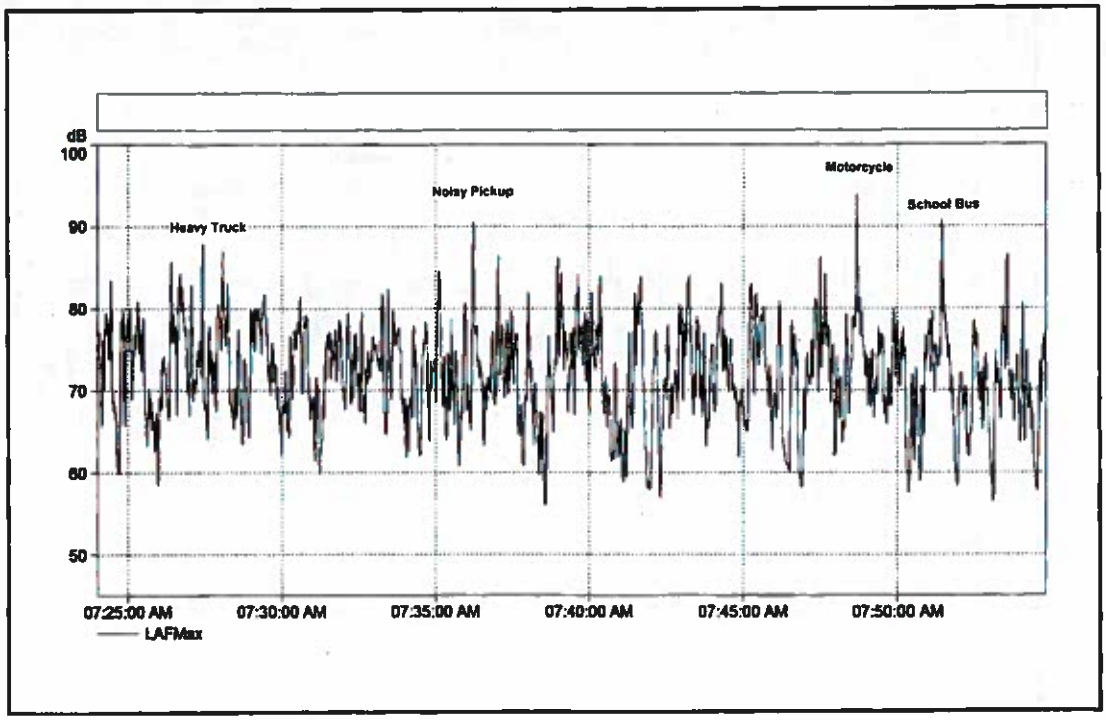
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "E1" (1554 TO 1654 HOURS; 3/22/05)

FIGURE
12(CONT.)



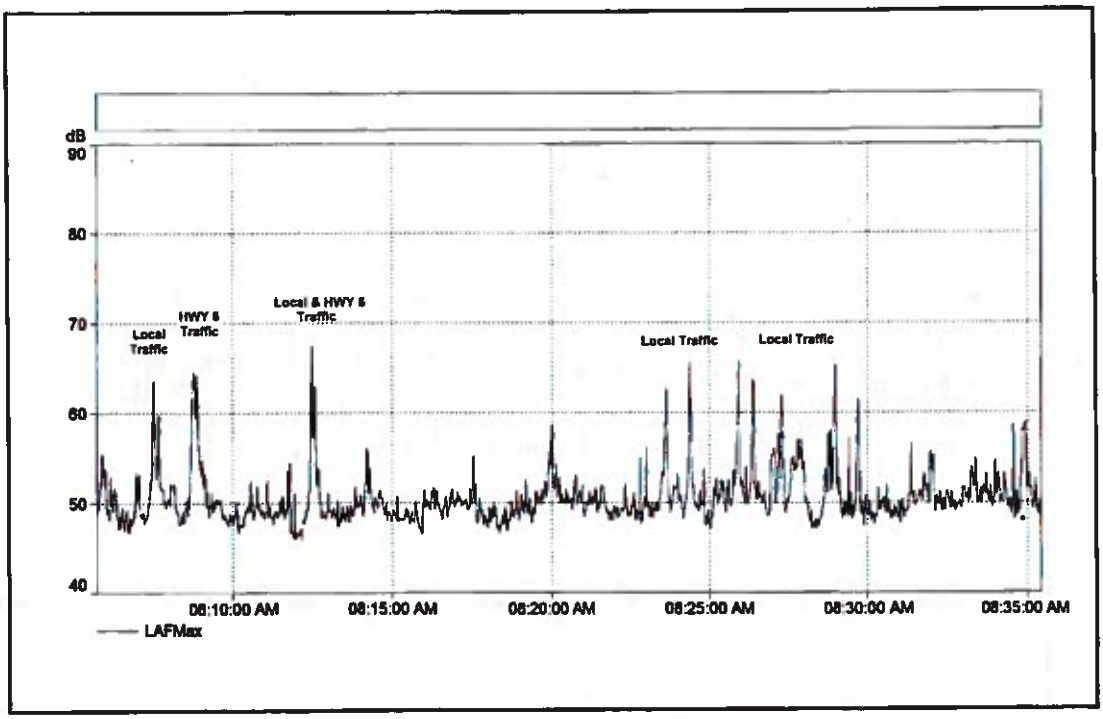
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "E1" (1854 TO 1954 HOURS; 3/23/05)

FIGURE
13



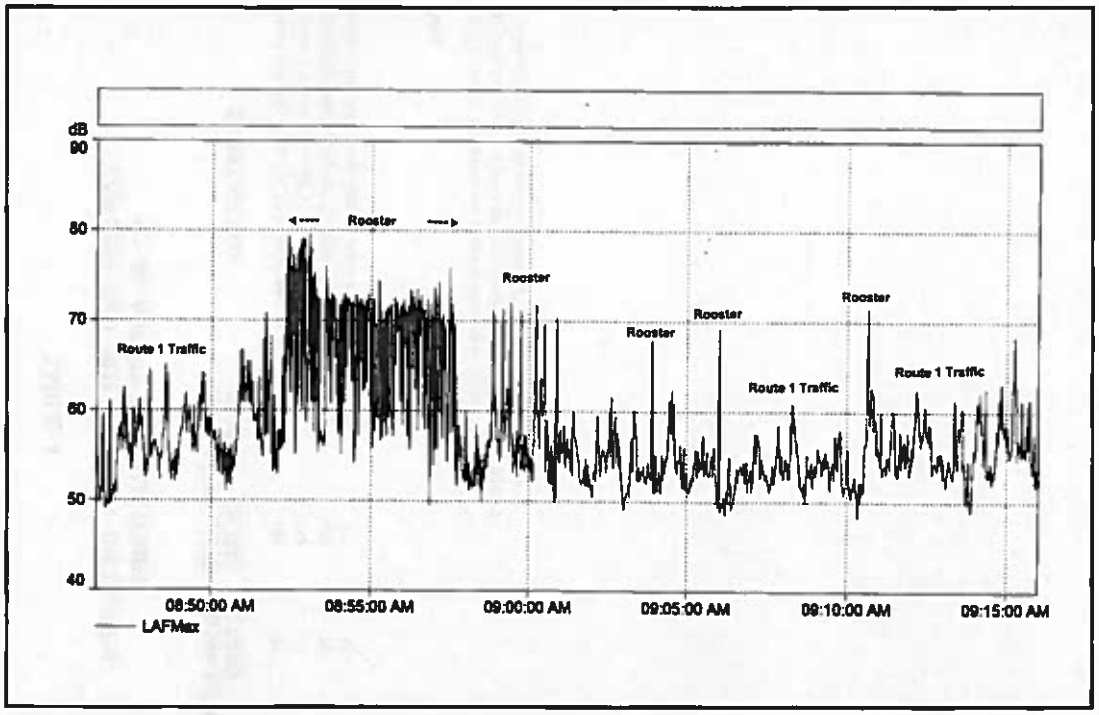
DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "E1" (1854 TO 1954 HOURS; 3/23/05)

FIGURE
13(CONT.)



DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "F" (0805 TO 0835 HOURS; 3/23/05)

FIGURE
14



DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "G" (0846 TO 0916 HOURS; 3/23/05)

FIGURE 15

TABLE 3

EXISTING (CY 2005) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS ROADWAY SECTIONS (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********** VOLUMES (VPH) ********** AUTOS	M.TRUCKS	H.TRUCKS	50' Leq	100' Leq	200' Leq
Route 1 North of Route 11 Intersection	50	2,605	2,521	25	59	75.1	67.1	61.4
Route 1 South of Route 11 Intersection	50	2,680	2,612	40	28	75.1	67.1	61.4
Route 11 West of Route 1 Intersection	40	485	374	31	80	68.3	64.8	61.9
Route 11 At Entrance Gate to Apra Harbor	25	270	209	17	44	63.5	60.1	57.4

Notes.

1. Traffic mix assumed for Route 1 north of Route 11 intersection: 96.7 percent autos; 1.0 percent medium trucks, and 2.3 percent heavy trucks and buses.
2. Traffic mix assumed for Route 1 south of Route 11 intersection: 97.5 percent autos; 1.5 percent medium trucks, and 1.0 percent heavy trucks and buses.
3. Traffic mix assumed for Route 11: 77.2 percent autos; 6.4 percent medium trucks, and 16.4 percent heavy trucks and buses.

TABLE 4

YEAR 2005 AND 2025 SETBACK DISTANCES TO 65 AND 70 DNL CONTOURS

STREET SECTION	65 DNL SETBACK (FT) CY 2005	65 DNL SETBACK (FT) CY 2025	70 DNL SETBACK (FT) CY 2005	70 DNL SETBACK (FT) CY 2025
Route 1 North of Route 11 Intersection	137	165	81	93
Route 1 South of Route 11 Intersection	137	157	81	91
Route 11 West of Route 1 Intersection	107	135	39	48
Route 11 At Entrance Gate to Apra Harbor	41	57	15	20

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See Tables 3 and 5 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.

value between 52 and 54 dB during the quietest hour near 3:00 am. This pattern of relatively high traffic noise levels during the daytime followed by a declining period to 3:00 am is a typical characteristic, and is depicted in Figures 4 and 5.

In the Piti residential area east of Apra Harbor, such as at Locations "F" and "G", existing background noise levels are controlled by local traffic, distant highway traffic, and roosters, with average noise levels ranging between 50 to 60 Leq. For existing residences beyond 250 feet from Route 1, existing background noise levels are estimated to be between 55 to 65 DNL. Figures 14 and 15 depict the typical noise levels associated with passing motor vehicles, distant highway traffic, and roosters at Locations "F" and "G".

VI. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS

The future traffic noise levels in the immediate vicinity of Apra Harbor during CY 2025 were evaluated for the No Build and Build Alternatives. The same methodology that was used to calculate the Base Year noise levels was also used to calculate the year 2025 noise levels. Appendix C contains the am and pm peak hour traffic volumes used for the No Build and Build Alternatives. Under both the No Build and Build Alternatives, average vehicle speeds and traffic mix were assumed to be identical to the Base Year values.

Table 5 presents the CY 2025 traffic volumes, speeds, mixes, and noise levels for the Build Alternative during the pm peak hour along the roadways which are expected to service Apra Harbor. The increases in setback distances to the 65 and 70 DNL contours from CY 2005 to CY 2025 are shown in Table 4 for conditions with the project. Table 6 presents the predicted increases in future traffic noise levels associated with project and non-project traffic. Traffic noise levels along Route 1 were predicted to increase by 1.4 to 1.6 dB between CY 2005 and CY 2025 primarily as a result of non-project traffic volume increases. Traffic noise levels along Route 11 were predicted to increase by 1.0 to 1.6 dB between CY 2005 and CY 2025 primarily as a result of project traffic volume increases. Without the proposed project, future traffic along Route 11 were assumed to be identical to base year values. Therefore, all future increases in traffic noise along Route 11 were attributable to the proposed project. Along the other roadways which service Apra Harbor, future traffic noise level increases range from 1.4 to 1.6 dB, which are considered to be minimal, and will be difficult to perceive over the 20 year forecast period.

Risks of adverse traffic noise impacts attributable to the Apra Harbor Wharf Improvements and Land Reclamation Project along Route 1, Route 11, and along the harbor entrance road are considered to be very low. The future total increases in traffic noise levels from both project and non-project traffic will be relatively small and difficult to measure over a 20 year period. Along Route 1, where existing traffic noise levels are high and where some existing residences are located within the 65 DNL contour, future traffic noise increases are primarily attributable to non-project traffic. Along Route 11, where future traffic noise increases are primarily attributable to project traffic, existing land uses are primarily commercial and industrial. For these reasons, traffic noise mitigation measures should not be required for the Apra Harbor Wharf Improvements and Land Reclamation Project.

TABLE 5

FUTURE (CY 2025) TRAFFIC VOLUMES AND NOISE LEVELS
ALONG VARIOUS ROADWAY SECTIONS
(PM PEAK HOUR, WITH PROJECT)

LOCATION	SPEED (MPH)	TOTAL VPH	******** VOLUMES (VPH) ********** AUTOS	M.TRUCKS	H.TRUCKS	50' Leq	100' Leq	200' Leq
Route 1 North of Route 11 Intersection	50	3,715	3,595	36	84	76.7	68.6	62.9
Route 1 South of Route 11 Intersection	50	3,800	3,703	57	40	76.5	68.4	62.4
Route 11 West of Route 1 Intersection	40	605	467	39	99	69.3	65.7	62.9
Route 11 At Entrance Gate to Apra Harbor	25	390	301	25	64	65.1	61.7	59.0

Notes:

1. Traffic mix assumed for Route 1 north of Route 11 intersection: 96.7 percent autos, 1.0 percent medium trucks, and 2.3 percent heavy trucks and buses.
2. Traffic mix assumed for Route 1 south of Route 11 intersection: 97.5 percent autos, 1.5 percent medium trucks, and 1.0 percent heavy trucks and buses.
3. Traffic mix assumed for Route 11: 77.2 percent autos, 6.4 percent medium trucks, and 16.4 percent heavy trucks and buses.

TABLE 6

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2025) (PM PEAK HOUR)

STREET SECTION	NOISE LEVEL (DB) NON-PROJECT TRAFFIC	INCREASE DUE TO PROJECT TRAFFIC
Route 1 North of Route 11 Intersection	1.5	0.1
Route 1 South of Route 11 Intersection	1.3	0.1
Route 11 West of Route 1 Intersection	0.0	1.0
Route 11 At Entrance Gate to Apra Harbor	0.0	1.6

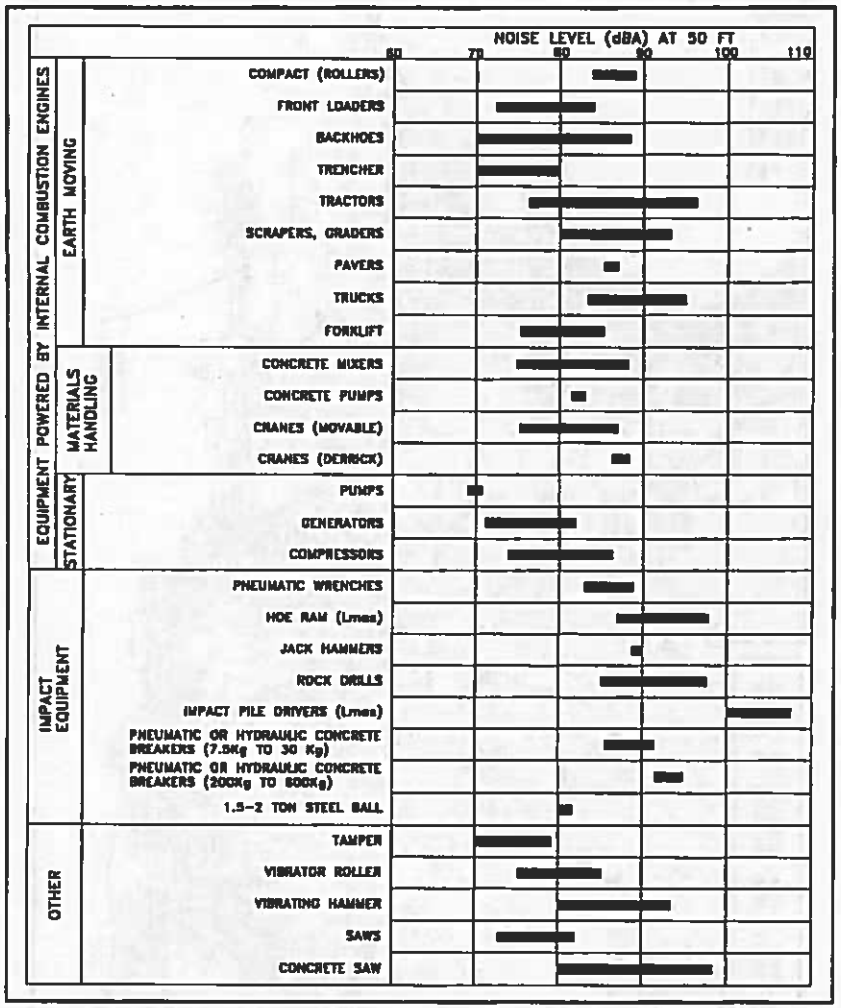
Construction Noise. Audible construction noise will be unavoidable during the construction of the planned harbor improvement projects. Typical levels of noise during the noisier phases of construction activity (excluding pile driving activity) are shown in Figures 16 and 17. The impulsive noise levels of impact pile drivers are approximately 15 dB higher than the levels shown in Figure 17, while the intermittent noise levels of vibratory pile drivers are at the upper end of the noise level ranges depicted in the figure. Figure 18 depicts the predicted range of noise levels outdoors within the surrounding communities during pile driving activities at Apra Harbor in the vicinity of the proposed 1,520 foot wharf. Indoors, typical levels of pile driving noise within naturally ventilated and air conditioned structures are approximately 10 and 22 dB less, respectively, than the outdoor levels shown in the figure. The noise levels from other construction activities (dredging, pier construction, paving, etc.) are expected to be approximately 15 dB lower than the values shown in Figure 18.

Noise impacts are not anticipated during construction activities at existing residential areas east and south of Apra Harbor. Maximum noise levels during pile driving activities are expected to remain below 50 dB at the closest residential areas of Piti to the east and at the U.S. Naval Base to the south. Noise levels during other construction operations are predicted to be 15 dB less than those shown in Figure 18.

The jet ski and other water sports activities west of the proposed 1,520 foot wharf are expected to experience the higher construction noise levels, with impulsive noise levels of approximately 72 dB during pile driving activities. Construction noise levels are predicted to be less than 70 DNL and in the "Marginally Compatible" category for water sports activities (see Figure 2).

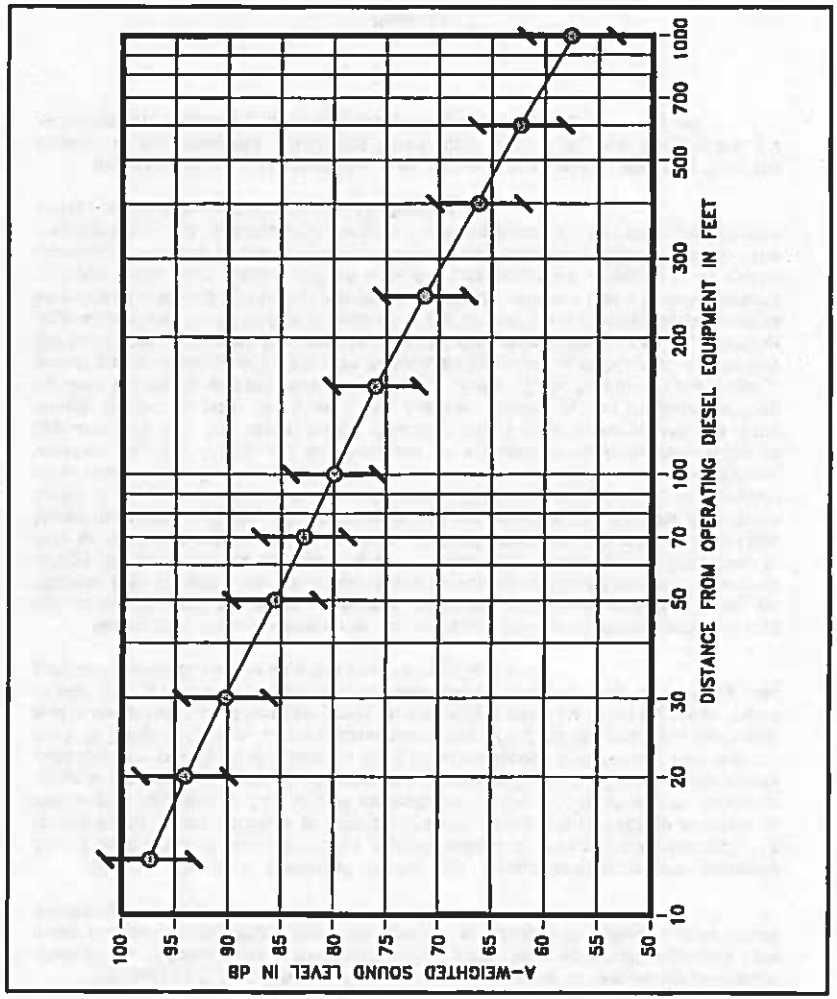
Mitigation of construction noise to inaudible levels may not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), due to the relatively low background ambient noise levels in the surrounding communities, and due to the exterior nature of the work (pile driving, jack hammering, earth moving, dredging, trenching, concrete pouring, hammering, etc.). The added noise during construction may result in the temporary degradation of the acoustical environments of the surrounding communities. Therefore, the following noise mitigation measures should be implemented if determined to be feasible:

- The use of properly muffled construction equipment should be required on the job site.
- Reduction of pile driving noise may be possible, if soil conditions allow, through the use of vibratory pile driving equipment rather than impact pile drivers.
- The incorporation of Hawaii State Department of Health construction noise limits and curfew times during the construction phases of this project is another noise



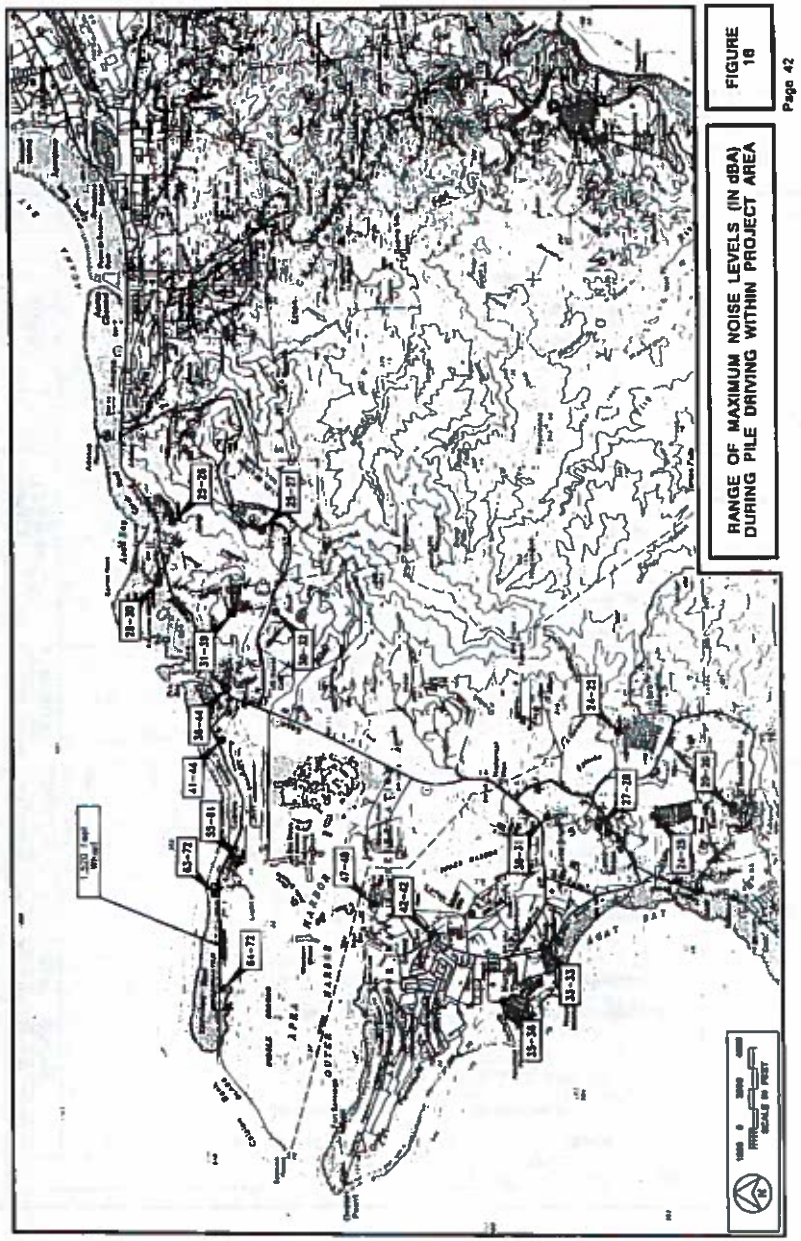
RANGES OF CONSTRUCTION EQUIPMENT NOISE LEVELS

FIGURE 16



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 17



- mitigation measure which is normally used. Table 7 depicts the allowed hours of construction under the Hawaii State DOH permit procedures, which are contained in Reference 4.

Vibration from Pile Driving. Pile driving will probably be necessary to implant sheet and/or concrete piles at the harbor project sites. Induced ground vibrations from these pile driving operations have the potential to cause architectural and structural damage to structures.

Ground vibrations generated during pile driving operations are generally described in terms of peak particle (or ground) velocity in units of inches/second. The human being is very sensitive to ground vibrations, which are perceptible at relatively low particle velocities of 0.01 to 0.04 inches/second. Damage to structures, however, occur at even higher levels of vibration as indicated in Table 8. The most commonly used damage criteria for structures is the 2.0 inches/second limit derived from work by the U.S. Bureau of Mines. A more conservative limit of 0.2 inches/ second is also used, and is suggested for planning purposes on this project because of the repetitive nature of pile driving operations which can increase risks of damage due to fatiguing, and particularly if structures are adjacent to pile driving activities.

Based on measured vibration levels during pile driving operations under various soil conditions and at various distances, estimates of ground vibration levels vs. distance from the pile driver have been made for various soil conditions and for various energy ratings of the pile drivers. Figure 19, which was extracted from Reference 8, may be used to predict vibration levels for the soil conditions indicated. When coral layers must be penetrated, vibration levels can be expected to be higher than those shown in Figure 19, particularly if the adjacent structures are supported by the common coral layer. From Figure 19, and for wet sand soil conditions, the 0.2 inches/second vibration damage criteria will be exceeded at a scaled energy distance factor of approximately 0.7. The scaled energy distance factor is equal to the square root of the energy (in foot-pounds) per blow of the hammer divided by the distance (in feet) between the pile tip and the monitoring location. For a 30,000 foot-pound pile driver, a scaled energy distance of 0.7 equates to a separation distance of 247 feet. Under clay soil conditions, and using the prediction procedures contained in Figure 19, a shorter separation distance of 115 feet is required to not exceed the 0.2 inches/second criteria when using a 30,000 foot-pound pile driver. It should be noted that 0.2 inches/second vibration levels were measured from a 22,400 foot-pound pile driver at even shorter separation distances of approximately 30 feet in sandy, layered soil (Reference 9). The measurement data reported in Reference 9 are significantly lower than the vibration levels predicted by the methodology of Reference 8.

Because the closest structures (fuel tanks) are at least 2,000 feet from the location of the proposed 1,520 foot wharf, they should be well beyond the 0.2 inches/second vibration contour associated with possible damage from ground

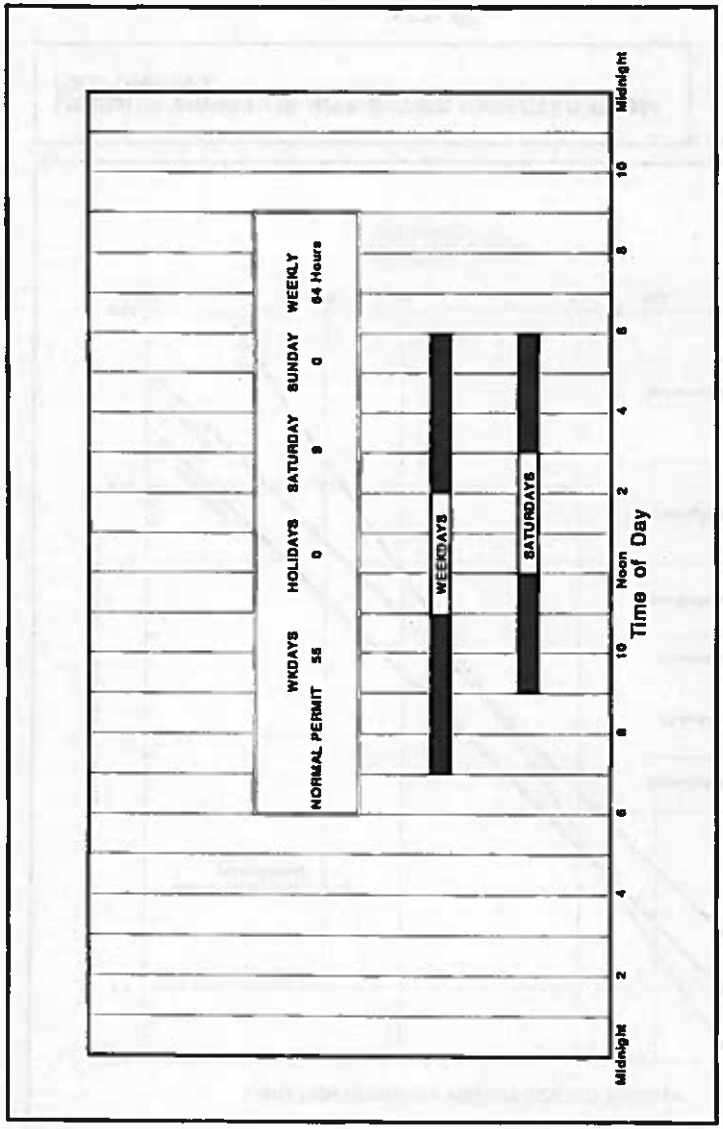
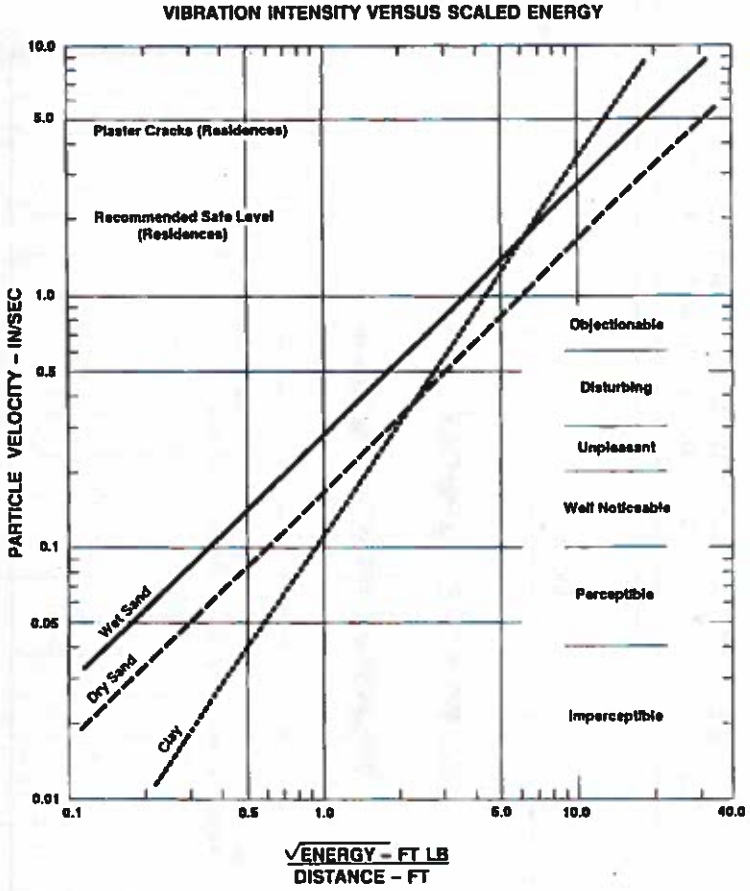


TABLE 8

SUMMARY OF BUILDING DAMAGE CRITERIA

PEAK GROUND VELOCITY (mm/sec)	PEAK GROUND VELOCITY (in/sec)	COMMENT
193.04	7.6	Major damage to buildings (mean of data).
137.72	5.4	Minor damage to buildings (mean of data).
101.16	4.0	'Engineer structures' safe from damage.
50.8	2.0	Safe from damage limit (probability of damage <5%).
		No structural damage.
33.02	1.3	Threshold of risk of 'architectural' damage for houses.
25.4	1.0	No data showing damage to structures for vibration <1 in./sec.
15.24	0.6	No risk of 'architectural' damage to normal buildings.
10.16	0.4	Threshold of damage in older homes.
5.08	0.2	Statistically significant percentage of structures may experience minor damage (including earthquake, nuclear event, and blast data for old and new structures).
		No 'architectural' damage.
3.81	0.5 to 0.15	Upper limits for ruins and ancient monuments.
1.0	0.04	Vertical vibration clearly perceptible to humans.
0.32	0.01	Vertical vibration just perceptible to humans.

Source: 'State-of-the-Art Review: Prediction and Control of Groundborne Noise and Vibration from Rail Transit Trains'; U.S. Department of Transportation; December 1983.



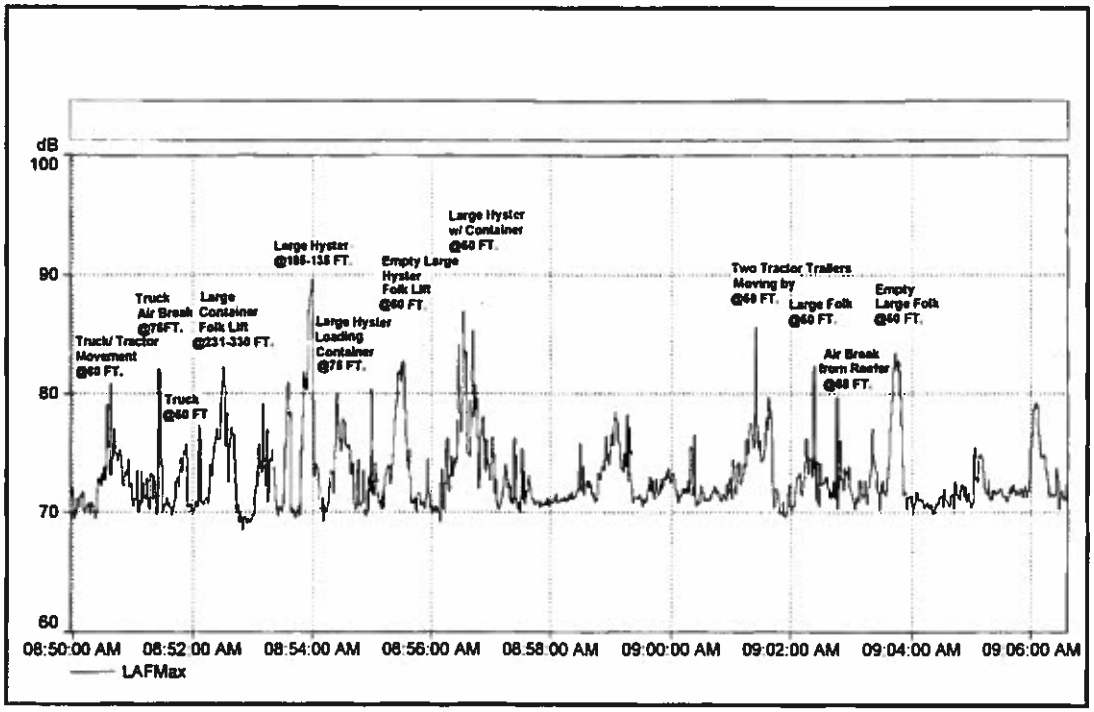
MINIMUM VIBRATION INTENSITIES EXPECTED FROM PILE DRIVING

FIGURE 19

vibrations during pile driving with 30,000 foot-pound pile drivers. Therefore, risks of adverse impacts from ground vibrations during pile driving operations are considered to be very low, and special mitigation measures should not be required.

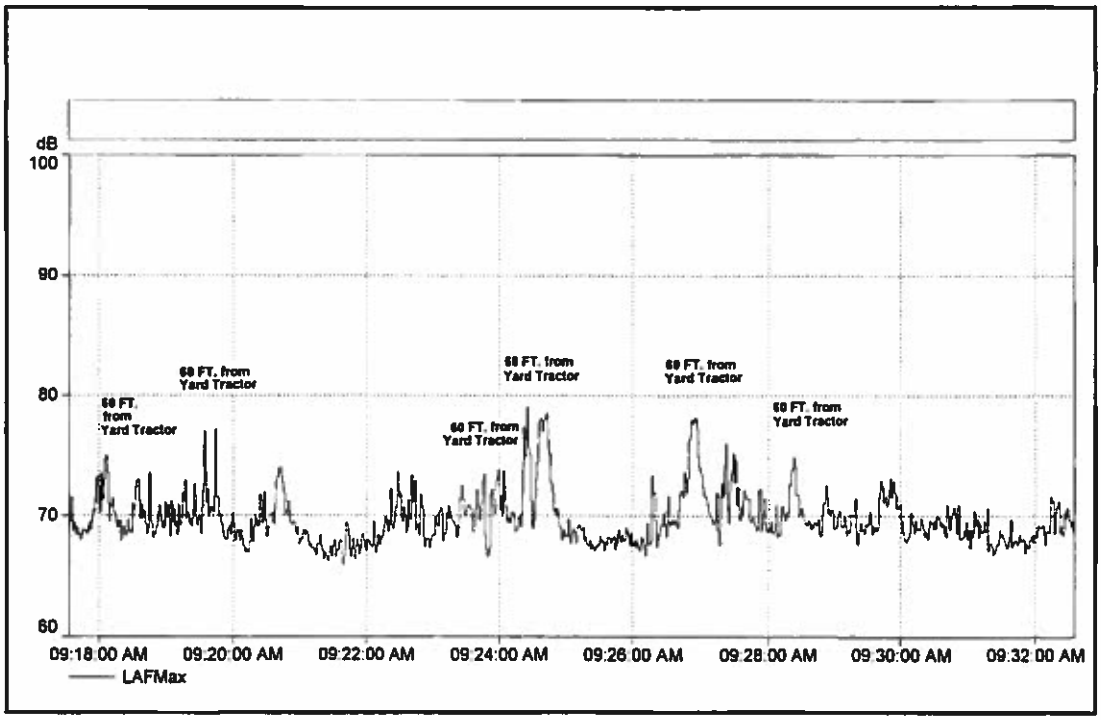
On-Site Vehicles and Fixed Mechanical Equipment. Harbor equipment and vehicles, such as gantry cranes, heavy trucks, forklifts, sweepers, and the ships which utilize the harbor are potential sources of noise associated with the new 1,520 foot wharf. Heavy trucks which transport materials to and from the harbor are additional noise sources which travel beyond the harbors' boundaries. New mechanical equipment such as emergency electrical generators, air conditioning equipment, exhaust fans, and other ventilating fans are the primary fixed on-site noise sources which may be permanently located at the project site. Typical noise levels of mobile harbor equipment are between 65 to 85 dB at 100 feet distance. Typical noise levels from yard activities at Nawiliwili Harbor on the island of Kauai, Hawaii were measured at two locations ("YB1" and "YB2") and are shown in Figures 20 and 21. Because the closest noise sensitive receptors are located over two miles from the proposed 1,520 foot wharf, risks of adverse noise impacts from harbor equipment are considered to be very low. Back-up alarms are approximately 85 dBA at 100 feet distance, and can be audible at long distances because the high pitched alarms are detectable and recognizable above other high frequency background noise sources. However, risks of these alarms being audible at the nearest noise sensitive receptor are also considered to be low due to the large buffer distance available.

In summary, risks of adverse noise impacts from on-site vehicles and mechanical equipment at the location of the proposed 1,520 foot wharf are considered to be low, and special noise mitigation measures should not be required.



DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "YB1" (0850 TO 0906 HOURS; 11/04/03)

FIGURE 20



DBA VS. TIME HISTORY OF NOISE LEVELS AT LOCATION "YB2" (0917 TO 0932 HOURS; 11/04/03)

FIGURE 21

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(3) "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety;" Environmental Protection Agency (EPA 550/9-74-004); March 1974.

(4) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(5) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(6) Draft "Traffic Impact Assessment Report - Apra Harbor Wharf Improvements and Land Reclamation Project;" Phillip Rowell and Associates; December 22, 2005.

(7) 24-Hour Traffic Counts, Intersection of Route 1 and Route 11; April 9-10, 2003; Guam Department of Public Works, Highway Planning.

(8) Wiss, John F., Janney, Elstner and Assoc.; "Damage of Pile Driving Vibration;" Highway Research Record, Number 155.

(9) Gutowski, T.G., Wittig, L.E., and Dym, C.L.; "Some Aspects of the Ground Vibration Problem;" Noise Control Engineering; May-June 1978.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "Lepn" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB, Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., decl).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PNL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

	TERM	A-WEIGHTING	ALTERNATIVE(1) A-WEIGHTING	OTHER(2) WEIGHTING	UNWEIGHTED
1.	Sound (Pressure)(3) Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2.	Sound Power Level	L_{WA}		L_{WB}	L_W
3.	Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4.	Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5.	Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6.	Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7.	Equivalent Sound Level (4) Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8.	Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9.	Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10.	Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12.	Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13.	Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14.	Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15.	Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX C

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES

ROADWAY SECTIONS	***** CY 2005 ***** AM VPH	PM VPH	CY 2025 (NO BUILD) AM VPH	PM VPH	CY 2025 (BUILD) AM VPH	PM VPH
Route 1 North of Route 11 Intersection (NB)	1,075	1,580	1,520	2,245	1,530	2,290
Route 1 North of Route 11 Intersection (SB)	1,455	1,025	1,995	1,415	2,055	1,425
Two-Way	2,530	2,605	3,515	3,660	3,585	3,715
Route 1 South of Route 11 Intersection (NB)	1,200	1,740	1,645	2,405	1,700	2,430
Route 1 South of Route 11 Intersection (SB)	1,305	940	1,845	1,330	1,860	1,370
Two-Way	2,505	2,680	3,490	3,735	3,560	3,800
Route 11 West of Route 1 Intersection (WB)	420	365	420	365	535	400
Route 11 West of Route 1 Intersection (EB)	145	120	145	120	170	205
Two-Way	565	485	565	485	705	605
Route 11 At Entrance Gate to Apra Harbor (WB)	275	70	275	70	390	105
Route 11 At Entrance Gate to Apra Harbor (EB)	55	200	55	200	80	285
Two-Way	330	270	330	270	470	390

APPENDIX L

Project Scoping Report

Apra Harbor
Wharf Improvements
and
Land Reclamation
Environmental Impact Statement

Piti, Guam

June 2005

Wil Chee – Planning
& Environmental, Inc.
1018 Palm Drive
Honolulu, Hawaii 96814

Draft Scoping Report

Apra Harbor
Wharf Improvements
and
Land Reclamation
Environmental Impact Statement

Piti, Guam

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June 2005

Table of Contents

Abbreviations and Acronyms ii

1.0 INTRODUCTION 1

1.1 Project Description 1
1.2 Purpose of Scoping Process 2
1.3 Public Notification 2

2.0 SCOPING PROCESS REPORT 3

3.0 SUMMARY OF KEY ISSUES AND CONCERNS 4

4.0 APPENDICES 8

APPENDICES

Appendix A: Public Notification Materials
Appendix B: Early Consultation Meeting Summary
Appendix C: Public Scoping Meeting Presentation and Display Boards
Appendix D: Public Scoping Meeting Handout Materials
Appendix E: Public Scoping Meeting Attendance Sheet and Transcripts
Appendix F: Public Scoping Comment Letters and Responses
Appendix G: Scoping Mail Solicitation Recipient List
Appendix H: Scoping Mail Solicitation Comment Letters and Responses

Abbreviations and Acronyms

CEQ	Council on Environmental Quality
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
NEPA	National Environmental Policy Act
NOI	Notice of Intent
TEU	Twenty-foot Equivalent Unit
USACE	United States Army Corps of Engineers
USDC-EDA	United States Department of Commerce - Economic Development Administration
WCP	Wil Chee – Planning and Environmental, Inc.

1.0 INTRODUCTION

Under a Federal grant from the U.S. Department of Commerce - Economic Development Administration (USDC-EDA), the Port Authority of Guam (PAG) is proposing construction of a new intermodal transportation facility located at Apra Harbor, Guam for the purpose of improving maritime access and services to the island of Guam. A requirement of the USDC-EDA grant, the U.S. Army Corps of Engineers (USACE) is to be the lead agency for the preparation of the Environmental Impact Statement (EIS).

The purpose of the EIS document is to provide an in-depth analysis of potential impacts to the environment from the proposed modifications to Apra Harbor, in compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations. Wil Chee – Planning and Environmental, Inc. (WCP), is the USACE contractor responsible for the preparation of the EIS.

1.1 Project Description

The Port Authority of Guam is proposing construction of new intermodal transportation facilities located at Apra Harbor, Guam. The new facilities will consist of 1,500 linear feet of wharf space and 18 acres of reclaimed land. The wharf will have a draft of 55 feet and accommodate the largest civilian cargo and passenger vessels and military supply and combatant vessels.

The primary purpose of the proposed facilities is to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels. The proposed deep-draft wharf would be able to service "Post Panamax" container vessels that have been entering the world fleet since 1980. These vessels have capacities of up to 4,500 twenty-foot equivalent units (TEU's). In addition, the new wharf would be able to service the larger container ships of today which have capacities of up to 7,000 TEU's, as well as deep-draft cruise ships, US Navy aircraft carriers and other large naval vessels on a contingency basis.

Elements of the proposed project include: (1) The construction of a 1,500 x 230-foot wharf to the east of Hotel Wharf. Improvements will include construction of a cellular sheet pile bulkhead or pier on piles, deposition of approximately 950,000 cubic yards of fill material over 7.92 acres, and construction and installation of mechanized cargo container handling equipment; (2) Placement of approximately 500,000 cubic yards of fill material over 18.1 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements will also include construction of rock revetments, and construction of cargo container storage yard facilities; and (3) Dredging of submerged lands to a depth of 55 feet as required in waters adjacent to the proposed 1,500-foot wharf to accommodate deep draft commercial and military vessels.

1.2 Purpose of Scoping Process

NEPA requires Federal agencies to carefully consider all environmental effects of their proposed actions. If an action is likely to have a significant effect on the quality of the environment, the agency proposing the action is required to prepare an EIS. An EIS is a document that contains many components, some which are: a description of the proposed action and alternatives to the proposed action; a description of the affected environment in its present and future states; and a description of the environmental consequences of each proposed and alternative action. The EIS also identifies mitigation measures to reduce or eliminate potential impacts, as necessary.

Following the decision that an EIS is required, there are a number of steps that must be followed. The first step is scoping, or the process of determining the scope, focus and content of an EIS. The scoping process involves the participation of Federal, State, and local agencies, stakeholders, and the general public. The scoping process asks agencies and interested parties to provide input on the proposed alternatives, the proposed topics of evaluation and potential impacts and mitigation measures to be considered. The most important thing that occurs during the scoping process is the identification of relevant and significant issues that will be analyzed in depth in the EIS.

1.3 Public Notification

For the proposed Wharf Improvement and Land Reclamation project the scoping process began with formal agency notification. On Wednesday, February 2, 2005, the USACE published a Notice of Intent (NOI) in the Federal Register to advise interested agencies and the public that an Environmental Impact Statement (EIS) would be prepared. The PAG and USACE also notified potentially interested organizations and individuals about the public scoping meetings and forthcoming EIS. The public scoping meetings were announced through publication in the February 17, 22, and 23, 2005 issues of the Pacific Daily News. The NOI, and public notice advertisement are attached in Appendix A.

2.0 SCOPING PROCESS REPORT

Prior to the initiation of the formal scoping process the PAG and the USACE initiated an informal early consultation period. On October 4, 2004 an early consultation meeting was held at the Port Authority of Guam boardroom. The meeting was attended by various federal and Government of Guam agencies for the purpose of soliciting agency comments, concerns, and recommendations with regard to the proposed project prior to the formal initiation of the EIS process. A list of early consultation meeting participants and meeting minutes are attached as Appendix B.

As discussed in the previous section, a NOI was published in the February 2, 2005 issue of the Federal Register. After publication of the NOI the formal scoping process and public comment submission period was initiated. The NOI stated that public comments should be submitted no later than June 1, 2005 in order to be considered in the draft EIS.

The PAG and the USACE conducted a public scoping meeting for interested agencies and the public on February 23, 2005. A total of 18 individuals attended the public scoping meeting. The meeting began as an informal open house format providing attendees the opportunity to review project information display boards and to talk one-on-one with PAG, USACE, and other project personnel. Following the brief open house period, a formal PowerPoint presentation was given by the PAG and WCP personnel. The presentation provided an overview of the proposed project and alternatives, the scoping and the environmental impact statement process, environmental issues, and the project schedule. Following the formal presentation meeting attendees were asked to provide oral and /or written comments on the scope of the EIS. No written comments were submitted at the meeting, however oral comments were made. Additionally, written comments were submitted by mail or email subsequent to the public scoping meeting.

The PowerPoint presentation and the meeting display boards are attached as Appendix C. Meeting handout materials are provided in Appendix D, and the scoping meeting attendance sheet and transcripts are attached as Appendix E. Public scoping written comments submitted by mail are attached as Appendix F

In addition to conducting early consultation and public scoping meetings, the USACE and PAG initiated a subsequent comprehensive scoping mail-out to stakeholders and interested parties. The mailing was designed to solicit input from potential interested parties that did not attend either the early consultation or public scoping meetings. A total of 123 user groups, tenants, and other stakeholders were mailed the public scoping meeting handout materials and asked to submit any comments and concerns they might have with regard to issues to be addressed in the forthcoming EIS. The scoping mailing list is attached as Appendix G. Written comments received by mail or email are attached as Appendix H.

3.0 SUMMARY OF KEY ISSUES AND CONCERNS

Early Consultation Meeting

The early consultation meeting was held on October 4, 2004, from 1 to 2:30 p.m. at the Port Authority of Guam Building, Board Conference Room, 1026 Cabras Highway, Piti, Guam. Notice of the meeting was sent to representatives of federal, local agencies and other organizations.

The meeting was attended by representatives of the U.S. Department of the Navy, Guam Bureau of Statistics and Planning, Guam Department of Agriculture – Division of Aquatic Resources, Guam Economic Development Authority, Guam Environmental Protection Agency, Guam Governor's Office, U.S. Army Corps of Engineers, and Port Authority of Guam.

The meeting was opened with a discussion of the purpose and need of the proposed improvements, discussion of the study area, and the purpose of the early consultation meeting. Afterward, the floor was opened to the agency representatives to express their concerns regarding the proposed harbor improvements.

Agency representatives voiced the following issues and concerns regarding the proposed project's design, social, cultural, and economic impacts, and environmental impacts.

Design and Operations

- How far proposed deep-draft wharf would extend into Apra Harbor
- Potential contamination of Navy dredge spoils to be used as fill material

Social, Cultural, and Economic Impacts

- Possible presence of cultural and archaeological resources within the project area
- Impacts on recreational use and public access onto the Glass Breakwater

Environmental Impacts

- Loss of coral communities within the harbor and the marine habitat they support
- Investigation of appropriate mitigation measures for coral communities affected (including but not limited to coral colony transplants)
- Impacts of harbor water quality
- Preparation of a marine species inventory within the project area
- Potential radiological hazards with Apra Harbor
- Potential unexploded ordnance within Apra Harbor

Public Scoping Meeting

A Public Scoping Meeting was held on Wednesday, January 23, 2005, from 6 to 8 p.m. at the Port Authority of Guam Building, Board Room, 1026 Cabras Highway, Piti, Guam. The purpose of the meeting was to provide information about the proposed project and the EIS process to the general public and to provide an opportunity to gather public input on the proposed harbor improvements.

Eighteen people from the general public and government agencies attended the meeting and a total of eight oral comments were made. A total of five written comments were received by mail or email subsequent to the public scoping meeting. Public scoping meeting transcripts and written comments and responses are attached as Appendices E and F, respectively.

Oral and written comments received expressed concerns regarding the following operational, social, cultural, economic, and environmental impacts.

Design and Operations

- Impacts of strong waves and storm events on proposed harbor improvements
- Design of the proposed improvements to benefit both US Navy and commercial port use.
- Design and use of the proposed wharf (and Apra Harbor in general) with respect to national security concerns and wartime operations.
- Consideration of alternatives to dredging activities
- Utilization of the proposed wharf by larger container vessels
- Suitability of the proposed project site for construction of a deep-draft wharf based on natural conditions (i.e., surge, currents, wind, etc.)
- Impact on military training activities conducted in the harbor
- Potential military use of the proposed wharf and its affect on port revenues
- Impact of the proposed wharf's location and activities with respect to the Navy's future requirements, i.e., including but not limited to home porting additional attack submarines; mooring of Military Prepositioned Ships, loading and off-loading of munitions at Kilo Wharf and maintenance of the Glass Breakwater
- Potential savings to the Navy, should use of the proposed wharf allow the Navy to delay construction of its own deep draft wharf
- Safety concerns regarding the types of vessels that will be berthing at the proposed deep draft wharf (i.e., Vessels carrying munitions or explosives)

Social, Cultural, and Economic Impacts

- Impacts on recreational users in the area

- Impacts on public access to the Seaplane Boat Ramp, Outhouse Beach and other recreational areas on the Glass Breakwater
- Loss publicly accessible areas within the harbor and the potential secondary impacts of divers relocating to marine protected areas.
- Impacts to small local scuba diving companies operating in the area
- Identification of alternative dive sites as a mitigation measure
- Support for the proposed project due to the fact that it would result in beneficial economic impacts to the Piti community and Guam as a whole.

Environmental Impacts

- Impacts of fill material on marine resources
- Preparation of an assessment of coral and marine resources in the project area
- Impacts of the proposed improvements on coral communities and loss of fish habitat.
- Investigation of appropriate mitigation measures for coral communities affected (including but not limited to coral colony transplants)
- Development of mitigation measures to include the artificial enhancement of areas in which corals are not found in abundance, reef balls or other environmentally sound method of artificial reef structure.
- Impacts on mangrove, coconut crab, and other area wildlife
- Increased surface runoff and waste discharges from the new facilities
- Project consistency with the Federal Coastal Zone Management Act

Scoping Mail Solicitation

Subsequent to the early consultation and public scoping meetings, a comprehensive mail solicitation was undertaken in an effort to solicit additional input from potentially interested parties unable to attend the meetings. One hundred twenty three (123) user groups, tenants, and other stakeholders were mailed project information packets and requested to provide any comments and concerns they might have regarding the proposed improvements or upcoming EIS. Of the 123 recipients a total of six (6) provided written comments. Written comments and responses are attached as Appendix H.

Design and Operations

- Identification of appropriate wharfage design to mitigate impacts from potential oil spills in the harbor
- Impacts of the proposed project on tanker schedules and operations at Golf Pier
- Impacts to tanker mooring activities and equipment in project areas 2A and 2B
- Impacts to use of outfalls in the vicinity of project area 2C
- Safety/hazard concerns related to fuel bunkering and storage facility integrity, and overall operations. Safety/hazard concerns included: tanker maneuverability within Apra Harbor during construction and dredging activities, impacts to handling of highly flammable materials, potential flammable vapors and

explosive atmospheres within the vicinity of the proposed project areas, increase in vehicular traffic and circulation and related safety impacts, impacts of military vessels containing explosives on fuel bunkering and storage facilities and operations.

- Site access for dive companies
- Establishment of entry and pass procedures
- Beneficial impacts resulting from reduced congestion within Apra Harbor, increased safety and security through the separation of commercial and cargo operations, and increased commercial opportunities.
- Beneficial impacts by enabling Apra Harbor to accommodate the largest U.S. Navy aircraft carriers.

Social, Cultural, and Economic Impacts

- Public access to Seaplane Boat Ramp, the ocean shores and marine resources in the project area
- Impacts to small commercial dive operators and other recreational users in the area
- Impacts on snorkeling and scuba diving activities in the vicinity of Outhouse Beach and possible mitigation measures (i.e., identification of alternative diving areas)
- Site access for dive companies
- Establishment of entry and pass procedures
- Impacts on submerged cultural resources (i.e., shipwreck dive sites and historic resources) within Apra Harbor
- Loss of access to the public to seasonal "atulai" (Selar crumenopthalmus) schools that frequently enter the harbor to feed.
- Beneficial impacts due to the expansion of Guam's cruise ship market and diversification of its tourism base.
- Beneficial impact due to the enhancement of Guam's position as a regional cargo and transshipment hub between Asia and the United States

Environmental Impacts

- Short and long-term effects on coral reef habitat and other marine resources and identification of compensatory mitigation options in the event of loss of these marine resources.
- Impacts to endangered species: Both hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtles forage in the harbor. Green sea turtles have been observed within the proposed project area.

4.0 APPENDICES

Appendix A: Public Notification Materials
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APPENDIX A

PUBLIC NOTIFICATION MATERIALS

DEPARTMENT OF DEFENSE

Office of the Secretary

General Solicitation of Comments From the General Public on Review of the National Information Assurance Partnership (NIAP)

AGENCY: Office of the Secretary, DOD, National Cyber Security Division, DHS.

ACTION: Notice for general solicitation of comments.

SUMMARY: The National Strategy to Secure Cyberspace, issued by the Office of the President in February of 2003 required the Federal Government to conduct a comprehensive review of the National Information Assurance Partnership (NIAP) to determine the extent to which it is adequately addressing the continuing problem of security flaws in commercial software products. The Department of Defense (DoD) and the Department of Homeland Security (DHS) were tasked with conducting the review on behalf of the Federal government. In an effort to ensure a comprehensive review of the subject, DoD and DHS seek public comment on the issues that should be considered before completing this review.

DATES: Comments must be received on or before March 4, 2005.

ADDRESSES: Submit comments electronically to DOD/DHS at *NIAPReview@ida.org*. Send written comments to: The Institute for Defense Analyses, 4850 Mark Center Drive, Alexandria, VA 22311, Attention: NIAP Review.

FOR FURTHER INFORMATION CONTACT: Dr. Greg Larsen, Institute for Defense Analyses, (703) 845–6661, e-mail: *glarsen@ida.org*.

SUPPLEMENTARY INFORMATION: During this review, DoD and DHS considered the results of current policy and practices, the general efficacy and adequacy of current capabilities, and the expectations of stakeholders. In addition, the scope of the review was extended beyond NIAP security testing, evaluation and assessment of information technology (IT) products to include the policy support infrastructure and integration into system development acquisition processes.

NIAP is a U.S. Government initiative originated to meet the security testing needs of both IT consumers and producers. NIAP is collaboration between the National Institute of Standards and Technology (NIST) and the National Security Agency (NSA) in fulfilling their respective responsibilities under Pub. L. 100–235 (Computer Security Act of 1987). To obtain more information on NIAP please go to: *http://niap.nist.gov/*.

To obtain a copy of The National Strategy to Secure Cyberspace please go to: *http://www.dhs.gov/interweb/assetlibrary/National_Cyberspace_Strategy.pdf*.

January 28, 2005.

Jeannette Owings-Ballard,

OSD Federal Register Liaison Officer, Department of Defense

[FR Doc. 05–1912 Filed 2–1–05; 8:45 am]

BILLING CODE 5001–06–M

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare an Environmental Impact Statement for Proposed Wharf Improvements and Fill at Apra Harbor, GU

AGENCY: Department of the Army; U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 as implemented by the Council on Environmental Quality (CEQ) regulations (40 CFR parts 1500–1508), the Port Authority of Guam and the U.S. Army Corps of Engineers hereby give notice of intent to prepare a Environmental Impact Statement (EIS) for proposed wharf improvements and fill at Apra Harbor, Guam.

Under a Federal grant from the U.S. Department of Commerce Economic Development Administration, the Port Authority of Guam is proposing modifications to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels.

The U.S. Army Corps of Engineers will be the lead agency in preparing the EIS. The EIS will provide an analysis of potential impacts to the environment from the proposed modifications to Apra Harbor, in compliance with NEPA and CEQ regulations.

DATES: In order to be considered in the draft EIS, comments and suggestions should be received no later than June 1, 2005.

ADDRESSES: Send written comments to U.S. Army Corps of Engineers, Honolulu District, ATTN: Mr. James Hatashima, Project Manager, Civil and Public Works Branch (CEPOH–PP–C), Rm. 312, Bldg. 230, Fort Shafter, HI 96858–5440.

FOR FURTHER INFORMATION CONTACT: Questions or comments concerning the proposed action should be addressed to Mr. James Hatashima, Phone: (808) 438–2264, e-mail: *james.k.hatashima@usace.army.mil*.

SUPPLEMENTARY INFORMATION: Apra Harbor is the commercial hub of Guam, handling both containerized and conventional cargo from around the world. The harbor is located near the center of the western coast of Guam. It is a natural harbor, protected by Orote Peninsula to the south and Cabras Island to the north. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F–2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations.

Proposed Action—Harbor improvements under consideration include: (1) Construction of a new 1,500-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead, deposition of approximately 950,000 cubic yards of fill material in Apra Harbor, and construction of mechanized cargo container handling facilities; (2) Placement of approximately 500,000 cubic yards of fill over 18 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities; (3) Dredging of submerged lands to depths of 55 to 60 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

Project Alternatives—Alternatives to be considered include: (1) "No Action". No improvements would be undertaken and existing port facilities within Apra Harbor would remain unchanged; (2) Alternate designs, and construction methods; (3) Alternate sources and types of fill material (4) Dredge material disposal alternatives.

To provide a forum for the public to obtain information on the project, the

Port Authority of Guam and the U.S. Army Corps of Engineers will hold a public scooping meeting on or about February 2005. The purpose of the scoping meeting is to present information and solicit public input, in the form of oral and written comments, on the proposed action and alternatives under consideration. Interested agencies, organizations, and individuals are invited to attend and participate in the scoping meeting to help determine the range of issues and alternatives to be addressed in the EIS. The date, time, and location of the scoping meeting will be publicly announced.

The draft EIS is anticipated to be available for public review in November 2005, and a public meeting will beheld after publication of the draft EIS. The date, time, and location of the meeting will be publicly announced.

Brenda S. Bowen,

Army Federal Register Liaison Officer.

[FR Doc. 05-1914 Filed 2-1-05; 8:45 am]

BILLING CODE 3710-NS-M

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Inland Waterways Users Board

AGENCY: Department of the Army, U.S. Army of Corps of Engineers, DoD.

ACTION: Notice of open meeting.

SUMMARY: In Accordance with 10(a)(2) of the Federal Advisory Committee Act (Pub. L. 92-463), announcement is made of the forthcoming meeting.

Name of Committee: Inland Waterways Users Board (Board).

Date: February 24, 2005.

Location: The Washington Court Hotel, 525 New Jersey Avenue NW., Washington, DC 20001-1527, (1-202-628-2100).

Time: Registration will begin at 8:30 a.m. and the meeting is scheduled to adjourn at 1 p.m.

Agenda: The Board will hear briefings on the status of both the funding for inland navigation projects and studies, and the Inland Waterways Trust Fund. The Board will also consider its priorities for the next fiscal year.

FOR FURTHER INFORMATION CONTACT: Mr. Norman T. Edwards, Headquarters, U.S. Army Corps of Engineers, CEMP-POD, 441 G Street, NW., Washington, DC 20314-1000; Ph: 202-761-1934.

SUPPLEMENTARY INFORMATION: The meeting is open to the public. Any interested person may attend, appear before, or file statements with the committee at the time and in the manner permitted by the committee.

Brenda S. Bowen,

Army Federal Register Liaison Officer.

[FR Doc. 05-1913 Filed 2-1-05; 8:45 am]

BILLING CODE 3710-92-M

DEPARTMENT OF EDUCATION

Submission for OMB Review; Comment Request

AGENCY: Department of Education.

SUMMARY: The Leader, Information Management Case Services Team, Regulatory Information Management Services, Office of the Chief Information Officer invites comments on the submission for OMB review as required by the Paperwork Reduction Act of 1995.

DATES: Interested persons are invited to submit comments on or before March 4, 2005.

ADDRESSES: Written comments should be addressed to the Office of Information and Regulatory Affairs, Attention: Carolyn Lovett, Desk Officer, Department of Education, Office of Management and Budget, 725 17th Street, NW., Room 10235, New Executive Office Building, Washington, DC 20503 or faxed to (202) 395-6974.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Office of Management and Budget (OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The Leader, Information Management Case Services Team, Regulatory Information Management Services, Office of the Chief Information Officer, publishes that notice containing proposed information collection requests prior to submission of these requests to OMB. Each proposed information collection, grouped by office, contains the following: (1) Type of review requested, *e.g.* new, revision, extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. OMB invites public comment.

Dated: January 27, 2005.

Angela C. Arrington,

Leader, Information Management Case Services Team, Regulatory Information Management Services, Office of the Chief Information Officer.

Office of the Undersecretary

Type of Review: New.

Title: Study of No Child Left Behind Flexibility Provisions (previous title—Flexing Federal Dollars Study.)

Frequency: One time.

Affected Public: State, local, or tribal Gov't, SEAs or LEAs.

Reporting and Recordkeeping Hour Burden:

Responses: 640.

Burden Hours: 356.

Abstract: To evaluate how school districts are using the provisions for enhanced flexibility over the use of Federal education funds authorized under the No Child Left Behind Act.

Requests for copies of the submission for OMB review; comment request may be accessed from *http://edicsweb.ed.gov*, by selecting the "Browse Pending Collections" link and by clicking on link number 2640. When you access the information collection, click on "Download Attachments" to view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue, SW., Potomac Center, 9th Floor, Washington, DC 20202-4700. Requests may also be electronically mailed to the Internet address *OCIO_RIMG@ed.gov* or faxed to 202-245-6621. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be directed to Katrina Ingalls at her e-mail address *Katrina.Ingalls@ed.gov*. Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1-800-877-8339.

[FR Doc. E5-318 Filed 2-1-05; 8:45 am]

BILLING CODE 4000-01-P

DEPARTMENT OF EDUCATION

Submission for OMB Review; Comment Request

AGENCY: Department of Education.

SUMMARY: The Leader, Information Management Case Services Team, Regulatory Information Management Services, Office of the Chief Information Officer invites comments on the submission for OMB review as required

PUBLIC NOTICE

Scoping Meetings to Prepare an Environmental Impact Statement for Wharf Improvements and Fill at Apra Harbor

The Port Authority of Guam and the U.S. Army Corps of Engineers announce a scoping meeting to engage public participation in the environmental impact statement (EIS) process that will address proposed wharf improvements and fill at Apra Harbor, Guam.

The EIS will provide an analysis of potential impacts to the environment from the proposed modifications to Apra Harbor, in compliance with the National Environmental Policy Act and the Council on Environmental Quality regulations. Proposed modifications would occur within outer Apra Harbor along the presently undeveloped, southern face of the Glass Breakwater, located west of Wharf F-2 on Cabras Island. The proposed improvements would provide additional berthing area and increased landside capacity for commercial port cargo storage and handling operations.

The purpose of the scoping meeting is to present information and solicit public input, in the form of oral and written comments, on the proposed harbor improvements and alternatives under consideration. Interested agencies, organizations, and individuals are invited to attend and participate in the scoping meeting to provide input on what they would like the EIS to address as it pertains to the proposed improvements. Public input received will help determine the range of issues and alternatives to be addressed in the EIS.

Public comments will be accepted for a period of 15 days following the meeting date and may be submitted in writing to the individual named below.

Public Scoping Meeting Location:

Port Authority of Guam
Board Conference Room
Cabras Highway, Piti

February 23, 2005
6:00 p.m. to 8:00 p.m.

Please submit written comments to or request additional information from:

Mr. James Hatashima, Project Manager
U.S. Army Corps of Engineers,
Honolulu District,
Civil and Public Works Branch
CEPOH-PP-C
Rm. 312, Bldg. 230
Fort Shafter, Hawaii 96858-5440

Telephone: 808-438-2264
Fax: 808-438-0430
E-mail: james.k.hatashima@usace.army.mil

APPENDIX B

EARLY CONSULTATION MEETING SUMMARY

MEETING SUMMARY
EIS for the Harbor Wharf Project, Apra Harbor, Guam

Meeting Time & Date: 1300 Hours, October 4, 2004

Meeting Location: Guam Port Authority Building, Board Room

Attendees:

NAME	AFFILIATION	ROLE	E-MAIL	PHONE
Hatashima, Jim	USACE	Project Manager	james.k.hatashima@poh01.usace.army.mil	808-438-2264
Shimtaku, Paul	PAG	Deputy Manager	pshimtaku@mail.gov.gu	671-477-5931 ext. 302
Harris, Dot	PAG	Planning	pag15@eccomm.com	671-477-5931 ext. 295
Paulino, Herman	PAG	Planning	pag5@eccomm.com	671-477-5931 ext. 276
Henderson, Mike	PAG	Planning	pag4@eccomm.com	671-477-5931 ext. 315
Delos Santos, Simeon	PAG	Engineering	sdelossantos@mail.gov.gu	671-477-5931 ext.
Hollingsworth, George	PAG	Commercial	pag11@eccomm.com	671-477-5931 ext. 483
Javelosa, Josette	PAG	Marketing	pag4@eccomm.com	671-477-5931 ext. 315
Mangubat, Rudel	PAG	Engineering		671-477-5931 ext. 433
Hoover, Anthony	U.S. Navy - Environmental	Meeting Participant	hoover@guam.navy.mil	671-339-8181
Fisher, Paul	U.S. Navy - Counsel	Meeting Participant	fisher@guam.navy.mil	671-339-2021
Lujan, Evangeline	Bureau of Statistics & Plans	Meeting Participant	vange@mail.gov.gu	671-472-4201
De Leon, Amelia	Bureau of Statistics & Plans	Meeting Participant	afdeleon@mail.gov.gu	671-472-4201
Tibbatts, Brent	Dept. of Agric – Div. of Aquatic Resources	Meeting Participant		671-735-3987
Cruz, Mike	Guam EDCA	Meeting Participant	mcruz@guamcda	671-647-4327
Gawel, Mike	Guam EPA	Meeting Participant	mgawel@govguam.net	671-475-1646 671-475-1658
Loerzel, Adrienne	Governor's Office	Meeting Participant	loerzela@mail.gov.guam	671-475-9303
Gudmundsen, Tor	TG Engineers	Engineer Contractor	tor@guam.net	671-647-0808
Yasaka, Derek	WCP, Inc.	EIS Contractor	wcpderek@lava.net	808-955-6088
Stook, Richard	WCP, Inc.	EIS Contractor	richrdstook@verizon.net	808-242-5051
Packbier, Paul	PCR Environ., Inc.	EIS Subcontractor	paul@pcrguam.com	671-646-3560
Perez-Steffy, Tara	PCR Environ., Inc.	EIS Subcontractor	tara@pcrguam.com	671-646-3560

Information contained herein shall be considered accurate unless comments and / or corrections are received within five (5) working days from the date of receipt of this report.

D. Harris provided WCP with the following documents upon arrival at the PAG board room:

- Title of EDA Financial Assistance Award No 07-01-05196
- Exhibit IV.A. of Application for Federal Assistance/Economic Development Administration Architectural and Engineering Design Deep Wharf and Land Reclamation
- Exhibit "A" of EDA Award No. 07-01-05196 Special Award Conditions
- Exhibit I.C.3. of GovGuam Architectural and Engineering Design for Deep Wharf and Land Reclamation Project including excerpt from Guam Comprehensive Economic Development Strategy
- Letter dated 23 Jan 02 from SHPO to Port Authority stating no historic properties affected
- Port Authority master plan

The meeting convened at 1310 hours by J. Hatashima.

Navy representatives said COMNAVMAR will be dredging at A and B piers. They estimate 600,000 cubic yards of dredged material will be generated.

A meeting participant asked how far into Apra Harbor will Hotel Wharf be expanded to. T Gundmunsen replied that 300 feet out is into 60 to 70 feet of water. At 400 feet out, it is about 80 feet deep. The following example was provided: Assuming Hotel Wharf is expanded to approximately 175 feet into the harbor and extends to about 1,500 feet in length results in about 6 acres of shoreside area.

The dredge material volume from Navy construction dredging is estimated to be 600,000 to 700,000 cubic yards. Maintenance dredging would generate approximately 150,000 cubic yards. The Navy expects to start construction dredging in October 2005 and estimates it will take about 2 years to complete.

The Navy is proposing to stockpile construction dredging material in a Confined Disposal Facility (CDF) on PAG property at the east end of Apra Harbor. Approximately 250,000 to 300,000 cubic yards of dredged material are to be stored at the site.

The Navy will collect core samples of the Inner Apra Harbor floor where construction dredging is to occur. Navy is not planning to collect additional samples once the material is dredged. PAG and GEPA representatives expressed concern about the Navy not sampling and analyzing the dredged spoils. A. Hoover replied that the dredged spoils become PAG's property once the Navy deposits the material into the CDF on the set-aside PAG parcel. There reportedly is an agreement between PAG and COMNAVMAR containing language to that effect.

D. Yasaka asked Navy representatives what the target analytes were and what analytical suite would the core samples be subjected to. A. Hoover was unable to respond except to state that there are a number of contaminants of concern that the Navy would be quantifying.

P. Packbier cautioned about the use of the PAG parcel being set aside for the CDF due to the presence of cultural resources there. Ogden had performed an archaeological survey there under its Navy CLEAN I contract. PCR Environmental may still have copy of the report.

An EIS is being prepared by the Navy on its proposed construction dredging. Public meetings are tentatively scheduled for 17 and 18 November 2004. To be determined, the meetings may be held at a hotel and at a public school in Agat.

B. Tibbatts said coral communities exist around Hotel Wharf. If coral loss is imminent, mitigation of that loss may be through coral colony relocation as was performed at Piti for the fish eye observatory. The success rate, however, is low. B. Tibbatts indicated that DAWR has environmental assessments/studies involving the relocation of coral colonies.

No known endangered species exist in Apra Harbor. But the loss of coral must still be addressed not necessarily for the coral itself but for the marine habitat it supports. When asked about available marine resources data, B. Tibbatts replied DAWR has more about Apra Harbor than the University of Guam Marine Lab.

Cabras Island, which includes Apra Harbor, is excluded from seashore protection requirements. M. Gawel stated that waters around Hotel Wharf and where land reclamation is to occur is classified as a port area which is the lowest water quality classification issued by GEPA.

B. Tibbatts stressed that in-water work should be performed and an inventory of species present within the area surveyed be prepared. R. Stook indicated that marine biology and water quality assessments will be undertaken as part of the NEPA process. DAWR and GEPA representatives expressed interest in accompanying WCP subconsultants during its oceanographic/marine data collection efforts in Apra Harbor. WCP will coordinate with PAG, DAWR, and GEPA when the field investigations begin.

Discussion as to the preparation of an EA or an EIS ensued. M. Gawel asked for a copy of the EIS scope of work issued to WCP. A. Hoover said COMNAVMAR is preparing an EIS for its construction dredging project. It too had to decide on preparing an EA or EIS, and decided on an EIS because of the potential impact to affected coral communities. He added that the EIS is more legally defensible.

P. Packbier said concerns about a potential radiological hazard in Apra Harbor were recently brought to public attention. This had to do with washdown of nuclear vessels at Apra Harbor and Cocos Island. He asked Navy representatives if testing for radiological isotopes in core samples attendant to its construction dredging project will be performed. Navy representatives replied that it is not.

R. Stook indicated that the present meeting wass essentially an early consultation with agencies to obtain their input and concerns. R. Stook asked if there were any existing EAs, EISs, or other environmental studies of the Apra Harbor area. M. Gawel recalled an EA or EIS prepared about 10 years ago by South Pacific Oil. He may have a copy and PAG also indicated that they may be able to provide WCP with a copy. M. Cruz provided WCP with a list of environmental studies that may be useful in the EA/EIS effort.

D. Yasaka asked GovGuam Bureau of Statistics and Planning representatives what GIS data the office may have of Apra Harbor. A. De Leon replied that the Bureau has soils, topography, and aerial photos of Apra Harbor. WCP can communicate with her to obtain the data. The PAG PAO added that NOAA is about to commence with a study of Apra Harbor.

D. Yasaka asked meeting participants if they thought there would be strong public interest in proposed action. No one knew with surety. He asked if any active native/aboriginal organizations may oppose the proposed action. It is possible that the Coalition of Colonized Chamorros may. Again, no one could say with surety if opposition is imminent, and if so, whether it would consist of an organizational endorsement.

D. Yasaka asked B. Tibbatts if WCP subconsultants should avoid times of the year to conduct its oceanographic/marine survey of Apra Harbor. B. Tibbats replied that except for the occasional storm that may blow directly into harbor, any time of year will do. He suggested avoiding Mondays and Tuesdays because of heavy vessel traffic during those days. The best days to conduct offshore surveys in Apra Harbor are on Thursday and Friday.

Brief discussion of limited availability of area for commercial and recreational use ensued. Port Authority representatives replied that public access minimal now because of homeland security.

D. Harris informed meeting participants that Guam Comprehensive Economic Development Strategy (CEDS) states Hotel Wharf improvements is the number one priority. She provided a paper copy of the appropriate excerpt from CEDS to WCP.

The meeting adjourned at 1430 hours.

J. Hatashima decided to hold a debriefing with PAG and TG Engineers that afternoon rather than following morning. He convened the debriefing at 1505 hours. Regarding meeting summaries, he allowed WCP a few days to prepare them rather than try to complete and make them available by following morning. The completed summaries can be sent electronically to individuals on the POC list in his handout, i.e., himself, D. Harris, S. Delos Santos, and T. Gudmundsen. D. Harris says she and/or S. Delos Santos can distribute the meeting summaries to others at PAG.

T. Gudmundsen will prepare and provide a design concept plan to USACE. Revisions to the shoreside area at Hotel Wharf may impact the project schedule.

T. Gudmundsen believed that the EA or EIS mentioned by M. Gawel during the meeting probably pertains to seawater intake pipes at the easternmost area of Apra Harbor for Mobil and South Pacific Petroleum fire suppression systems. The pipes would need to be extended or re-routed should land reclamation at this area of Apra Harbor occur. G. Hollingsworth recalled seeing an EA and/or pipeline extension plan, and will provide a copy of the document to WCP if he is able to find it.

Disappointment was expressed regarding the absence of a UOG Marine Lab representative during the 1300 hours meeting. The POC there is Barry Swift.

G. Hollingsworth provided WCP with a copy of a November 26, 2003 memorandum regarding a report of unexploded ordnance in 60 to 90 feet of water off Golf Pier. He was still looking for data on disposition of a purported munitions barge off Family Beach and Hotel Wharf.

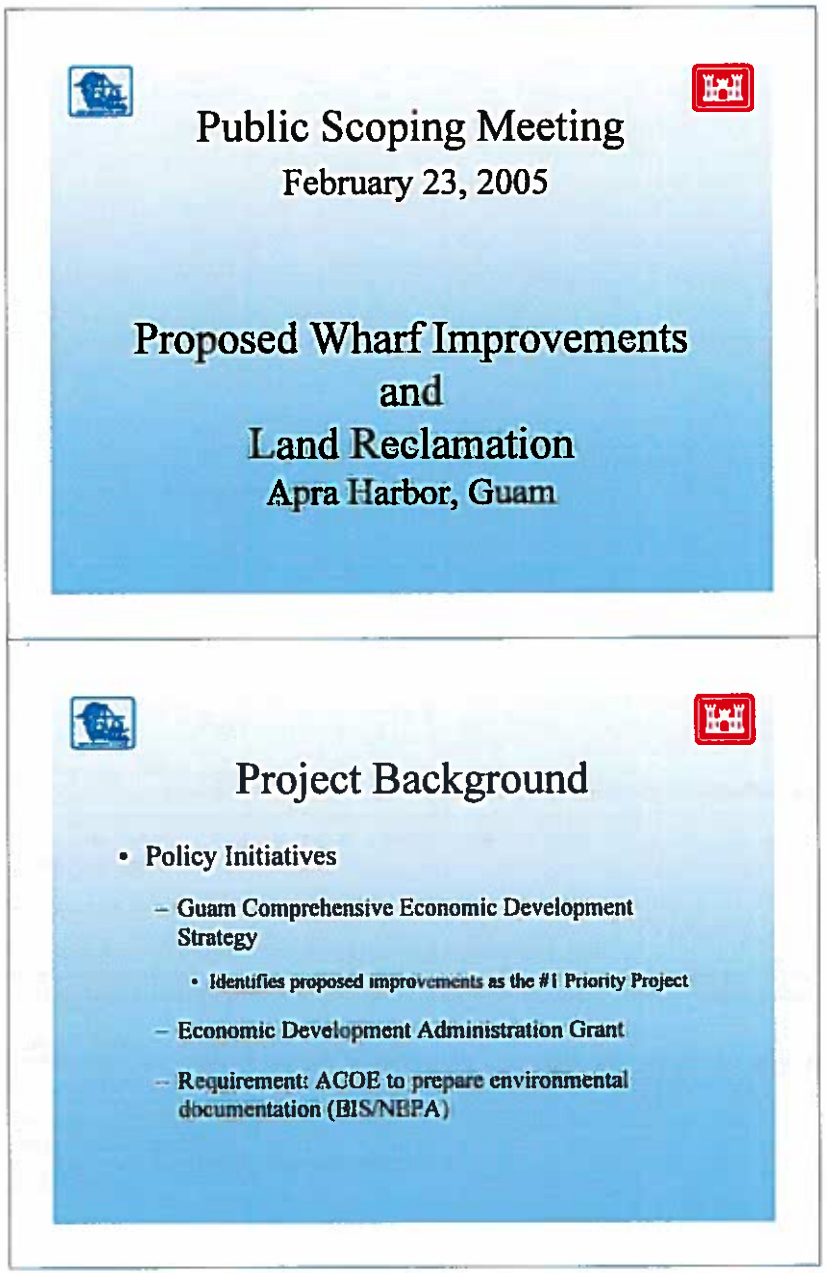
The debrief adjourned at 1540 hrs.

Follow-Up Actions

- J. Hatashima will provide a copy of of the EIS scope of work to M. Gawel
- T. Gudmundsen will prepare and provide a design concept plan to USACE.
- PAG will try to obtain a copy of the South Pacific Oil seawater pipeline extension EA or written plan and provide a copy to WCP

APPENDIX C

PUBLIC SCOPING MEETING PRESENTATION AND DISPLAY BOARDS



Existing Conditions

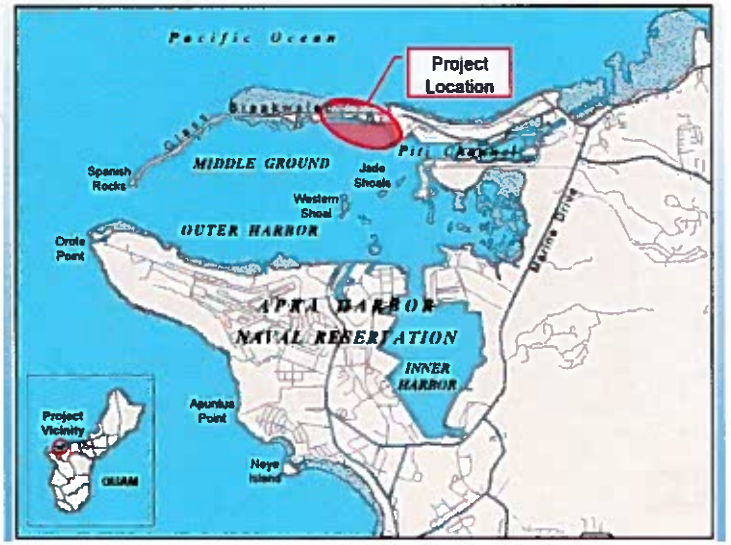
- Apra Harbor – Guam's Only Commercial Port
- Multiple Maritime Users
  - Cargo (Imports and Exports)
  - Tourism (Cruise Ships and Excursion Vessels)
  - Fisheries (Tuna Shipments)
  - Military (U.S. Navy)

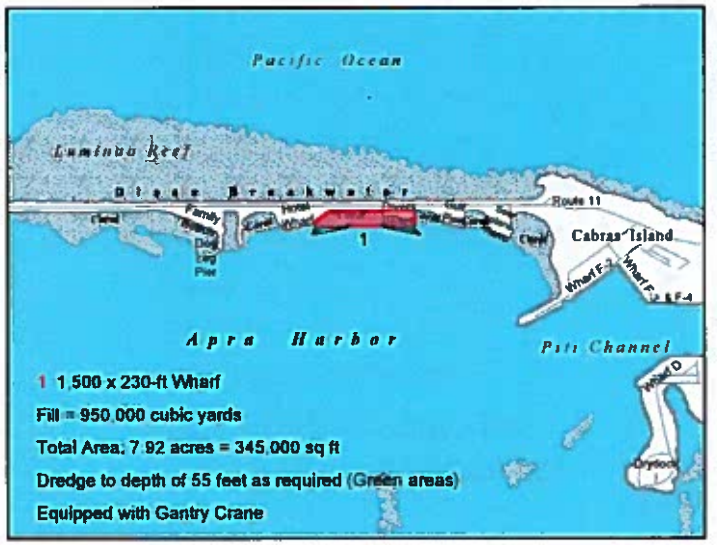
- Cargo Operations
  - Account for over 70% of total port traffic
  - 95% of goods imported to Guam arrive by sea
  - In 1980 cargo volume was 687,000 tons, in 2000 1,970,000 tons
  - Increase of 186% in cargo volume

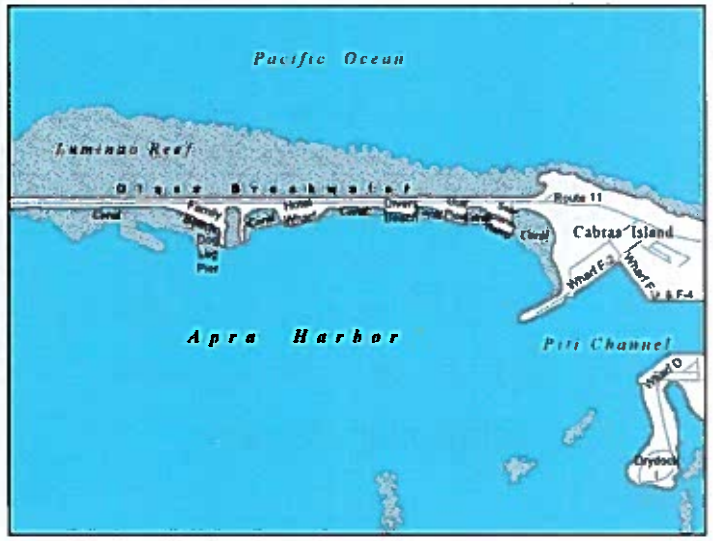
- Harbor Operations and Constraints
  - Today port averages 300 port calls per month
  - Congested operating conditions
  - No increase in wharfage in past 30 years
  - No deep water berthing facility for new generation of container ships (Post-PANAMAX)
  - Limited container yard capacity
  - New federal regulations for port security

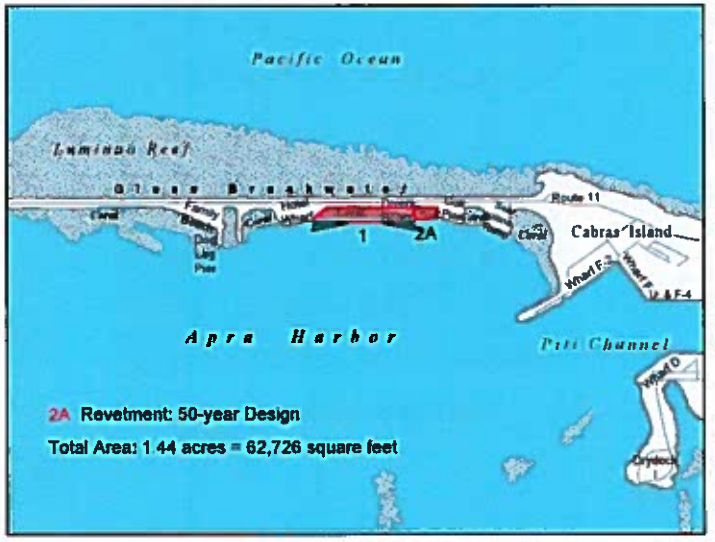
Proposed Improvements

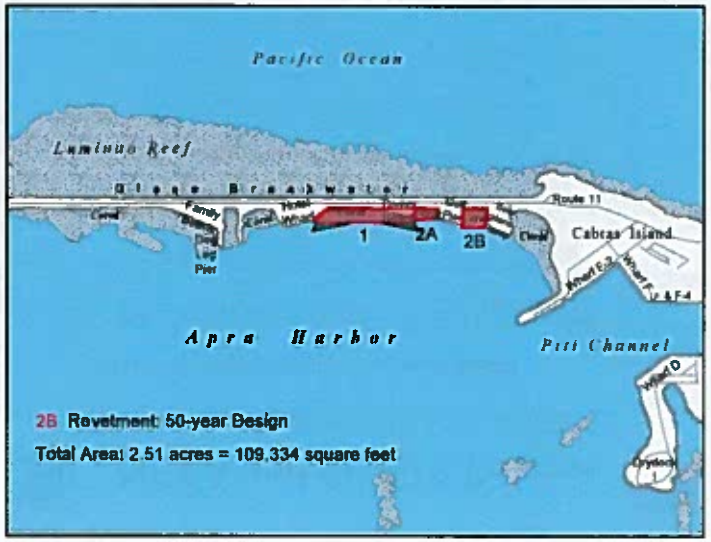
- Construction of a new deep draft wharf
  - Post-PANAMAX Container Vessels
    - Minimum Berth Length = 1,100 feet
    - Minimum Berth Depth = 50 feet MLLW
  - Nimitz Class Aircraft Carrier (on contingency basis)
    - Minimum Berth Length = 1,300 – 1,325 feet
    - Minimum Berth Depth = 49.5 feet MLLW
- Dredge to depth of 55 feet as required
- Land reclamation to increase container yard capacity

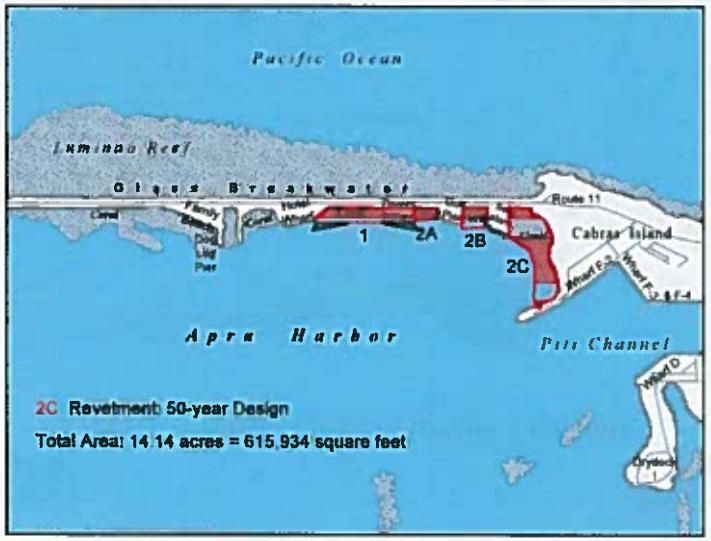

Pacific Ocean
Project Location
Outer Breakwater
Piti Channel
MIDDLE GROUND
Jade Shoals
Spanish Rocks
Western Shoal
OUTER HARBOR
Orote Point
Marine Drive
APRA HARBOR
NAVAL RESERVATION
INNER HARBOR
Project Vicinity
GUAM
Apuntua Point
Neye Island

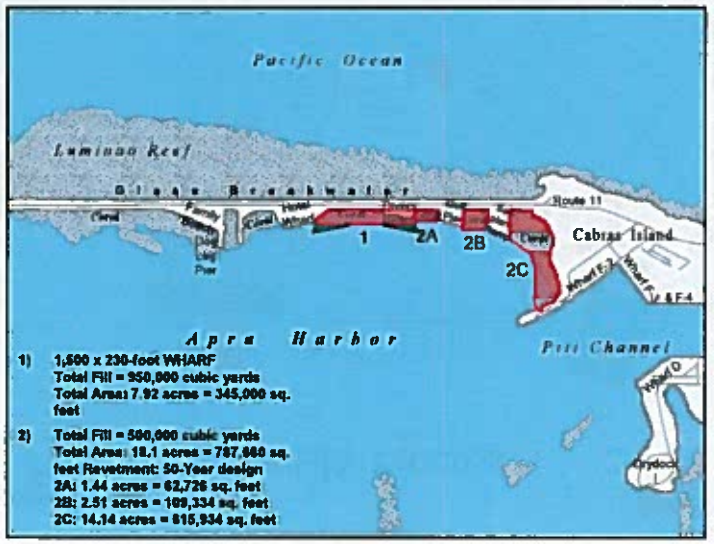

Pacific Ocean
Luminao Reef
Outer Breakwater
Route 11
Cabras Island
Wharf F-2
Wharf F-3 & F-4
Apra Harbor
Piti Channel
Wharf O
Drydock
1
1 1,500 x 230-ft Wharf
Fill = 950,000 cubic yards
Total Area: 7.92 acres = 345,000 sq ft
Dredge to depth of 55 feet as required (Green areas)
Equipped with Gantry Crane


Pacific Ocean
Luminao Reef
Outer Breakwater
Route 11
Cabras Island
Wharf F-2
Wharf F-3 & F-4
Apra Harbor
Piti Channel
Wharf O
Drydock


Pacific Ocean
Luminao Reef
Outer Breakwater
Route 11
Cabras Island
Wharf F-2
Wharf F-3 & F-4
Apra Harbor
Piti Channel
Wharf O
Drydock
1
2A
2A Revetment: 50-year Design
Total Area: 1.44 acres = 62,726 square feet







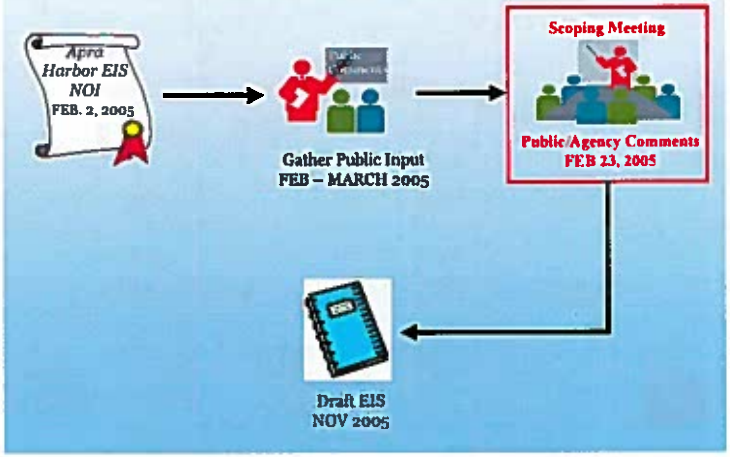
Fill Material

- Approximately 7.9 acres for construction of new wharf
- Approximately 18.1 acres for land reclamation
- Potential Sources:
  - Navy Dredge Sites within Apra Harbor
  - Import fill material
  - Combination of two

Dredge Material Staging Options



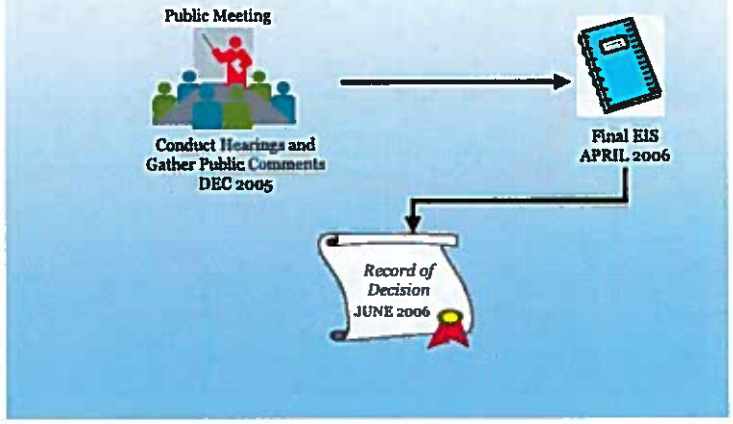
The EIS Process



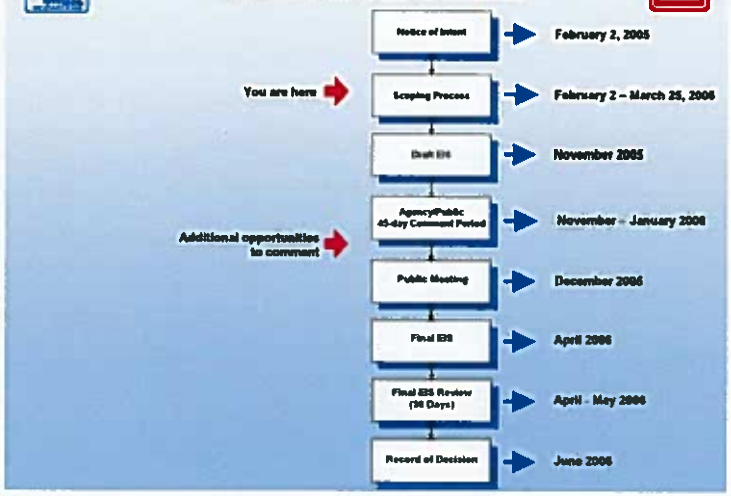
NEPA and the EIS Process

- National Environmental Policy Act (or NEPA)
  - Law for the protection of the environment
  - Agencies must address potential impacts of action
  - Consider reasonable alternatives to proposed action
- Environmental Impact Statement (or EIS)
  - Most comprehensive documentation under NEPA
  - Identifies reasonable alternatives to the action
  - Identifies potential environmental impacts of action
  - Identifies mitigation measures

The EIS Process



APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION EIS FLOW CHART and PROJECTED DATES



Public Input

- On Project Alternatives
  - No Action Alternative
  - Alternative Design
  - Partial Build-out
  - Alternative Fill Material Sources
- Cultural Resources & Traditional Cultural Properties
  - Section 106 of the National Historic Preservation Act
- Potential Impacts to Other Resources
- Potential Mitigation Options for Unavoidable Impacts

To Make Written Comments

- Use written comment sheets provided and turn them in tonight
- Mail written comments by March 25, 2005 to:

  U.S. Army Corps of Engineers, Honolulu District
  Civil and Public Works Branch, (CEPOH-PP-G)
  Rm. 312, Bldg. 230
  Fort Shafter, HI 96858-5440
  ATTN: Mr. James Hatashima, Project Manager
  Re: Apra Harbor Wharf Improvements EIS
- Submit comments via Email or Fax

  Email: **james.k.hatashima@usace.army.mil**

  Fax: **(808) 438-0430**

APPENDIX D

PUBLIC SCOPING MEETING HANDOUT MATERIALS

Proposed Wharf Improvements and Land Reclamation Environmental Impact Statement

February 23, 2005

SCOPING MEETING INFORMATION SHEET

Project Background

Under a federal grant from the U.S. Department of Commerce Economic Development Administration, the Port Authority of Guam is proposing modifications to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. Apra Harbors operates under congested conditions, and is in need of improvements to meet anticipated future demands of the island's commercial port operations. The proposed project would provide additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep-draft container vessels, and cruise ships. The proposed improvements would also provide contingency berthing facilities for U.S. Navy military vessels.

Elements of Proposed Project

1) Construction of a new 1,500 x 230-foot wharf to the east of Hotel Wharf. Improvements may include construction of a cellular sheet pile bulkhead or pier on piles, deposition of approximately 950,000 cubic yards of fill material over 7.92 acres, and construction of mechanized cargo container handling equipment.
2) Placement of approximately 500,000 cubic yards of fill material over 18.1 acres of submerged lands in three areas along the east end of the Glass Breakwater. Improvements may also include construction of rock revetments, and construction of cargo container storage yard facilities.
3) Dredging of submerged lands to a depth of 55 feet in waters adjacent to the proposed 1,500-foot wharf to accommodate larger deep draft commercial and military vessels.

The attached figures show the proposed project areas.

NEPA and the EIS Process

What is NEPA? The National Environmental Policy Act (NEPA) is a federal law that was created to establish policies and goals for the protection of the environment. The process implemented by NEPA is intended to help federal agencies make decisions on projects based on an understanding of environmental consequences. Agencies are required to look at the potential impacts of a proposed action (including, but not limited to, impacts on air, water, land use, noise, socioeconomics) and identify reasonable alternatives to the proposed action or project. Agencies must also consider the cumulative impacts of their actions.

What is an EIS? An Environmental Impact Statement (EIS) is a public document with a primary purpose of ensuring that environmental considerations are incorporated early into programs and actions of federal agencies. An EIS is the most comprehensive form of environmental documentation under NEPA. It provides a full and fair discussion of environmental impacts associated with a proposed action and must inform the decision-makers and the public of reasonable alternatives and mitigation measures that

would avoid or minimize any adverse impacts caused by the action. The EIS provides a basis for informed decision-making. Further, it allows for public review and input as well as coordination with other agencies.

The EIS Process: Following the decision that an EIS is required, there are a number of steps that must be followed. The EIS process consists of the following stages:

1) Scoping: Scoping is the initial step in the EIS process. The scoping process involves the participation of stakeholders, government and nongovernmental entities, and the general public. The most important thing that occurs during scoping is the identification of relevant and significant issues that will be analyzed in depth in the EIS. The scoping process is officially announced in the Federal Register through a Notice of Intent (NOI) to prepare a Draft EIS. The NOI for the proposed project was published in the February 2, 2005 Federal Register.

2) Draft EIS: The Draft EIS is a document that contains many components, some which are: a description of the proposed action and alternatives to the proposed action; a description of the affected environment in its present and future states; and a description of the environmental consequences of each proposed and alternative action. The Draft EIS is the document upon which the decision to proceed with any particular alternative is made. The Draft EIS is scheduled to be published in November 2005.

3) Final EIS: After a 45-day comment period, input on the Draft EIS from the public and local and federal government reviewers will be used in the preparation of a Final EIS. The Final EIS will identify the preferred alternative, the reasons it was selected, and the reasons other alternatives were not selected. The Final EIS is scheduled to be published in April 2006.

4) Record of Decision: The Record of Decision (ROD) is a concise public document that summarizes the findings in the EIS and the basis for the agency's final decision. The ROD must also identify the environmentally preferable alternative, discuss how and why the agency reached its decision, and indicate whether all practicable means to reduce environmental harm have been included in the preferred alternative. The ROD is scheduled to be published in June 2006.

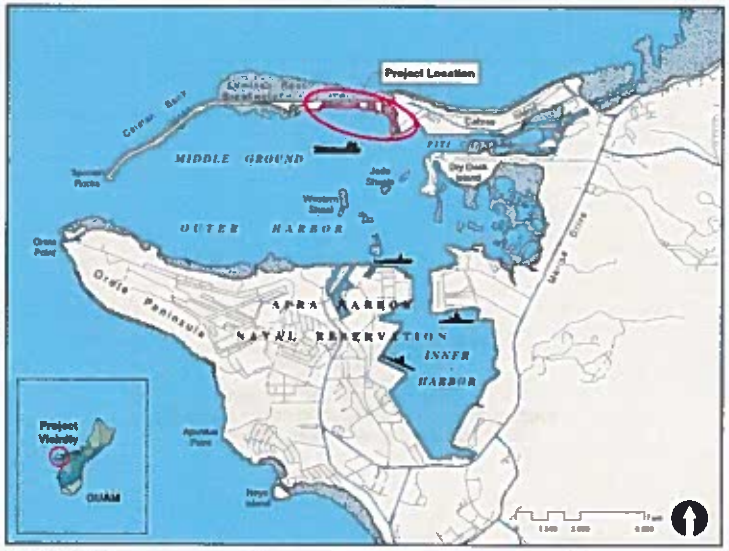
How to Submit Comments

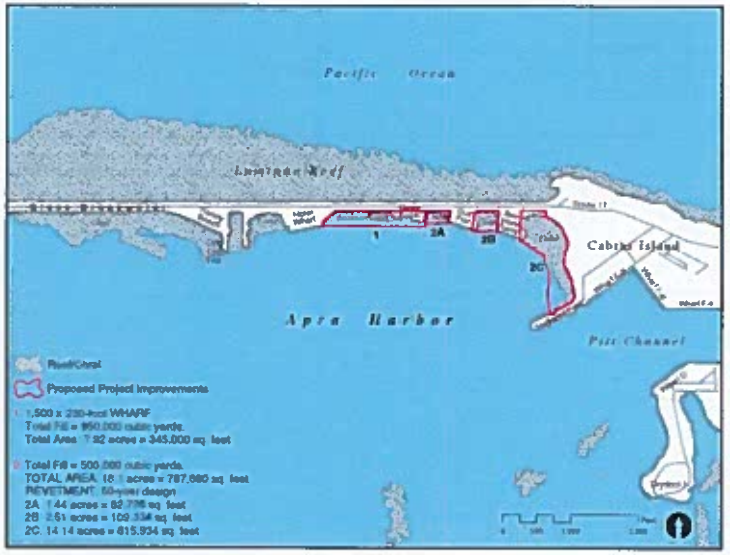
You may submit comments on the proposed project in writing to the address below. You may also submit your comments to the below fax number or email address. To make the submission of your comments easier we have attached a Comment Mail-In Form to the back of this information packet. Simply write your comments in the space provided and mail the form to the pre-printed address.

SUBMIT COMMENTS TO:

U.S. Army Corps of Engineers
Honolulu District
Civil and Public Works Branch
(CEPOH-PP-C)
Rm. 312, Bldg. 230
Fort Shafter, HI 96858-5440
ATTN: Mr. James Hatashima
Project Manager

E-mail:
james.k.hatashima@usace.army.mil
Fax: (808) 438-0430





PUBLIC COMMENT MAIL-IN FORM

PUBLIC SCOPING MEETING
FOR THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT
APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION PROJECT

This form offers a convenient way for you to provide comments regarding the Draft Environmental Impact Statement for the proposed improvements at Apra Harbor. Please write your comments in the space below, fold the form, tape, stamp and mail. Thank you!

To: James Hatashima, U.S. Army Corps of Engineers, Honolulu District, Civil & Public Works Branch, CEPOH-PP-C, Rm. 312, Bldg 230, Ft. Shafter, Hawaii, 96858-5440

Subject: Draft Environmental Impact Statement for Apra Harbor Wharf Improvements and Land Reclamation Project

Signed: _____ Date: _____

Name and address (please print): _____

Fold top portion down and stamp

Stamp

Mr. James Hatashima, Project Manager
U.S. Army Corps of Engineers, Honolulu District,
Civil and Public Works Branch
CEPOH-PP-C
Rm. 312, Bldg. 230
Fort Shafter, Hawaii 96858-5440.

Fold here, tape and mail

APPENDIX E

PUBLIC SCOPING MEETING ATTENDANCE SHEET AND TRANSCRIPTS

PUBLIC SCOPING MEETING FOR APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION EIS PREPARATION
23 February 2009. PAG Conference Room

	NAME	ORGANIZATION	ADDRESS	PHONE	E-MAIL ADDRESS	PROVIDE ME A COPY OF THE DRAFT EIS
1	Paul Paulshen	PLR Env.	[illegible]	646-3500	paul@pcrguam.com	☑ Y ☐ N
2	Damian Yeman	USCG	Commander [illegible]	339-2001	[illegible]	☐ Y ☐ N
3	Anthony Harper	Navy	COMNAVMARIANAS	339-8181	harpera@guamnavy.mil	☑ Y ☐ N
4	Rosalind Hunter-Anderson	MARS	PO Box 22303 GMF Guam 96921	734 1129	[illegible]	☒ Y ☐ N
5	Suzanne Wilkins	NOAA Marine Lab	NOS Station Manila	735-2181	[illegible]	☑ Y ☐ N
6	Darleen Mesa	MARS	P.O. Box 22303 GMC 96921	734-1129		☑ Y ☐ N
7	Paul Fisher	Com Nav Mar	Com Nav Marianas	339-2021	Fisherp@guam.navy.mil	☐ Y ☐ N
8	Mike Cruz	GEDCA	540 S. Marine Corps Dr.	6474327	mcruz@guamchamber.com	☑ Y ☐ N
9	LT Cdr Morales	U.S. Coast Guard	Commander MAR Sasha Plaza Ste 303	339 2001	[illegible]	☑ Y ☐ N
10	Tor Gudmundsen	TG Engineers	125 Ti Chulan Street	647-0800	TOR@Guam.NET	☐ Y ☐ N
11	Ariella F De Leon	BSP/GCMP	PO Box 3933	475-9669	[illegible]	☑ Y ☐ N
12	Mike Gawel	GEPA	120 Bangbang St. Suite 401	475-1646	[illegible]	☐ Y ☐ N
13	Dawie De Leet	DFW	[illegible]	646-3701	—	☑ Y ☐ N
14	[illegible]	DAWR	142 Dairy Road	735-3984	[illegible]	☑ Y ☐ N
15	Simeon Delos Santos	[illegible]		477-5731		☐ Y ☐ N

PUBLIC SCOPING MEETING FOR APRA HARBOR WHARF IMPROVEMENTS AND LAND RECLAMATION EIS PREPARATION
23 February 2005, PAG Conference Room

	NAME	ORGANIZATION	ADDRESS	PHONE	E-MAIL ADDRESS	PROVIDE ME A COPY OF THE DRAFT EIS
1	[illegible]	Mayor	P.O. Box 503 Piti	472-1202		☐ Y ☐ N
2	[illegible]	Sen. Urban Sch. Liaison	155 Hesler St., Hagatna GU	477-7451		☑ Y ☐ N
3	Dot Harris	PAG		472-2611		☑ Y ☐ N
4						☐ Y ☐ N
5						☐ Y ☐ N
6						☐ Y ☐ N
7						☐ Y ☐ N
8						☐ Y ☐ N
9						☐ Y ☐ N
10						☐ Y ☐ N
11						☐ Y ☐ N
12						☐ Y ☐ N
12						☐ Y ☐ N
14						☐ Y ☐ N
15						☐ Y ☐ N

Piti, Guam: Wednesday, February 23, 2005 6:00 P.M

PUBLIC SCOPING MEETING
PROPOSED WHARF IMPROVEMENTS
AND LAND RECLAMATION
APRA HARBOR, GUAM
PORT AUTHORITY BOARD CONFERENCE ROOM

INTRODUCTION
BY JOE MESA:

MR. JOE MESA: Hafa Adai Ladies and Gentlemen. I would like to welcome you here to the Port Authority, the place where ninety five percent of your cargo that comes through Guam comes in. And to be politically correct, its...its important and also protocol to introduce the mayor of Piti, Mr. Mayor Ben Gumataotao. He's taken time out of his busy schedule to join us because actually we're his constituents you know. I know he was talking to me the other day about how he can get maybe a dollar off of each container that comes through here for his village.

Anyway, on behalf of the Port Authority of Guam, the United States Army Corps of Engineers, I would like to welcome you to this public scoping meeting for the Environmental Impact Statement for the proposed Apra Harbor Wharf Improvement and land reclamation project.

And before I begin I would like to introduce the individuals who you would be interacting with this evening.

From the Port, my right hand person, Paul Shintako, he's our Deputy – Paul, Dot Harris is our Chief Planner, from the Army Corp, James Hatashima, and Cindy Barger. From T&G Engineers, our consultants who is

doing the A & E, Tor, WCP Richard Stook and of course from PCR, and before I introduce her, I've known her from when she was like this...(laughs)...Tara.

We are here this evening to provide information on the proposed action and to receive your comments on what issues should be considered and addressed in the forth coming environmental impact statement or the EIS.

An Environmental Impact Statement is the most comprehensive document that an agency can prepare under the National Environmental Policy Act. The forth coming EIS will comprehensively analyze the potential impacts the proposed action will have on the environment. There will be a 30-day comment period for this scoping meeting. Therefore we will be accepting written comments until March 25th. However as we explained, later, there are additional times in this process where you will have the opportunity to provide input through the preparation of the EIS.

The Port's role tonight is to provide information regarding our proposed action that is the construction of a new wharf, and reclamations of lands within Apra Harbor.

The Army Corps of Engineers and Wil Chee Planning's role is to provide information about the National Environmental Policy Act, which governs the EIS process, and what you can expect in the coming months.

Our facilitators' role is to provide information, and ground rules for tonight's meeting and to keep things moving along in a timely manner.

And your role is to provide input on what Environmental issues and concerns you believe should be addressed and analyzed in the EIS. Your issues and concerns will help us to develop a basis on which we can plan which special

studies and data we may need to gather in order to properly assess the potential impacts on the environment.

At this time I would like to introduce Dot...will go through some flight presentations and then following that is Tor.

Again, where's the refreshments? We didn't bring any refreshments? (Crowd laughs) We have water and this and that, okay. Thank You.

PRESENTATION
BY DOT HARRIS:

DOT HARRIS: Thank you, and again I am Dot Harris with the Port. And I'll start off with the presentation.

Okay. A little bit about the project background... Which way can I point? Oops. Can you hit the back arrow? The, the back arrow. There we go. Okay.

The policy initiatives that started this...this process..., first of all..., this project was identified as the number one priority project in the Guam Comprehensive Economic development strategy of two thousand and one and it was also, and the construction phase was identified again as the number one priority in the following years in the Comprehensive Economic development strategy.

The said is a threshold document that is required in order for us to receive funding, federal funding under the Economic Development Administration – grant program, which is administered by the U.S. Department of Commerce.

They, they have... and it is the federal funds that are paying for the design component and the EIS component of this project. Um, and in that grant...in that grant award there was specifically identified a requirement that the Army Corp is to prepare the environmental documentation which at this point we have determined will be the environmental impact statement for the NEPA compliances.

And our existing conditions at this point, as we all know Apra Harbor is Guam's only commercial port, and we have multiple maritime users.

Of course as we know cargo imports and exports, tourism we receive cruise, uh, cruise ships and excursion vessels, we are a major protocol and transshipment point for fisheries, tuna transshipments, and of course we provide services as needed for the, for the military to include the U.S. Navy.

For our, for our cargo operations, we account for over seventy five – seventy percent total of port traffic and as Mr. Mesa noted earlier, ninety five percent of the goods imported to Guam are arrive by a seas.

So we're very critical component of any, of anything that comes into the island of Guam. And in nineteen ninety, in nineteen eighty the cargo volume was, just under seven hundred thousand tons and in two thousand, if we look one point, nine million tons. And this represents an increase of hundred and eighty six percent, in total cargo volume.

Our harbor, as we, as I mentioned is our only harbor and it...and operations...I'll describe the operations on some of the constraints that we have.

Today we average about three hundred port calls per month for the various vessels that I identified in the earlier slide, which results in congested operating conditions at our waterfront.

We have had no increase in wharfage in the past thirty years. What you see, waterfront was turned over to the Government of Guam by the Navy. So this is what we have, this is what we are working with as a private community.

And we have no deep water birthing facility for the new generation of cons, of container ships to include Post-Panamax vessels. I believe that our, our draft at this point doesn't...is, is on average about between – about thirty-five feet on average at our resisting waterfront.

And for Post-Panamax we require a minimum of forty, oh a minimum of fifty feet in draft, excuse me. And we additionally have limited container yard capacity.

Cabras Island is as you know is, is, uh, does not have, much in terms of land mass and another area of concern that we need to comply with are the new federal regulations for Port security where we would need - where we have an increasing need to start segregating different uses for protocols.

For instance we cannot no longer combine a certain operations at the waterfront, such as cargo operations and passenger cruise vessels operations. These operations have to be conducted separately, and uh, cannot, can't happen on our waterfronts simultaneously.

As for proposed improvements...I think this is where I turn it over to you. Oh and this is Tor Gudmundsen as, as Mr. Mesa had introduced him, he is our engineer for the design component.

PRESENTATION
BY TOR GUDMUNDSEN:

TOR GUDMUNDSEN: So, I will just discuss the wharf project and the adjacent reclamation sites.

One point we wanted to clarify is the areas that are going to be constructed with fill, adjacent to the wharf or actually fill sites.

We have the term reclamation in the project title but they're, they're actually fill sites.

So we've listed here construction of a new deep draft wharf and it will have the capability of birthing both of these types of vessels that are listed here: the Post-Panamax container vessels that Dot had mentioned, require a birth length of eleven hundred feet and a birth depth of fifty feet and the Nimitz class aircraft carrier, just on a contingency basis has a minimum birth length requirement of thirteen hundred to thirteen twenty five feet and birth depth of about forty nine in a half feet.

And so the ram...the land reclamation areas that are a part of the project will increase the container yard capacity.

All right. This slide shows all of Apra Harbor and the project location is highlighted there at the North side. This is a blow up of the same area. If you're familiar with this part of the harbor, Hotel Wharf is here, what we're calling Diver's Beach is here, Sea Plane Ramp, and the Mobil Fuel Facility over at the western side of Cabras Island.

So this slide, first of all shows the wharf side, the deep draft wharf side. And the wharf is planned to be fifteen hundred feet long.

Butting up against the east side of hotel wharf, or actually, we've reached the point in the design where I think we may have about a hundred foot

space now between the east end of hotel wharf and the west side of our new wharf.

But then extending fifteen hundred feet to the east, we've got an initial estimate of fill for the wharf that was up around nine hundred and fifty thousand cubic yards, and a total area of almost eight acres, and we are dredging to the depth of fifty five feet to meet the minimum birthing requirements and the wharf will be equipped with gantry cranes and typhoon stowage requirements and so forth for the gantries.

The green triangles that are just in front of the wharf site approximately show areas that will be dredged in front of the wharf to reach consistent depth of fifty-five feet along the full length of the wharf.

What happened did I? Okay I think I went passed 2a right? Right 2a. So we have three fill sites that are identified and the first one here we are calling 2a, has an area of about one point four, four acres, and it is adjacent to the east end of the wharf. And we'll fill the area between the wharf and the golf pier property. Okay.

And revetment 2b is just a little bit larger, two and a half acres and we'll fill the area between the gulf pier and the seaplane ramp. Okay.

And 2c then fills in the area...that's along the western shore line of the Mobil fuel farm and covers an area of about fourteen, a little over fourteen acres.

So this slide shows the full areas of the project. The wharf itself and then the three fill sites. Okay.

So we summarize here: we've got the wharf with the fill requirements and the approximately eight acres of area and the three fill areas. The initial estimate was around five hundred thousand cubic yards of fill and the acreage that we covered, one point four acres for 2a, two and a half acres for 2b, and a little over fourteen acres for 2c. Okay.

The fill material, right, again is just listing the acreage that we've estimated for the wharf itself and for the fill sites, and potential sources right now for the fill...we're having on going discussions with the Navy about using fill material that will be available from dredging that they have planned in the inner harbor. And depending on the quality of that material, we may also need a better quality aggregate type of material for structural capabilities, and so we may be looking at other quarry sites on island for imported aggregate fill and quite possibly it will end up being a combination of those two things.

Where we use the dredge material to the extent that that's possible and then a better quality fill where we need it for the structure, and dredge material staging options...this is a plan that's part of our discussions with the Navy.

The timing of the Navy dredging projects is a little bit different from the timing of our project and there are several projects that the Navy will be dredging over the next three to four years. So, we may need a temporary staging site to bring the material and de-water it, and keep it close to the site until we're ready to use it.

And actually, this green oval right here, because it's being looked at most seriously right now...and extending a little further up until this old quarry site and then also extending into this area over toward the commercial port container yard.

Those two areas combine to about thirty-five acres of property. Okay. So I'll turn it over to Richard.

PRESENTATION
BY RICHARD STOOK:

RICHARD STOOK: Good evening, my name is Richard Stook. I'm with a company called Wil Chee Planning, we're contractors out of Honolulu with the Army Corp of Engineers to prepare the Environmental Impact Statement.

And before I begin, I would just like to mention that the slides that I'm about to discuss, uh, all the information is on the handout, the information packet that you picked up. In addition, some of Tor's discussion is also in the information packet.

So, I guess I would like to discuss the reason we're all here now which is the upcoming EIS and the NEPA and EIS process.

So first to start with the National Environmental Policy Act, many of you already know this, but just bear with me. NEPA, is basically the major federal law for the protection of the environment, and NEPA requires agencies to address potential impacts of their actions and NEPA also requires agencies to consider reasonable alternatives to a proposed action.

The Environmental Impact Statement or EIS, is the most comprehensive environmental documentation under NEPA and it's the EIS document which identifies the reasonable alternatives to an action. It identifies the potential impacts, environmental impacts of the action, and it also identifies mitigation measures.

However the EIS is actually... it's more than just a document. It – it's a process um, which I'd like to go through now.

It's a process that allows for review and public input – public review and input, and one of the first steps in EIS process is the scoping process, which is why we're here today.

And you can see on February second, a notice of intent was published in the Federal Registrar. A notice of intent is essentially a public...an agency publicizing their intent to prepare an environmental impact statement. That was published on February second and as you can see the red square...we're here today, during our scoping meeting.

The scoping meeting is important in that it um, identifies significant, and relevant issues to be addressed in the Environmental Impact Statement.

So based upon research that's done, data that's collected, and public and agency input, the draft EIS is developed. And the draft EIS is draft document of the EIS, which is scheduled to be published around November of this year. It is in the draft EIS that alternatives are identified and impacts and mitigation measures are identified. And its actually the draft EIS which is the decision document. So the decision to proceed with which alternative is based on the analysis in the draft EIS.

After publication of the draft EIS, a forty-five day comment period follows. In addition, a public meeting will be held. That is scheduled for December of this year. And based upon the feedback and the comments on the draft document and the comments received during the public meeting, they're incorporated and they are used to develop the final Environmental Impact Statement. And the final EIS, which is scheduled to be published around April 2006, that is the document that identifies the preferred alternative and it also identifies a reasoning why that alternative was chosen.

After publication of the final EIS, a record of decision, or ROD, is published and for this particular project, it's scheduled to be around June. And that is a concise document that just summarizes the findings in the final EIS and the reasoning again for selection of the preferred alternative.

(Mr. Stook refers to presentation slide at this time)

On this slide, this actually summarizes the two diagrams but it is in a flow chart form so you can see some of the milestones along the right...the right hand side of the slide and the dates that are projected. And again you can see where we are now. We're in the... in the early stages of the EIS process and scoping process gathering information. And again as Joe mentioned earlier, the additional opportunities to comment during the process are after publication of the draft EIS. You'll be able to comment on the document for a forty-five day period as well as during the public meeting. Again these dates are also on the information sheet.

So again, public input...that's the scoping process is all about, to get some feedback for agencies and the public, and if you all can provide some input, any input on project alternatives.

Right now some of the preliminary alternatives being considered are the no action alternative...alternative designs, partial build out, and alternative sources for the fill material.

If you can provide any information on cultural resources or traditional cultural properties, that's important because NEPA requires compliance with section 106 of the National Historic Preservation Act, which is uh, I guess the major federal law for protection of those types of resources.

Any input on potential impacts for the resources will be very helpful or input on potential mitigation options will also be of great help.

Again to submit comments on what you've heard tonight, you can use the written comment sheets provided in the front and there's a turn in box, that you can turn these sheets in or you can mail your comments in. The last page of your information packet has a mail in comment form, and you just put a thirty-seven cents stamp on it. Put it in the box to the address on the form. Or you can mail a long letter the address there...to Jim at the Army Corp in Honolulu or you can also submit comments via e-mail or fax to those numbers up there.

UNIDENTIFIED PERSON: Who do we send it to?

RICHARD: Jim Hatishima. He's with the Army Corp, he's the project manager *(laughs). (Individual in crowd makes a comment, unable to hear. Crowd laughs)*

So I'll just leave this up here and before we get onto the comment phase, I'll just turn it over to Tara real quick, if you have any quick ground rules on the comment session.

PUBLIC COMMENT
FACILITATED BY TARA PEREZ-STEFFY:

TARA PEREZ-STEFFY: If we could perhaps turn on the lights, now that we're getting to the public comment portion of the meeting.

I've noticed that everybody...that a majority of you that are here tonight are either from Gov Guam agencies or Federal agencies.

So, I'm sure you're thoroughly familiar with the format of the public comment portion of the meeting, such as this. But just to remind us all, we'd like

to go through some brief ground rules, to make sure that the meeting continues to move at a good pace and to also ensure that everybody who would like to make a comment, has the time to do so within the amount of time we're here tonight.

First of all you can always submit your comments in writing as Richard had mentioned with the public comment forms, should you not choose to do so tonight then please use this information which is also on your handouts, on the second page in the small blue box on the lower right hand corner, okay. And then the comment form itself also has that in the back.

RICHARD STOOK: I just wanted to interject. One thing that's missing on the hand out is (Tara: Deadline?) a deadline. So please make a note of the March 25th deadline.

TARA: Right. And that will be thirty calendar days from the date of the meeting this evening. So like Richard said, it's March 25th and it is not on the handout, so it might be good to make a mental note or write that down before you leave.

But before we get into the receiving oral comments tonight, first of all we would like to remind everyone our focus this evening is on the preparation of the EIS. And so the most effective comments the best use of tonight's time will be to try to keep our comments relative to the alternatives that are under consideration in the preparation of the EIS.

Secondly, in order to make sure that we move along we're going to ask that you try to limit your comments to five minutes and I will let you know when you have a minute left.

The proceeding, or the meeting tonight is also being taped for the project record, so, we're going to ask that if you would like to make a comment please raise your hand and I'll bring the microphone to you. And before you make your comment, if you could please state your name clearly, and also let us know what organization that you're with, just identify the organization that you're representing. And I believe that...those are pretty much all...just, kindly turn your cell phone down, respect other people's comments and try not to interrupt, refrain from interrupting, and that should be it.

We're scheduled to be here until eight, but we'll be here just as long as it takes to get everybody's comments and viewpoints in. Okay. So having said that, one quick note, the restrooms are located out the door, in the back of the room to your left. In case... I didn't think that that was mentioned earlier. So having said that, why don't we go ahead and open up the public comment portion, and would anybody like to make a comment?

AMILIA DE LEON: Going over the least of requirements in the...regarding the preparation of the EIS, I would like to at least include...if Mr. Stook can include the requirement of the CZM law, the Coastal Zone Management Act, that requires that better consistency the um, uh...what is that...this EIS go through a better consistency of process.

TARA: Okay. Just for the record, would you mind stating your name and the organization you are with?

AMILIA DE LEON: My name is Amelia De Leon, from the Bureau of Statistics and Planning and Guam Coastal Zone Management Program.

MIKE CRUZ: My name is Mike Cruz representing Gerry Perez from the Guam Economic Development and Commerce Authority. He has prepared written comments, that I would like to kind of summarize or read. It is

pretty short. This is from Gerry Perez, the Administrator of the Guam Economic Development Authority but it is addressed to Joe Mesa, General Manager of the Port.

Thank you for the invitation to attend the Public scoping meeting, to prepare an Environmental Impact Statement for wharf improvements at Apra Harbor. As you know Governor Camacho's ten point plan for Guam's economic recovery includes the presence of a larger military force footprint on island, my office has been tasked to implement this objective, and as such has been an active participant in various activities associated with the construction of a new wharf and land reclamation at the Commercial Port of Guam. It is from this perspective that we suggest the following areas to be addressed in the development of the EIS or other related studies.

The impact uh, first the impact of the project on military training activities conducted in the harbor, potential military use of the wharf and its effect on Port revenues, impact of the wharfs location and activities with respect to the Navy's future requirements including but not limited to home porting additional attack submarines, worrying of military preposition ships, loading and off loading of ammunitions of Kilo wharf and maintenance of the glass break water and finally potential savings of the Navy...should use of the new wharf allow the Navy to delay construction of its own deep draft wharf.

In closing he states, By the way, Dot, Ms. Dot Harris and Mr. Simien Delos Santos of your staff and Mr. Jim Hatashima of the Army Corp. of Engineers are doing a great job of facilitating the involvement of all stake holders in this important project. Should you have any questions, contact the Guam Economic Development Authority. Thank you for the opportunity to provide comments.

Lt. SETH MANANDIC: Hi. My name is Lt. Seth Manandic, U.S. Coast Guard and the Port Prevention Department Head, I do...we do all the inspections for the vessels and the facilities.

My concern is if you build wharf there, you gotta be careful about the vessels you accept in this ? ... Especially those that are carrying explosives and also ammonia nitrate and different substance. Because you're proposing to build in a location right next to the oil pier. Uh, it's going to be...you're gonna have a big bang if you're having explosives shipped here...um, be careful in selecting ships in this ...

And we're gonna be issuing permits for specific types of ships that can use this facility...these facilities. So just be careful. Thank You.

TARA: Would anybody else like to provide comment? Or some input? On any of the alternatives or some of the... could you pull up the...please...

RICHARD STOOK: In terms of security measures for harbor operations, what will be the best source to obtain these regulations? Will it be through you guys or will it be through the....

Lt. MANANDIC: Every ship has different operation. There's a container and an oil pier ship. You know what I mean, and oil ship. It's different.

RICHARD STOOK: Okay. So we should contact...

Lt. MANANDIC: Every different operations...the safety regulations for each type of ship and each container too.

RICHARD STOOK: Okay. I see. Okay. So we can get this information from your office? Okay thanks very much.

SUSAN WILKINS: I'm Susan Wilkins from the University of Guam Marine Lab. My concern is that we have uh, in the past always used the seaplane ramp as an access to the harbor if we do studies in the harbor, in the in the harbor. Uh, will it still be accessible for the public?

RICHARD STOOK: As far as I understand, public access will still be permitted. As a matter of fact we just saw a guy launching a boat there.

SUSAN WILKINS: Yeah, we always launch our boat...and sufficient parking as well?

RICHARD STOOK: You know, we're gonna have, again, we're gonna have close to the scoping a whole bunch of studies being done in the near future. Traffic engineers will be out here. We're also looking at internal circulation of traffic as well. So, we'll be addressing those issues. Thank you.

MIKE GAWEL: Thank you. I'm Mike Gawel from Guam Environmental Protection Agency and I'd like to thank our host here and the team that's been seeking this public input. They've been very cooperative in looking forward in not waiting until last minute to get input into this draft EIS and Scoping, and we do appreciate that and we're planning to send written comments from Guam EPA concerning the scoping area.

We just briefly we probably touched on the need for good identification of the living marine resources that are in the area for them to be impacted and what kind of impacts will affect them including the areas that will be filled and covered as well as adjacent areas.

And we also hope the scoping will accommodate information on the potential uses of the new fill in constructed areas. Uh, what alternative uses and the different impacts of perhaps uh, different types of ships or activities used in these filled areas.

Also impacts on....quick frequent and heavy recreational use of some of the areas of harbor and how this development may impact on that. And some other issues we probably uh, put into writing. Thank You.

Oh, I might ask a question too. In the presentation, that uh, Tor...that uh, you noted a couple of areas that might be dredged right off the face of the new dock. Will that dredging material be something that will be available for fill too? Is there much of a quantity expected?

TOR: And so, yes it would be available for fill material, and again it would depend on the quality of it as to how and where it can be used.

ROLAND GUITERREZ: My name is Roland Guiterrez, I'm from the Department of Agriculture. We also will be providing written comments.

My concern will be mainly resources, such as the coral and we would like the opportunity to be a part of the process to do an assessment prior to the work being done and then maybe look at the effects after. That's all I wanted to say. Thank You.

RICHARD STOOK: I just wanted to let you know that we discussed the project with Brent from your office, and as a matter of fact when our biology marine team goes out there, I think Brent or someone from your office will come along during the marine investigations. Just in answer to your question.

BEN GUMATAOTAO: Oh, I'm Ben Gumataotao of Piti. All this job, all this project that we're gonna do is very acceptable. The history of this place here Cabras island, I was living in Sumay is nothing but a big rock, it's useless. Now, the progress, we're gonna do something good for the future. When they start dredging the entire place in Sumay, which is right now SRF, at that time, they killed all the good plants and crab that we have there. But we accept the fact that we need to progress. At that time we don't have any EPA. Now, we're being watched by the EPA...it's going to be fine. Lo' everything is going to be okay. But I really admire the way things are going to be done in here. And I hope the people of Piti will benefit to this too and the entire island of Guam. Thank you.

TARA: This wasn't on...If there are no additional comments, then I'd like to call up Dot, Okay. Mr. Shintako, the Deputy for the Port, I'd like to call him up to make some closing remarks uh, for this evening.

MR. SHINTAKO: Kay, we all get a turn here. Well this is uh basically harmless and easy and uh, non antagonistic and we...all we've been to keep it open and transparent and inviting as many comments as possible.

Uh, this isn't the first time many of the different agencies and bureaus and stakeholders in this project have met. So uh, there has been a lot of dialog going on and we hope to keep that open and open it to the public too.

And on behalf of the Port Authority of Guam, I would like to thank to personally thank all of you for coming out here this evening. Sorry we didn't have more refreshments, uh, we'll try to do a better job next time. Uh, but uh, we certainly appreciate all your comments and we look forward to uh, any written and oral uh, statements that were made tonight and we will take those into

consideration during the preparation during the draft Environmental Impact Statement.

And please remember as you saw the milestone chart, this is just the beginning of the process and the draft EIS impact statement will be available as another opportunity for public comment around November, I believe is what the milestone chart said, of this year. And there will be a public announcement when that draft is EIS is released.

For those of you who are late comers, in the beginning of the meeting, we did put out word that in November...I mean the uh, the comments will be accepted through the twenty fifth of March, uh, and uh, we have some more comment sheets back there on the table which are self addressed and you can fill out, and we look forward to any comments that, after you leave you think of something, please uh, send it in to us. And again, thank you very much for being here this evening.

APPENDIX F

PUBLIC SCOPING
COMMENT LETTERS AND RESPONSES

Aturidad Inadilanton — Ikunumihan Guahan

GUAM ECONOMIC DEVELOPMENT AUTHORITY

Governor
Felix P. Camacho

Lieutenant Governor
Kaleo S. Moylan

Mr. Joe Mesa
General Manager
Port Authority of Guam
1026 Cabras Highway, Suite 201
Piti, Guam 96915

February 23, 2005

RE: Public Scoping Meeting – EIS for Wharf Improvements

Hafa Adai Mr. Mesa:

Thank you for your invitation to attend the Public Scoping Meeting to prepare an Environmental Impact Statement (EIS) for Wharf Improvements at Apra Harbor. As you know, Governor Camacho's Ten Point Plan for Guam's Economic Recovery includes the presence of a larger military footprint on island. My office has been tasked to implement this objective and, as such, has been an active participant in various activities associated with the construction of a new wharf and land reclamation at the Commercial Port of Guam. It is GEDCA's belief that the new wharf and land reclamation project will entice additional port business including cruise ships and transshipment opportunities.

It is from this perspective that we suggest the following areas be addressed in the development of the EIS or other related studies:

- The impact of the project on military training activities conducted in the harbor;
- Potential military use of the wharf and its effect on port revenues;
- Impact of the wharf's location and activities with respect to the Navy's future requirements, i. e., including but not limited to home porting additional attack submarines; mooring of Military Prepositioned Ships, loading and off-loading of munitions at Kilo Wharf and maintenance of the Glass Breakwater; and
- Potential savings to the Navy, should use of the new wharf allow the Navy to delay construction of its own deep draft wharf.

By the way, Ms. Dot Harris and Mr. Simeon Delos Santos of your staff, and Mr. Jim Hatashima of the Army Corps of Engineers, are doing a great job in facilitating the involvement of all stakeholders in this important project. Should you have any questions, please contact Mike Cruz or Larry Toves. Thank you for the opportunity to provide comments.

Sincerely,

GERALD S. A. PEREZ
Administrator

received

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Gerald S.A. Perez, Administrator
Guam Economic Development Authority
ITC Building, Suite 511
590 South Marine Drive
Tamuning, Guam 96913

Dear Mr. Perez:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated February 23, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. The impact of the project on military training activities conducted in the harbor.

b. Potential military use of the proposed wharf and its affect on port revenues.

c. Impact of the proposed wharf's location and activities with respect to the Navy's future requirements, i.e., including but not limited to home porting additional attack submarines; mooring of Military Prepositioned Ships, loading and off-loading of munitions at Kilo Wharf and maintenance of the Glass Breakwater.

d. Potential savings to the Navy, should use of the proposed wharf allow the Navy to delay construction of its own deep draft wharf.

We appreciate your agency's interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

From: Bob [mailto:rmleeper@hotmail.com]
Sent: Wednesday, March 23, 2005 12:19 PM
To: Hatashima, James K POH
Subject: new docking facilities,Apra Harbor, Guam

Dear James,

My name is Robert Leeper and I recently retired to move to Guam with my wife, Helen Kennedy, who was recently hired as the general counsel for Guam EPA and as an Assistant Attorney General for Gov Guam. I have two concerns regarding the the proposed dredging, fill and new dock construction here in Apra Harbor.

First, there are environmental issues. The 1.5 million cubic yards of fill will destroy almost 1/4 mile of near-shore marine habitat. Though I know of no endangered species that might be impacted by this project, there will be destruction of marine life. I would hope that your plans would include some form of on-site mitigation, such as the transplantation of new coral colonies on the seaward edges of the fill to speed up recovery of the shallows. The area in question supports a rich marine environment now, with abundant reef fishes, invertebrate, coral and marine plant life.

Also of concern is the impact of the presence of more human impact from waste water run-off, trash and ship discharge at the new facility. Please advise the public of your plans to deal with these problems as you go further in the planning stages.

My second area of concern deals with public access. This particular stretch of harbor supports a great deal of public recreation, including snorkeling, fishing, boating, picnicing and scuba diving. There are even some financial concerns regarding the scuba diving, as several local companies use this stretch to train new divers and perform certification dives. Particularly in light of the proposed use of the new facilities by the military, I expect access will be severely restricted to other publicly used sites further out along the breakwater, to say nothing about the the complete loss of access to this particular property as a recreational site. Perhaps you could try to plan the new project in such a way that public access to these outer areas, such as Family Beach, can be assured, while still allowing for the security of the new facility. There was once public access along the entire length of the Glass Breakwater via the road that runs atop the breakwater. This changed with 9/11, rightfully so. Perhaps, as mitigation for the loss of recreational opportunities caused by the new dock development, plans could be made to open up more of the Glass Breakwater to public access and maybe even creating a few good parking areas with restrooms and trash collection.

The access to the road atop the breakwater is gated prior to the boundary of the new development, so fencing could be used to provide security at the new dock. Or perhaps the present security check-point could be enhanced to provide greater safety for all of the harbor area, while continuing public access.

Your attention to these details will be greatly appreciated and I suspect it will also help to assuage possibly negative public response to the proposed development.

Thank you for your time and consideration.

Sincerely,

Robert M. Leeper
rmleeper@hotmail.com
671-472-1955
P O Box 4614
Hagatna, Guam 96932

<Body: Font: html>

3/31/2005

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Robert M. Leeper
P.O. Box 4614
Hagatna, Guam 96932

Dear Mr. Leeper:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated March 24, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Impacts on the near-shore marine organisms and habitat.

b. Impacts to public access along the Glass Breakwater.

We appreciate your interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

From: Ivan Matek [mailto:ivanm@kuentos.guam.net]
Sent: Tuesday, March 22, 2005 10:34 PM
To: Hatashima, James K POH
Subject: Dredging in Guam port

From: Mr. Ivan Matek
P O. Box 8456
Tamuning , Guam 96931
Phone: 671-477-3169
To: Mr. James Hatashima
US Army Engeneer District
e-mail:james.k.hatashima@usace.army.mil

Subject : Commercial Port Guam Dredging and development

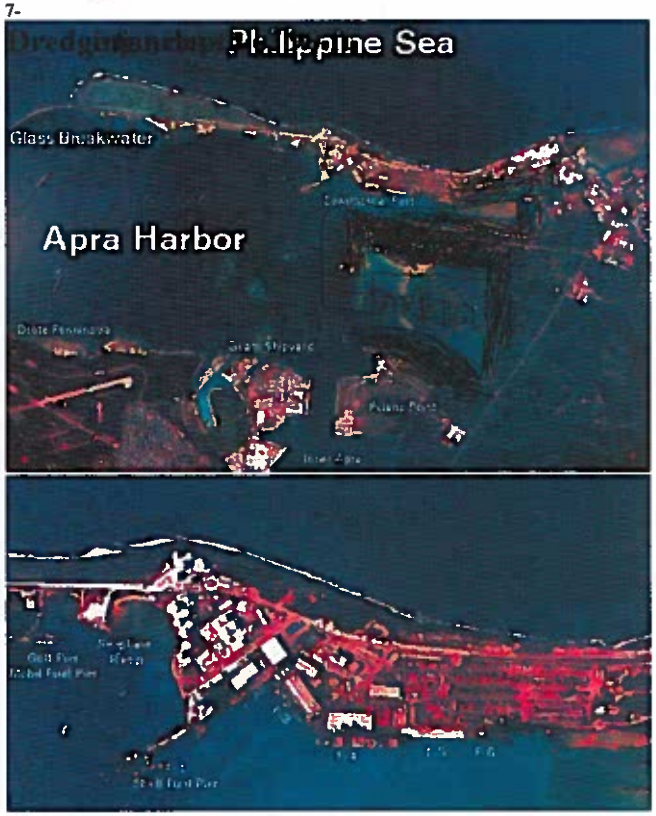
Dear Sir
Proposed dredging from Hotel Warf to the Mobil fuel farm from my stand point:

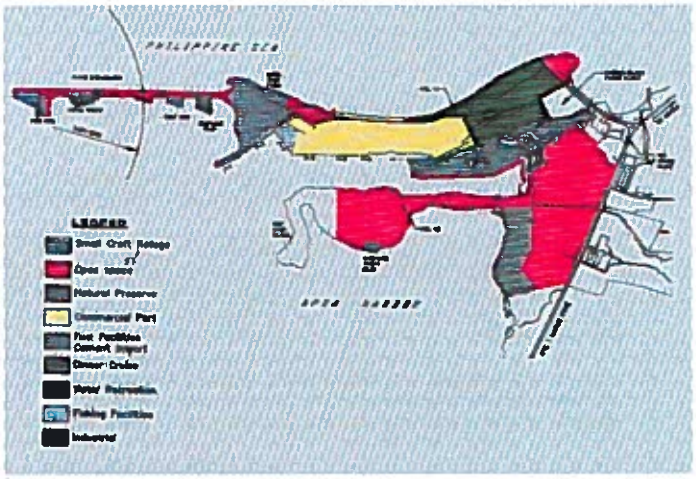
1- 1- That area of the port is exposed to strongest waves in typhoon
2- 2- This area shal be considered as staging or temporary usage only in calm
3- 3- During storm this entire area is under minimum of three feet of water, not counting waves from opposite direction when eye pass over and they just wash over the reef and break water

The dredging in Port shal be done from the F6 in the channel to the Cabras Power Plant, taking out small Islands in the middle, raising the level of surroundings and building the wharf all the way in and around. Also fill shal be used to build Philippine sea side water breaker and waves breakers in front of it.
Building the dock space for ships on the Power Plant channel, extending it and widening it , will provide safe harbor for vessels and shelter of wave exposure from Mouth of the harbor and removal of Navy Ammo dock shall be considered to inside of the port.
Dredging in this direction will benefit US NAVY as well as Commercial Port. I also suggest to on the side of the NAVY and Yacht club that area be dredged and dock space build.
I hope to my projections were wrong but :

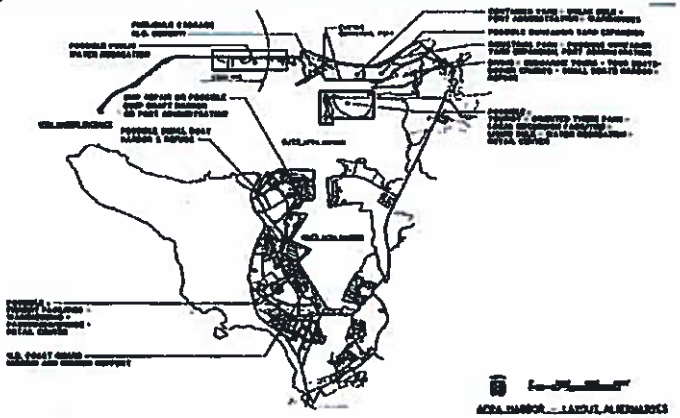
1- 1- I inspect to major conflict in North will erupt within max 15 years

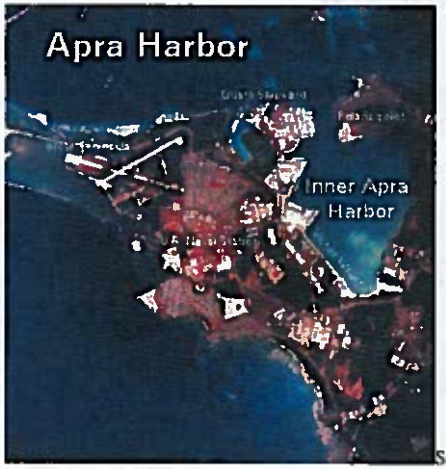
2- 2- In case of civilian and military supply of forces Guam will be necessary
3- 3- Naval and civilian dock space must be build now without delay
4- 4- All accesses to the shielded and protected areas shall be build, constructed, re constructed, rebuild NOW without delay,(see marked on the picture)
5- 5- Building at areas from the newspaper article will secure just dock space for calm weather
6- 6- Building from F6 inland will provide much secure and longer, wider area with close proximity to Marine drive allowing use of small Navy Warf where Kutty Hawk dock in visits.(Across F6)
7- 7-





m





Small islands are product of previous dredging any way.

8- 8- Developing in the Power plant channel and space between Navy and Yacht club will provide space necessary for uninterrupted operations of civilian and military supply in peace and war.

9- 9- In case of attack on Port by air or sea, more dispersed wharf's and operation surface will provide for faster recovery and less damage.

10- 10- In case of attack all what enemy shall do is bomb real hard connection between Port and Guam mainland, and Port will be useless for a days while repairs were under way. How vital this is can be seen on the section of the road washed away by storms between Seaman's club and bridge. Latest Typhoon damage still is there and road slowly become dangerous for traffic.

11- 11- Some Agencies and people will complain about mangrove (almost eradicated), coconut crab, (almost eaten), wildlife refuge(nonexistent wild life)

12- 12- Whole NEW Port must to be developed as much inland toward Marine drive as possible for reason's : A – remove from fuel and LNG unloading areas most likely to be hit in attack or in case of accident

B- easy communication and transportation from multiple sides of the new port to Island main through fare, not limited as now on the narrow corridor.

Additional space will secure for years to come proper and secure operation of the Port.

In case of military conflict Port will be under military rule and control any way – otherwise don't make any sense.

To elaborate more on the development of the harbor considering the Navy, one must bear in mine narrow passages in to the inner harbor and few beautiful reefs that

obstruct access in wartime to the Navy side of the harbor, but building closer to the Marine drive and widening dock space this way will provide easy and safe harbor for a largest of NAVY vessels.

If you have any other questions please fill free to contact me. I have work Tugs and dinner cruises in the Port for years and I am familiar with bottom, sea and land conditions.

All this is not sufficient for large project as this, it cant be done through e mail, but just to turn your attention to few problems existing and appearing or hidden from vive of ordinary people not involved with.

Sincerely,

Ivan Matek
Chief engineer – diesel.

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Ivan Matek
P.O. Box 8456
144 Chalan Saduc
Tamuning, Guam 96931

Dear Mr. Matek:

On behalf of the Port Authority of Guam, we thank you for your letter dated March 21, 2005, subject: *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process.

a. The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

b. Impacts of strong waves and storm events on proposed harbor improvements.

c. Design of the proposed improvements to benefit both US Navy and commercial port use.

d. Design and use of the proposed wharf (and Apra Harbor in general) with respect to security concerns and wartime operations.

e. Impacts on mangrove, coconut crab, and other area wildlife.

We appreciate your interest and offer to provide your local knowledge and experience to assist us in developing the EIS. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

Department of Agriculture
Dipåttamenton Agrikottura

142 Dairy Road, Mangilao, Guam 96913

Felix P. Camacho
Governor

Kaleo S. Moylan
Lt. Governor

Director's Office	734-3942/43; Fax 734-6569
Agricultural Development Services	734-3946; 735-3946; 735-3950
Plant Nursery	734-3949
Aquatic & Wildlife Resources	735-3955/56; Fax 734-6570
Forestry & Soil Resources	735-3949/51; Fax 734-0111
Plant Inspection Station	475-1426/27; Fax 477-9487

Paul C. Bassler
Director

Joseph D.Torres
Deputy Director

March 25, 2005

Mr. James Hatashima
Project Manager
U.S. Army Corps of Engineers (ACOE)
Honolulu District
Civil and Public Works Branch
(CEPOH-PP-C)
Rm. 312, Bldg. 230
Fort Shafter

Re: Comments Public Scoping Meeting: Draft Environmental Impact Statement
Proposed Apra Harbor Wharf Improvements and Land Reclamation Project

Mr. Hatashima:

The habitat that will be impacted by the dredging at Hotel Wharf in Apra Harbor, Guam, is mainly sandy slope with isolated coral heads, primarily of the genus Porites. These coral heads provide fish habitat in an otherwise depauperate area. A question we would like to have answered is what are the kind, size, and distribution of the various species of coral heads that will be affected by this project. As the coral diversity in Apra Harbor is relatively low and Porites corals form the vast majority of coral reef in the harbor, the loss of these coral colonies should not have a great impact on the coral community within Apra Harbor. We are more concerned with the loss of fish habitat.

As coral transplanting projects may not be effective on Guam, we prefer mitigation of the coral loss to be artificial enhancement of areas in which corals are not found in abundance, reef balls or some other environmentally sound method of artificial reef structure. Additionally, the loss of Outhouse Beach and several other sites along the proposed wharf improvement area as easy, safe dive sites has caused many commercial and private divers to relocate to the Piti Bombholes area. Piti bay is a marine protected area and the increase in dive traffic has had a detrimental effect on the habitat of the preserve. As mitigation for the loss of Outhouse Beach and the other dive sites along the proposed dredging area, we would consider an easily accessible and safe dive site for

commercial operators to use as an alternative to the Piti marine protected area. Areas in East Agana are candidates for such. We would consider an alternative to dredging if the alternative proves to be an appropriate action consistent with our mandates. Once all environmental assessments are completed, we would have a better idea of the proposed alternatives and provide further comments.

Thank you for the opportunity to comment on this project. If you have any questions, please feel free to contact Celestino Aguon at (671) 735-3979, Jay Gutierrez at (671) 735-3984/4036, or Brent Tibbatts at (671) 735-3987.

Sincerely,

PAUL C. BASSLER
Director

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Paul C. Bassler, Director
Guam Department of Agriculture
142 Dairy Road
Mangilao, Guam 96913

Dear Mr. Bassler

On behalf of the Port Authority of Guam, we thank you for your letter on *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Phase dated March 25, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Impacts of the proposed improvements on coral communities and loss of fish habitat.

b. Development of mitigation measures to include the artificial enhancement of areas in which corals are not found in abundance, reef balls or other environmentally sound method of artificial reef structure.

c. Loss of Outhouse Beach and other publicly accessible areas within the harbor and the potential secondary impacts of divers relocating to marine protected areas.

d. Identification of alternative dive sites as a mitigation measure.

e. Possible alternatives to dredging activities.

We appreciate your agency's interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915, Mr. Brent Tibbatts and Mr. Jay Gutierrez, Guam Department of Agriculture, Division of Aquatic and Wildlife, 142 Dairy Road, Mangilao, Guam 96913. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil.

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

From: Robert Hahn [mailto:rehahn@ite.net]
Sent: Monday, March 21, 2005 8:04 PM
To: Hatashima, James K POH
Subject: APRA HARBOR PIER PROJECT
Importance: High

MR. HATASHIA,
kindly take the time to read the attachment and feel free to contact me any time
ROBERT E. HAHN
MARITIME CONSULTANT
144 CHALAN SADUC
YONA, GUAM,USA 96915-4928
PHONE & FAX 1-671-789-2866

3/30/2005

ROBERT E. HAHN
144 CHALAN SADUC
YONA, GUAM
96915-4928

March 30, 2005

US Army Engineer District
Honolulu District/Civil and Public works Branch
Rm. 312, Bldg 230
Fort Shafter
Honolulu, HI
96858-5440

Att: Mr. James Hatashima

Dear Mr. Hatashima,

I am writing relative to the proposed dredging/fill project west of Hotel wharf in Apra Harbor. I have lived in Guam since 1959 and active in commercial shipping and maritime matters. While this project is touted as beneficial it is my sincere belief that should it be concluded there would be a lot of egg on many faces. The assumption that deeper draft piers would attract larger container vessels is ungrounded by fact. Guam today enjoys extremely good service and the current vessel size is probably the largest that will be used for many years. True larger vessels are now being built but I ask you to research how many ports in the entire world they actually call at and what is the population that said ports serve.

In addition to the above I suggest you look at the Tudor Engineering Co. study of Apra Harbor made for the Bureau Of Yards and Docks, Navy Department dated January 1964. (If you cannot locate this I will lend you my copy) The area of you project is specifically mention as unsuitable due to surge caused by westerly winds and currents. How would this surge be overcome to allow container vessels to be loaded and discharged? In addition to this the US navy moved from Hotel pier as hotel pier was too dangerous for ammo handling due to this surge problem.
(Regretably the new Kilo pier is perhaps worse)

In closing I would offer my local knowledge and experience to your good office as you might need
Regards,

Robert E. Hahn

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Robert E. Hahn
Maritime Consultant
144 Chalan Saduc
Yona, Guam 96915-4928

Dear Mr. Hahn:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated March 21, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Utilization of the proposed wharf by larger container vessels.

b. Suitability of the proposed project site for construction of a deep-draft wharf based on natural conditions (i.e., surge, currents, wind, etc.).

We appreciate your interest and offer to provide your local knowledge and experience to assist us in developing the EIS. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or e-mail at james.k.hatashima@usace.army.mil

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

APPENDIX G

SCOPING MAIL SOLICITATION RECIPIENT LIST

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
Mr.	Il Han "Peter"	Yan	24 Tour	P.O. Box 1186		Hagatna	GU	96932		User Group
Mr.	J Lawrence	Cruz	Acting President	Department of Chamorro Affairs	P.O. Box 2950	Hagatna	GU	96932		Section 106
Mr.	Lawrence	Cruz	Acting President	Department of Chamorro Affairs	P.O. Box 2950	Hagatna	GU	96932		User Group
Mr.	Joseph	Borja	Administrative Director	Chamorro Land Trust Commission	P.O. Box 2950	Hagatna	GU	96932		Section 106
Mr.	Steven	Kesperbauer	Alupang Beach Club	President	P.O. Box 10929	Tamuning	GU	96931		User Group
Mr.	Takumi	Ueki	Alupang Beach Tower	General Manager	999 South Marine Drive	Tamuning	GU	96913		User Group
Mr.	Brian	Kawabe	American Express Trs. Co. aka Travel Pacificana	Manager of Market Development	677 Moana Blvd #1025	Honolulu	HI	96813		User Group
Mr.	Kenneth	Hine	American Hotel & Motel Association	1201 New York Avenue, NW #600		Washington	DC	20005-3931		User Group
Mr.	Akiyoshi	Kakazu	Ana Hallo Tours (USA) Inc.	P.O. Box 8903		Tamuning	GU	96913		User Group
			Aqua Academy	801 Pale San Vitores Rd	#3105 Garden Villa	Tumon	GU	96913		User Group
			Aquatic Tours	P.O. Box 24849		GMF	GU	96921		User Group
Mr.	B.K. "David"	Chung	BK Travel & Tour	P.O. Box 7321		Tamuning	GU	96931		User Group
			Blue Ocean Inc. dba Real World Diving	P.O. Box 2800		Hagatna	GU	96932		User Group
Ms.	Sandy	Whyte	Cairns Chamber of Commerce	P.O. Box 2336		Cairns	QLD	4870	Australia	User Group
Mr.	Michael	Makio	Chairman	Guam Preservation Trust	P.O. Box 3036	Hagatna	GU	96910		Section 106
Sen.	Tina	Muna-Barnes	Chairperson	Committee, Culture, Recreation and Public Broadcasting	155 Hesler Place	Agana	GU	96910		Section 106

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
			Channel International Corp. dba Channel Marine Center	P.O. Box 315 909		Tamuning	GU	96931		User Group
			Cocos Island Resort	PO Box 7174		Tamuning	GU	96931		User Group
			Commission on Decolonization	P.O. Box 2950		Hagatna	GU	96933		Section 106
			Coral Reef Marine Center	167H Calvo Industrial Park		Tamuning	GU	96911		User Group
	Jae Ho	Jun	Dae Kun Tours	275-G Farenholt St.	Suite 2	Tamuning	GU	96911		User Group
Mr.	Thomas	Morrison	Deputy Director	Department of Parks & Recreation	P.O. Box 2950	Hagatna	GU	96931		Section 106
Mr.	Filamore	Aleon	Director	Chamorro Artists Association	P.O. Box 362	Agana	GU	96932		Section 106
Mr.	Leonard	Iriarte	Director	Guma' Paulu Life	P.O. Box 23089	GMF Barrigada	GU	96921		Section 106
Mr.	Larry	Perez	Director	Department of Public Works	542 North Marine Corps Drive	Tamuning	GU	96913		Section 106
	Tae Young	Lee	E&F Tour	415 Chalan San Antonio	Suite 101 PMB	Tamuning	GU	96911		User Group
	Sung Bak	Chang	ETC Tour	415 Chalan San Antonio	Suite 101-177	Tamuning	GU	96911		User Group
Mr.	Ed	Benavente	Executive Director	Guam Ancestral Lands Commission	P.O. Box 2950	Hagatna	GU	96932		Section 106
Mr.	Warren	Pelleher	Fish Eye Diving Guam, Inc.	818 North Marine Drive		Piti	GU	96925		User Group
			Gently Blue Scuba Diving	Holiday Plaza Hotel #2103	1000 Pale San Vitores Road	Tumon	GU	96911		User Group
Ms.	Adrienne	Loerzel	Governor's Special Asst on Environment	Governor's Office	P.O. Box 2950	Hagatna	GU	96932		User Group
Ms.	Adrienne	Loerzel	Governor's Special Asst. On Environment	Governor's Office	P.O. Box 2950	Hagatna	GU	96932		Section 106

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
Ms.	Eloise	Baza	Guam Chamber of Commerce	Suite 101, Ada Plaza Center		Hagatna	GU	96910		User Group
Mr.	Manny	Duenas	Guam Fisherman's Cooperative							Section 106
Ms.	Lynda	Aguon	Guam Historic Preservation Officer	Department of Parks and Recreation	490 Chalan Palasyo	Agana Heights	GU	96931		Section 106
Ms.	Lynda	Aguon	Guam Historic Preservation Officer	Department of Parks and Recreation	490 Chalan Palasyo	Agana Heights	GU	96931		User Group
	D	Tydingo	Guam Hotel & Restaurant Association	P.O. Box 8565		Tamuning	GU	96931		User Group
			Guam Lagoon Scuba Diving	PO Box 23983		GMF Barrigada	GU	96921		User Group
			Guam Padding Association	c/o Guam National Olympic Committee	P. O. Box 21809	GMF Barrigada	GU	96921		User Group
			Guam Paul's Diving	Onward Beach Resort Hotel	Camp Watkins Rd	Tamuning	GU	96431		User Group
	Joe	Yamashita	Guam Response Services	P.O. Box 4892		Hagatna	GU	96932		tenants
Mr.	Renato	De Guzman	Guam Seawalker Tours	Vice President - Marketing	372 Manne Drive	Piti	GU	96925		User Group
	Hyun Su	You	Guam Sharp Tour	P.O. Box 5502		Hagatna	GU	96932		User Group
Mr	Mathews	Pothen	Guam Shipyard aka Guam Industrial Services, Inc.	President/CEO	P O. Box 13010 (NavActs)	Santa Rita	GU	96915-3010		User Group
Mr.	James	Borja	Guam Spearfishing Association	Department of Administration, Personnel Section	212 Aspinall Avenue,	Hagatna	GU	96910		User Group
			Guam Surfing/Lotus Surf Shop	PO Box 3609		Hagatna	GU	96932		User Group
Mr.	John	Bent	Guam Tropical Dive Station	P.O. Box 1649		Hagatna	GU	96910		User Group
	In Hwan	Han	Guamco	1026 Cabras Highway, Suite 118		Piti	GU	96915		tenants

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
Mr.	Masaru	Tamura	H.I.S. Guam, Inc.	P.O. Box 11769		Tamuning	GU	96931		User Group
Mr.	Koji	Kakiuchi	Hankyu Guam Tours, Inc.	P.O. Box 9519		Tamuning	GU	96931		User Group
	Derek K.	Sadler	Hanson Cement	P.O. Box K		Hagatna	GU	96932		tenants
Mr.	Murray	Towill	Hawaii Hotel Association	2250 Kalakaua Avenue #404-4		Honolulu	HI	96815-2564		User Group
Mr.	Matthew	Summers	Hillmann Environmnetal Group, LLC	1600 Route 22		East Union	NJ	07083		User Group
Mr.	Akiyoshi	Hirabayash	Hit Tours Guam, Inc.	C/O Guam Reef Hotel	1317 Pale San Vitores Road	Tamuning	GU	96193		User Group
	Hee Suk	Yu	Hole in One Tours	P.O. Box 26316		GMF	GU	96921		User Group
Mr.	Sumio	Fukui	Holiday Tours Micronesia (Guam), Inc.	P.O. Box 10570		Tamuning	GU	96931		User Group
Mr.	Ron	Sablan	Hotel Association of the Northern Mariana Islands	P.O. Box 501983		Saipan	MP	96950	CNMI	User Group
Mr.	Frank	Rabon	I Taotao Tano'	P.O. Box 3503		Hagatna	GU	96910		Section 106
	Victor	Yoon	Isla Guam Publication	P.O. Box 1186		Hagatna	GU	96921		User Group
Mr.	Mitsuo	Iwamoto	Jalpak International Micronesia, Inc.	Suite 101 Ypao Business Center	231 Ypao Road	Tamuning	GU	96913		User Group
Mr	Isao	Mamada	Japan Guam Travel Association	Suite 420, GITC Bldg.	590 South Marine Drive	Tamuning	GU	96913		User Group
			Jet Ski Association	255 E. Marine Drive		Hagatna	GU	96910		User Group
			Kazuhisa Okada	117 Guerrero St.	Harmon Industrial Park	Tamuning	GU	96913		User Group
Ms.	Jacquelyn	Quitugua-Ronan	KGTF-TV	P.O. Box 21449		GMF	GU	96921		Section 106

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
	Kwang Il	Kim	KK Tour	P.O. Box 3832		Hagatna	GU	96932		User Group
Mr.	Bruce	Kloppenburg	Kloppenburg Enterprises, Inc.	dba Turtle Tours/Nautilus Guam/Agana Bay Sunset Cruise	P.O. Box 6098	Tamuning	GU	96931		User Group
Mr.	David	Chung	Korean Travel Association of Guam	P.O. Box 7321		Tamuning	GU	96931		User Group
	Sung Jung	Yin	Korus Tours	P.O. Box 27441		GMF	GU	96921		User Group
Mr.	Pete	Benavent	Lam Lam Tours and Transportation	117 Guerrero Street Harmon Industrial Park		Tamuning	GU	96911		User Group
	Sang Yong	Shim	Land Mark Tours	P.O. Box 11175		Tamuning	GU	96911		User Group
	Hyun Wook	Kang	LG Tour	P.O. Box 5502		Hagatna	GU	96932		User Group
	Im Kyo	Bin	Magellon Tour	P.O. Box 10629		Tamuning	GU	96931		User Group
			Make Diving and Salvage	P.O. Box 23455		GMF Barrigada	GU	96921		User Group
Ms.	Cindy	Bell	Marianas Yacht Club	P.O. Box 2297		Hagatna	GU	96910		User Group
			Marine World of Diving	P.O. Box 6356		Tamuning	GU	96931		User Group
Mr.	Thomas G.	Ahlen	Matson Navigation Company, Inc.	1026 Cabras Highway, Suite 115		Piti	GU	96925		User Group
			Micronesian Divers Association	856 North Marine Drive		Piti	GU	96915		User Group
	Hiroshi	Takakuwa	Micronesian Dream Dinner Cruises	P.O. Box 24468		GMF	GU	96921		tenants
Mr.	Norio	Nakajima	Micronesian Hospitality Inc.	360 Chalan Pasaheru Route 10-A		Tamuning	GU	96913		User Group
	Won Sun	Park	Mipo Tour	P.O. Box 6547		Tamuning	GU	96931		User Group
	Jeff	Borja	Mobil Oil Guam	P.O. Box EU		Hagatna	GU	96932		tenants

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
Mr.	Ronald	Laguana	Nanon Chomoru							
	Susan	Chang	New Koreana Tour	P.O. Box 12658		Tamuning	GU	96931		User Group
			NEX Dive & Snorkel Center	Naval Exchange Guam US Naval Station	PSC 455 Box 178	Piti	GU	96925		User Group
Mr.	Hiroshi	Yanagida	Nippon Travel Agency Micronesia, Inc.	Suite 214 GITC Bldg.	590 S. Marine Drive	Tamuning	GU	96913		User Group
			Ocean Island Club	404 San Vitores Rd		Tumon	GU	96913		User Group
Mr.	Ken	Lambaco	Ocean Jet Club	P.O. Box 3058		Hagatna	GU	96932		User Group
Mr.	Ruto	Lupan	Organization of People for Indigenous Rights							
Ms.	Linda	Reyes	Pa'a Taotao Tano'	238 Archbishop Flores St.	PNB Building Suite 905	Hagatna	GU	96910		User Group
Mr.	Masako	Watanabe	Pacific Daily News	244 Archbishop Flores St.		Hagatna	GU	96910		Section 106
Ms.	Kate	Worth	Pacific Daily News	244 Archbishop Flores St.		Hagatna	GU	96910		Section 106
	Jae Joon	Shim	Palm Palm Tour	P.O. Box 22905		GMF	GU	96921		User Group
			Papalagi Guam, Inc.	108A Pia Marine	193 Tumon In.	Tamuning	GU	96931		User Group
			Paradise Aqua Corporation	P.O. Box 5048		Agana	GU	96932		User Group
Mr.	Isao	Mamamda	PMT Guam Corp	Suite 420 GITC Bldg.	590 S. Marine Drive	Tamuning	GU	96913		User Group
Mr.	Robert	Lizama	President	Mayor's Council	P.O. Box 786	Hagatna	GU	96932		Section 106
			Pro Dive International, Inc.	PIA Marine #102 Tumon Lane		Tumuning	GU	96913		User Group
Mr.	Masanori	Kobayashi	R&C Tours Guam, Inc.	La Casa De Corne	200 Chechinca St.	Tamuning	GU	96913		User Group

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
			Rainbow Dolphin and Diving	P.O. Box 10417		Tamuning	GU	96931		User Group
	Chun	Elton	Red Cap Tour	#310 Ladera Lane		Mangilao	GU	96923		User Group
			Sailing Federation	PO Box 21809		GMF	GU	96921		User Group
			Sally Guam, Inc.	PO Box 10507		Tamuning	GU	96931		User Group
			Scuba Company	P.O. Box 11901		Tamuning	GU	96931		User Group
			Scuba Dive Micronesia	1448 Pale San Vitores Rd		Tumon	GU	96911		User Group
Ms.	Ann	San Nicolas	Seibrao Para I Manamko'	P.O. Box 3057		Hagatna	GU	96932		Section 106
	Idel	Santos	Shell Guam, Inc.	643 Chalan San Antonio, Suite 100		Tamuning	GU	96913		Tenants
	Seung Ho	Kang	Shin Sae Gae Tour	1270 N. Marine Drive #101-320		Tamuning	GU	96911		User Group
			Shinichi Ehara	P.O. Box 3299		Hagatna	GU	96932		User Group
Mr.	Kaoru	Friedenfels	Skydive Guam, Inc.	P.O. Box 21348		GMF	GU	96921		User Group
			SNUBA Tours of Guam	P.O. Box 5407		Agana	GU	96932		User Group
	Pedro Leon	Guerrero	South Pacific Petroleum Corp.	816 North Marine Drive	EVA Building, 2nd Floor	Tamuning	GU	96913		tenants
			Sunset Surf Club	P.O. Box 9310		Tamuning	GU	96931		User Group
			Takemasu Noguchi	P.O. Box 8562		Tamuning	GU	96931		User Group
Ms.	Trina	Leberer	The Nature Conservancy	P.O. Box 5411		Hagatna	GU	96932		User Group
	Jong Chan	Lee	Tour Wide Korea	P.O. Box 27083		GMF	GU	96921		User Group
Mr.	Leonard	Calvo	Two Lovers Point (Calvo Enterprises)	138 Martyr Street		Hagatna	GU	96910		User Group

Apra Harbor EIS Scoping Mailing List
(Stakeholders and Interested Parties)

Title	First Name	Last Name	Company Name	Address Line 1	Address Line 2	City	State	ZIP Code	Country	Mailing List
Mr.	Roland	Boudreau	Underwater World	1245 Pale San Vitores Rd. Suite 400		Tumon	GU	96913		User Group
Mr.	Peter	Oneders	University of Guam	UOG Station		Mangilao	GU	96923		Section 106
Mr.	Rudy	Villaverde	University of Guam	UOG Station		Mangilao	GU	96923		Section 106
Mr.	Frank	Aguon	Vice Speaker	27th Guam Legislature	155 Hesler Place	Agana	GU	96910		Section 106
	Hyun	Lee	Whales Tour	PMB 4172 Route 8	ST1B-768	Mate	GU	96927-2010		User Group
			Yasuhide Tengoe	P.O. Box 6098		Tamuning	GU	96931		User Group
			Yoshida Int'l Ent. Dba Aquatic Tours	P.O. Box 24849		GMF	GU	96921		User Group

APPENDIX H

SCOPING MAIL SOLICITATION COMMENT LETTERS AND RESPONSES

GUAM CHAMBER OF COMMERCE
PARTNERS IN PROGRESS

March 24, 2005

JAMES HATASHIMA
U.S. Army Corps of Engineers, Honolulu District
Civil & Public Works Branch
Room 312, Building 230
Fort Shafter, Hawaii 96858-5440

RE: Proposed Wharf Improvements and Land Reclamation Environmental Impact Statement

Dear Mr. Hatashima:

The construction of a new wharf and land reclamation at the Commercial Port of Guam is a top priority pursuit of the Guam Chamber of Commerce. We are therefore writing to state our full support of the project for the following key reasons:

1. It will alleviate congestion at the Port of Guam and make room for additional business activity through increased cruise ship travel to and from Guam. Today, passenger ships must dock in the cargo areas without a safe area for passengers to wait for tour buses. Due to homeland security concerns, cargo and passengers can not be mixed together. We need a wharf that has a passenger terminal where they can wait for buses to take them around the island.

   As you well know, Guam is currently developing into a major mass market destination for East Asia's rapidly rising numbers of overseas tourists. With the increase in Asian travelers, there is a greater demand for leisure cruise ship travel, for which Guam is an attractive destination.

   There is a high level of interest for an inter island cruise industry to diversify our tourism base. Guam and Micronesia is a safe and new destination product being viewed as the New Caribbean destination. The additional wharf frontage would also allow the development of

berthing facilities and amenities that would also entice tour boat and yacht visits to our island;

173 Aspinall Avenue, Suite 101, Ada Plaza Center, Hagåtña • P.O. Box 283, Hagåtña, Guam 96932 • http://www.guamchamber.com.gu
Tel: 472-6311/8001 • Fax: 472-6202 • E-mail: gchamber@guamchamber.com.gu

2. Guam will be able to handle the largest container ships of today (up to 7,000 containers), enhancing our position as a regional cargo and transshipment hub. In as far as cargo transshipment, over the years, trade traffic between the U.S. and China has been on the rise. The Guam Chamber of Commerce has already started to promote Guam as a base of operations for U.S. companies and ultimately a shipping hub to help handle the increase in trade between the U.S. and China. The upgrading of infrastructure at our island's only commercial port such as the new wharf project, therefore, is the centerpiece to the expansion of commerce and trade with and through Guam, and a key driver of Guam's future economic prosperity;

3. Congested operating conditions would be abated to accommodate increased port calls by breakbulk carrier vessels, cement carriers, fishing vessels including and purse seiners, longliners, research vessels, tankers, training vessels visiting the region, and tugs and barges; and,

4. The expanded commercial wharf would accommodate the largest carriers in the U.S. Navy.

Thank you for the opportunity to submit our views on the project.

Sincerely,

Monty A. McDowell

MONTY A. MCDOWELL
Chairman of the Board

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Monty A. McDowell
Chairman of the Board
Guam Chamber of Commerce
P.O. Box 283
Hagatna, Guam 96932

Dear Mr. McDowell:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated March 24, 2005.

We appreciate your support for the project and the following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Reduction of congestion within Apra Harbor, increased safety and security through the separation of commercial and cargo operations, and increased commercial opportunities.

b. Expansion of Guam's cruise ship market and diversification of its tourism base.

c. Enhancement of Guam's position as a regional cargo and transshipment hub between Asia and the United States

d. Accommodation of the largest U.S. Navy aircraft carriers.

We appreciate your agency's interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil.

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

WCP-MAUI

From: Trina Leberer [tleberer_1999@yahoo.com]
Sent: Friday, March 25, 2005 3:58 PM
To: Barger, Cindy S POH
Cc: Hatashima, James K POH, wcpmaui@lava.net
Subject: RE: EIS scoping comments for Apra Harbor's proposed wharf improvements.

Hi Cindy,

For this scoping phase, some things to consider for the EIS are:

- Endangered species issues: both hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtles forage in the harbor - greens have been seen more frequently in the proposed work area.
- Mapping and ecological services assessment of coral reef habitat that is proposed to be dredged/filled and identification of compensatory mitigation options in the event of loss of these public resources.
- Loss of access for the public to "Seaplane" boat ramp.
- Loss of access to the public to seasonal "atulai" (*Selar crumenopthalmus*) schools that frequently enter the harbor to feed.
- Loss of economic activity from small-scale tourist and dive companies operating in the proposed work area.
- Identification of appropriate wharfage design to mitigate impacts from potential oil spills in the harbor (i.e. in July 2002, a Navy SWOB leaked several hundred thousand gallons of oil during a storm and there was difficulty in recovering the oil that entered through gaps and became trapped under the current wharfage at F5-6).

I guess that's it for now - sorry it's a bit late!

Cheers, Trina

"Barger, Cindy S POH" <Cindy.S.Barger@poh01.usace.army.mil> wrote:

From: Barger, Cindy S POH
Sent: Tuesday, March 22, 2005 12:45 PM
To: 'tleberer_1999@yahoo.com'
Cc: Hatashima, James K POH; 'wcpmaui@lava.net'
Subject: EIS scoping comments for Apra Harbor's proposed wharf improvements.

Dear Trina -

I'm working as the environmental coordinator on on the EIS for Apra Harbor's proposed wharf improvements. Dot Harris of the Port Authority and Vanji Lujan at Guam CZM recommended that we contact you to see if you had any comments on the proposed EIS for Apra Harbor's proposed wharf improvements. We are in the scoping comment period at this time which ends 25 March 2005. I apologize for the short notice but I had trouble locating contact information for you.

Attached is the form letter and the scoping meeting handout we mailed to the public. Any comments you have would be of great assistance to us. Also, if you could provide me with your regular mailing address, we will make sure to include you in future notifications on this project.

If you have any comments, please send them to our Project Manager, James Hatashima (his email is in the cc line above).

Thanks much.

Cindy

Cindy S. Barger
Biologist
U.S. Army Corps of Engineers
Environmental Technical Branch, Engineering & Construction Division
CEPOH-EC-E, Bldg 252
Ft. Shafter, HI 96858
(808) 438-4812
fax: (808) 438-6930
<< File: Scoping Mtg Handout.pdf >> << File: scoping letter to user groups.pdf >>

Do you Yahoo!?
Yahoo! Small Business - Try our new resources site!

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Ms. Trina Leberer
The Nature Conservancy
P.O. Box 5411
Hagatna, Guam 96932

Dear Ms. Leberer:

On behalf of the Port Authority of Guam, we thank you for your email on *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Phase dated March 25, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Endangered species issues: both hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtles forage in the harbor - greens have been seen more frequently in the proposed work area.

b. Mapping and ecological services assessment of coral reef habitat that is proposed to be dredged/filled and identification of compensatory mitigation options in the event of loss of these public resources.

c. Loss of access for the public to "Seaplane" boat ramp.

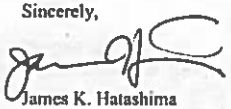
d. Loss of access to the public to seasonal "atulai" (*Selar crumenopthalmus*) schools that frequently enter the harbor to feed.

e. Loss of economic activity from small-scale tourist and dive companies operating in the proposed work area.

f. Identification of appropriate wharfage design to mitigate impacts from potential oil spills in the harbor (i.e. in July 2002, a Navy SWOB leaked several hundred thousand gallons of oil during a storm and there was difficulty in recovering the oil that entered through gaps and became trapped under the current wharfage at F5-6).

We appreciate your interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil.

Sincerely,



James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

From: Victor & MaryBeth Torres [mailto:torresmv@ite.net]
Sent: Friday, March 25, 2005 12:34 PM
To: Hatashima, James K POH
Subject: Comments on Proposed Wharf Improvements and Land Reclamation, Apra Harbor Guam

We have a couple of major concerns on the proposed project.

1. Public Access to the Ocean Shores and marine Resources in the Area

The area has been utilized by windsurfers, surfers (Luminao Reef Magandas surf break) fishermen, snorkelers, divers, picknikers, etc. for many years. Seaplane ramp was a very popular boat launch site for that side of the island. If this project proceeds we would like to see that such access is maintained during and after the construction phase. In fact the plan should be designed to incorporate a continued public beach and shoreline access corridor while ensuring for the security of such facilities.

If not, the access denied to these areas will have adverse effects on other sites outside of the Port Authority of Guam's jurisdiction as this will greatly increase use in these other areas to probably beyond their carrying capacity. Such adverse effects by increased Basic SCUBA Instruction have been observed at Tepungan Beach Piti after September 11, 2001 restrictions at the PAG were instituted.

2. Short and Longterm Effects on the Coral Reefs and Marine Resources.

Though somewhat degraded in areas closer to the main port facilities the Coral Reefs in these areas are still a viable resource. This is especially so west of Hotel Wharf where diving and snorkeling are some of the favored activities of residents and tourists alike for these areas. There are also glass bottom vessels which provide a look at coral reefs and their inhabitants to residents and visitors. There is a viable and healthy tourism industry and local near shore fishing activities associated with these coral reef resources.

The project should take into account these resouces and related activities and design any approved project to reduce damage to such resources by construction, run-off from wharfs, and vessels during and after the project.

Please forward any future notices on this project to this email address or to the following mailing address.

Guam Sailing Federation
c/o POB 3643 Hagatna, Guam 96932

Sincerely,

Victor R H. Torres

3/31/2005

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Victor R.H. Torres, President
Guam Sailing Federation
c/o P.O. Box 3643
Hagatna, Guam 96932

Dear Mr. Torres:

Subject:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated March 25, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Public access to the ocean shores and marine resources in the project area

b. Short and long-term effects on coral reefs and marine resources

We appreciate your interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil.

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

To: James Hatashima, U S Army Corps of Engineers, Honolulu District, Civil & Public Works Branch, CEPOH-PP-C, Rm 312, Bldg 230, Ft. Shafter, Hawaii, 96858-5440

Subject: Draft Environment Impact Statement for Apra Harbor
Warf Improvements and Land Reclamation Project

The largest percentage of the economy of Guam is driven by tourism, which in return provides employment and economic progress for the people of Guam. With this in mind, it is essential that the committee of the proposed project be made aware of the following:

Guam receives a little over one million tourist per year and of these approximately one third of them partake in water activities with the largest portion of this group being snorkelers and scuba divers

Tourist and local divers need access to safe diving spots. Outhouse Beach which is inside the redevelopment area has historically been a major training ground for divers, as it has flat sandy areas where divers can learn their skills without damaging surrounding coral areas. It has a good array of tropical fish for the tourist diver to view and being inside the harbor is has a large good weather window.
A result of the loss of this beach will have a serious negative impact on the existing Marine Preserves by forcing the dive traffic from Outhouse beach into the Marine Preserves of Piti and Ypao areas which are already highly stressed.
Apra Harbor is a famous dive destination for divers from all over the world as it contains the Famous shipwrecks from World War I and World War II and is the only place in the world where two such wrecks lay alongside touching each other. I am sure that these two historic sites would not be jeopardized by either dredging or excessive silting.
It is not to say that the proposed project is disagreeable, but to recognize a need to replace the loss of the Outhouse Beach with an alternative special diving zone. There are areas nearby which would be suitable for development as a specific dive training area and the cost of this should be included in the redevelopment proposal.
Additionally, to make this project more successful for everyone involved, we propose the following information also be addressed:

- Provide easier access for the dive companies into this new site
- Set entry and pass procedures

Signed,

John Bent
President
Guam Tropical Dive Station
Guam Dive Industry Association

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. John Bent, President
Guam Tropical Dive Station
Guam Dive Industry Association
P.O. Box 1649
Hagatna, Guam 96910

Dear Mr. Bent:

Subject:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Process dated March 24, 2005.

The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Impacts on snorkeling and scuba diving activities in the vicinity of Outhouse Beach and possible mitigation measures (i.e., identification of alternative diving areas).

b. Impacts on shipwreck dive sites and historic resources.

c. Site access for dive companies.

d. Establishment of entry and pass procedures

We appreciate your organization's interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or email at james.k.hatashima@usace.army.mil.

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

April 25, 2005

Mr. James Hatashima
U.S. Army Corps of Engineers
- Honolulu District
Civil & Public Works Branch CEPOH-PP-C
Rm. 312, Bldg 230
Ft. Shafter, Hawaii, 96858-5440

Subject: Draft Environmental Impact Statement for Apra Harbor Wharf Improvements and Land Reclamation Project

Dear Mr. Hatashima:

Mobil Oil Guam Inc. (Mobil) is always supportive of any plans to improve maritime access and services to the island of Guam. Unfortunately, Mobil received Mr. Ray Jyo's letter dated March 11, 2005 on March 28, 2005. While we missed the March 25th public scoping period, we do wish to comment on some issues that should be taken into consideration before the start of the planning and design stages of this proposed wharf improvement project.

In reviewing the charts and accompanying documents for the proposed improvements Mobil noted the following:

1. The work to be done in Areas 2A & 2B may greatly affect our tanker receipt/loading operations at our Golf Pier facility. Mobil currently receives a Medium Range (MR) tanker (when loaded has a draft of 38ft and capacity of 268 thousand barrels of fuel) every 22 days (total of 16 annually). Additionally, we load a Local Coastal Tanker (LCT) (when loaded has a draft of 30ft and a capacity of 60 thousand barrels of fuel) approximately every 30 days (total of 12 annually).

   Due to the proposed work, we need assurance that the maneuverability of our vessels will not be impacted. The cargo (gasoline, diesel, JetA1) is extremely flammable and trying to "thread" our MR through dredgers and other on-water equipment related to this project is not the safest scenario.

2. During our tanker operations, flammable vapors are a concern. With the prevailing winds coming predominately from the Northeast it is highly likely that these vapors will be introduced into Areas 1 & 2A and possibly 2B (coming from shore tanks). The potential for these flammable vapors to create an explosive atmosphere is high and that would require any work to be stopped until after these tanker operations.

3. The current mooring locations for our MR/LCT are in areas 2A & 2B. During tanker operations, the construction equipment may interfere with the mooring cables. Additionally, if the mooring bollards are to be removed or relocated Mobil request that new bollards (the design would need to be approved by ExxonMobil prior to either removal of the old bollards or installation of the replacement bollards) be installed before the old ones are removed to ensure that our tanker operations are not affected.

4. With the increased construction activity expected there will also be an increase in vehicle traffic passing directly in front of our two terminal locations. This presents a serious safety issue for us as we have employees/contractors regularly crossing between the two areas on a daily basis. The increased traffic will increase the chances of accidents and injuries to our employees and possibly our facilities. We would suggest that this hazard is considered, and preventive measures (i.e.; speed bumps) are reviewed as part of the scope of work to minimize this safety exposure.

5. Area 2C is directly adjacent to our Terminal Area C tank farm and if that portion is re-claimed and converted to commercial use, measures must be put in place to ensure that the flammable vapors that might be produced from our tank farm do not affect the proposed commercial operations and consequently, the commercial operations/personnel do not affect our tank farm/terminal operations as well as our facility integrity. Mobil has to reiterate the importance of planning for safety, especially considering that our tanks store highly flammable products. As you would agree, this is of paramount importance during the construction process.

6. If dredging is required to accommodate larger vessels like military ships, please take into consideration that any military vessels that will be carrying explosives should not be moored next to Golf Pier or adjacent to our fuel tankers while they are in berth.

7. Two outfalls for the Cabras terminal are located in Area 2C and will be affected by the proposed project improvement. Provisions for continuous use of outfalls (at a minimum, effluent is discharged monthly at Area 2C) during the improvement period and eventual extension of the pipelines should be made available. Historical effluent discharge volume is available upon request. The discharge is covered by US EPA NPDES permit GU0020036.

The above items document our major environmental and safety concerns with the proposed project. We may have some future concerns as we learn more about the project and we will raise them accordingly. We appreciate your review and consideration of our concerns as you move forward with the EIS as well as the planning and design stages of this project.

If you need more information regarding our concerns please feel free to contact me via email at jim.b.rose@exxonmobil.com.

Sincerely,

Jim B. Rose
Operations Manager

Cc: J.C. Borja - MOGI Country Manager
C.B. Suda, PA/GA Manager

May 2, 2005

Civil and Public Works Branch
Programs and Project Management Division

Mr. Jim Rose, Operations Manager
Mobil Oil Guam
P.O. Box EU
Hagatna, Guam 96932

Dear Mr. Rose:

On behalf of the Port Authority of Guam, we thank you for your letter in reference to *Apra Harbor Wharf Improvements and Land Reclamation Environmental Impact Statement* - Scoping Consultation Phase dated April 25, 2005.

We very much appreciate the information provided in your letter regarding environmental and safety concerns. The following comments have been noted and will be considered in the preparation of the Environmental Impact Statement (EIS):

a. Impacts of the proposed project on Mobil's tanker schedules and operations at Golf Pier.

b. Impacts to tanker mooring activities and equipment in project areas 2A and 2B.

c. Impacts to Mobil's use of outfalls in the vicinity of project area 2C.

d. Safety/hazard concerns related to Mobil's facility integrity, and overall operations. Safety/hazard concerns included: tanker maneuverability within Apra Harbor during construction and dredging activities, impacts to Mobil's handling of highly flammable materials, potential flammable vapors and explosive atmospheres within the vicinity of the proposed project areas, increase in vehicular traffic and circulation and related safety impacts, impacts of military vessels containing explosives on Mobil's facilities and operations.

Once again, thank you for your interest in the environmental review process. The draft EIS will be available for your review when published. I am forwarding a copy of this letter to Mr. Joe Mesa, General Manager, Port Authority of Guam, 1026 Cabras Highway, Suite 201, Piti, Guam 96915. Should you have any questions regarding this matter, please feel free to call me at (808) 438-2264 or e-mail at james.k.hatashima@usace.army.mil.

Sincerely,

James K. Hatashima
Project Manager
U.S. Army Corps of Engineers
Honolulu District

Department of Parks and Recreation
Dipattamenton Plaset Yan Dibuetsion
Government of Guam
490 Chalan Palasyo Road
Hagåtña, Guam 96910
Director's Office: (671) 475-6296/97
Facsimile: (671) 477-0997
Parks Division: (671) 475-6288/89
Guam Historic Resources Division: (671) 475-6294/95/6272
Facsimile: (671) 477-2822

Felix P. Camacho
Governor

Kaleo S. Moylan
Lt. Governor

Thomas A. Morrison
Director

Gregory A. Matanane
Deputy Director

In reply refer to:
RC2005-152F

25 March 2005

James L. Bersson, P.E.
Chief, Engineering and Construction Division
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Subject: Section 106 Consultation: Apra Harbor Wharf Improvements and Land Reclamation
Port Authority of Guam and U.S. Army Corps of Engineers, Packfic Ocean Division, Honolulu District (POH)

Dear Mr. Bersson:

This letter is in response to your March 9, 2005 letter. Thank-you for initiating the National Historic Preservation Act (NHPA) Section 106 consultation for the above referenced project. We appreciated being able to meet in February with Ms. Cindy Barger, from your staff, to establish a working relationship and to obtain an overview of the project. At that time we understood that you had already contracted for historical resources consulting with MARS, and we have had contact with them concerning the project. We look forward to receiving their report.

A review of our records indicates at least one site, a WWII shipwreck that could be potentially impacted by the proposed development. This is Guam Site 3-1155, the wreck of the Nichiyu Maru, also known as the Gorco Wreck. The Nichiyu Maru is a Japanese merchant cargo ship, built in 1938 at Nagasaki. Site 3-1155 is described as being located "directly adjacent to the Gorco Pier" and "at the northern corner of the entrance to Commercial Port of Guam, directly adjacent to and touching the eastern most support pilings of the Guam Oil and Refining company fuel off-loading pier." A more complete description is available at our offices in the site files.

While we await the report from MARS, if there is any further information you require from us do not hesitate to contact either Vic April (Territorial Archaeologist) or Richard Olmo (Staff Archaeologist) at 475-6294/5.

Sincerely,

/s/
LYNDA B. AGUON
Guam (State) Historic Preservation Officer

Cc: James K. Hatashima, U.S. ACOE, POH
Darlene Moore, President, MARS
BSP, GCZM
ACOE, Guam Regulatory Branch
Guam Department of Agriculture, DAWR

APPENDIX M

Draft EIS Distribution List

Distribution List

The following government officials and agencies, commercial and non-profit organizations, and other interested parties received a copy of the draft EIS to review.

Territory of Guam Elected Officials:

U.S. Congresswoman Madeleine Z. Bordallo
Washington D.C. Office
472 Cannon HOB
Washington D.C. 20515-5301

U.S. Congresswoman Madeleine Z. Bordallo
Guam District Office
120 Father Duenas Avenue, Suite 107
Hagåtña, Guam 96910

Office of the Governor
Ufisinan Maga'lahi
P.O. Box 2950
Hagatna, Guam 96932
Attn: Adrienne Loerzel, Special Assistant on the Environment

Guam Legislature
155 Hesler Place
Agana, Guam 96910
Attn: Frank Aguan, Vice Speaker

Guam Legislature
Committee on Community, Culture, Recreation, and Public Broadcasting
155 Hesler Place
Agana, Guam 96910
Attn: Senator Tina Muna-Barnes, Chairperson

Senator Anthony Umpingco
155 Hesler Street
Hagåtña, Guam 96910

FINAL EIS for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor

Guam Mayor Council
P.O. Box 786
Hagatna, Guam 96932
Attn: Robert Lizama, President

The Honorable, Vicente Gumataotao
Mayor of Piti
P.O. Box 503
Hagåtña, Guam 96932

U.S. Federal Agencies:

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of the Director
1601 Kapiolani Boulevard
Suite 1110
Honolulu, Hawaii 96814

U.S. Department of Commerce
Economic Development Administration
Jackson Federal Building, Room 1890
915 Second Avenue
Seattle, Washington 98174-1001
Attn: Kristine Skinde, Project Manager

U.S. Department of Interior
Fish and Wildlife Service
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850
Attn: Patrick Leonard, Field Supervisor

U.S. Department of the Navy
Commander, Naval Forces Marianas
PSC 455 Box 152
FPO AP 96540
Attn: Anthony Hoover, Environmental Branch

U.S. Department of the Navy
Commander, Naval Forces Marianas
PSC 455 Box 152
FPO AP 96540
Attn: Paul Fisher, Office of Counsel

U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA, 94105
Attn: Office of the Director

U.S. Coast Guard Marianas Section
Victor Pier, Building 2
PSC 455 Box 176
FPO AP 96540-1056
Attn: Lt. Cef Manandic

U.S. Coast Guard Marianas Section
Victor Pier, Building 2
PSC 455 Box 176
FPO AP 96540-1056
Attn: Damien Yemma

Territory of Guam Agencies:

Bureau of Statistics and Plans
Guam Coastal Management Program
P.O. Box 3631
Hagåtña, Guam 96931
Attn: Ameila F. De Leon

Department of Agriculture
142 Dairy Road
Mangilao, Guam 96913
Attn: Paul C. Bassler, Director

FINAL EIS for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor

Department of Agriculture
Guam Aquatics and Wildlife Resources
192 Dairy Road
Mangilao, Guam 96913
Attn: Jay Gutierrez

Department of Chamorro Affairs
P.O. Box 2950
Hagåtña, Guam 96932
Attn: J. Lawrence Cruz, Acting President

Department of Land Management
One Stop Building, Anigua
P.O. Box 2950
Hagåtña, Guam 96932
Attn: Joseph M. Borja, Director

Department of Military Affairs
Civil Defense
P.O. Box 2877
Hagåtña, Guam 96910
Attn: Charles Ada

Department of Parks and Recreation
490 Chalan Palasyo Street
Agana Heights, Guam 96910
Attn: Thomas Morrison, Deputy Director

Department of Public Works
P.O. Box 3631
Hagåtña, Guam 96931
Attn: Larry Perez, Director

Department of Public Works
P.O. Box 3631
Hagåtña, Guam 96931
Attn: Dionie De Leon

Guam Chamber of Commerce
P.O. Box 283
Hagåtña, Guam 96932
Attn: Monty, A. McDowell, Chairman

Guam Chamber of Commerce
Ada Plaza Center, Suite 101
Hagåtña, Guam 96910
Attn: Eloise Baza

Guam Economic Development Authority
590 South Marine Corps Drive
Tamuning, Guam 96911
Attn: Mike Cruz

Guam Environmental Protection Agency
Guam Main Facility
P.O. Box 22439
Barrigada, Guam 96921
Attn: John M.U. Jocson, Acting Administrator

Guam Environmental Protection Agency
120 Bongbong Street
Dededo, Guam 96929
Attn: Mike Gawel

Guam Fire Department
1301-1 Central Avenue, Tiyan
P.O. Box 2950
Hagåtña, Guam 96932
Attn: John L. Wusstig, Chief

Guam Historic Preservation Office
490 Chalan Palasyo Street
Agana Heights, Guam 96910
Attn: Lynda Aguon, Historic Preservation Officer

FINAL EIS for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor

Guam Police Department
233 Central Avenue
Tiyan, Guam 96913
Attn: Frankie T. Ishizaki, Chief

University of Guam Marine Laboratory
Room 110
University of Guam
Mangilao GU 96923 USA
Attn: Suzanne Wilkins

University of Guam
UOG Station
Mangilao, Guam 96932
Attn: Professor Peter J. Onedera

University of Guam
UOG Station
Mangilao, Guam 96932
Attn: Professor Rudy Villaverda

Information Repositories:

Guma' Palu Li'e
c/o Guam Community College Library
P.O. Box 23069 GMF
Barrigada, Guam 96921
Attn: Leonard Iriarte, Director

Nieves M. Flores Memorial Public Library
254 Martyr Street
Hagåtña, Guam 96910
Attn: Head Librarian

Port Authority of Guam
Planning Division
1026 Cabras Highway
Suite 201
Piti, Guam 96915

Organizations and Interested Parties

Chamorro Artists Association
c/o Jay Baza Pascua
P.O. Box 362
Agana, Guam 96932
Attn: Filamore P. Alcon, Director

Chamorro Land Trust Commission
Kumision Inangoklon Tano' Chamorro
P.O. Box 295
Hagatna, Guam 96932
Attn: Joseph Borja, Administrative Director

Commission on Decolonization
Kumision Dinitetminan-Maisa
P.O. Box 295
Hagatna, Guam 96932
Attn: Office of the Director

Guam Ancestral Lands Commission
P.O. Box 295
Hagatna, Guam 96932
Attn: Ed Benavente, Executive Director

Guam Preservation Trust
P.O. Box 3036
Hagåtña, Guam 96910
Attn: Michael Makio, Chairman

Guam Dive Industry Association
Guam Tropical Dive Station
P.O. Box 1649
Hagåtña, Guam 96910
Attn: John Bent

FINAL EIS for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor

Guam Sailing Federation
c/o POB 3643
Hagåtña, Guam 96932
Attn: Victor R.H. Torres

Pacific Daily News
244 Archbishop Flores Street
Hagatna, Guam 96910
Attn: Masako Watanabe

The Nature Conservancy
P.O. Box 5411
Hagåtña, Guam 96932
Attn: Trina Leberer

Sebastio Para I Manamko'
GGARP-SPIMA
P.O. Box 3057
Hagatna, Guam 96932
Attn: Ann San Nicolas, Chairperson

Paul Packbier
PCR Environmental
266 Father San Vitores Street
Tamuning, Guam 96911

Darlene Moore
Micronesian Archaeological Research Services
P.O. Box 22303
GMF, Guam 96921

Rosalind Hunter-Anderson
Micronesian Archaeological Research Services
P.O. Box 22303
GMF, Guam 96921

Gail Renard
Helbert, Hastert and Fee
733 Bishop Street

Suite 2590
Honolulu, Hawaii 96813

Frank Rabon
I Taotao Tano'
P.O. Box 3503
Hagatna, Guam 96910

Robert Leeper
P.O. Box 4614
Hagåtña, Guam 96932

Ivan Matek
P.O. Box 8456
Tamuning, Guam 96931

Robert E. Hahn
14 Chalan Saduk
Yona, Guam 96915

APPENDIX N

Draft EIS Public Hearing Materials

Draft Environmental Impact Statement Master Plan for Deep-Draft Wharf and Fill Improvements

August 27, 2007

Introduction

Under a federal grant from the U.S. Department of Commerce Economic Development Administration, the Port Authority of Guam is proposing Master Plan improvements to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. A Draft Environmental Impact Statement (EIS) was prepared for the proposed improvements in compliance with the National Environmental Policy Act (NEPA) of 1969 as implemented by the regulations of the Council on Environmental Quality. The public comment period for the Draft EIS began on August 10, 2007 and will end on September 30, 2007.

Project Background

Apra Harbor operates under congested conditions, and is in need of improvements to meet anticipated future demands of the island's commercial port operations. The proposed Master Plan improvements would provide additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep-draft container vessels, and cruise ships. The deep-draft wharf would also provide contingency berthing facilities for U.S. Navy military vessels.

Purpose and Need for the Action

Waterfront dock space at the Commercial Port is severely limited. Containerized cargo operations currently share wharf space with the sometimes conflicting requirements of the fishing fleet, cruise ships, and other cargo operations. Additionally, modern larger deep-draft vessels, such as Post-Panamax container vessels, cannot berth at existing Port facilities because they exceed the Port's draft.

The purpose and need for the Master Plan improvements is to provide Guam with berthing facilities capable of accommodating modern deep-draft commercial cargo, passenger, and military vessels and to increase operational capacity for containerized cargo operations to meet future demands for these services within the Apra Commercial Harbor.

Alternatives Evaluated in Draft EIS

1) No Action Alternative
- Required by NEPA
- Proposed Master Plan Improvements would not occur
- Provides baseline for comparison of impacts

2) Preferred Alternative: Pier on Piles Wharf and Land Reclamation (see attached Figures 1-3)
- Wharf design consisting of concrete deck with piled foundation
- Wharf area requirement: 7.4 acres
- Wharf fill requirement: 83,524 cubic yards
- Land reclamation area: 16.67 acres

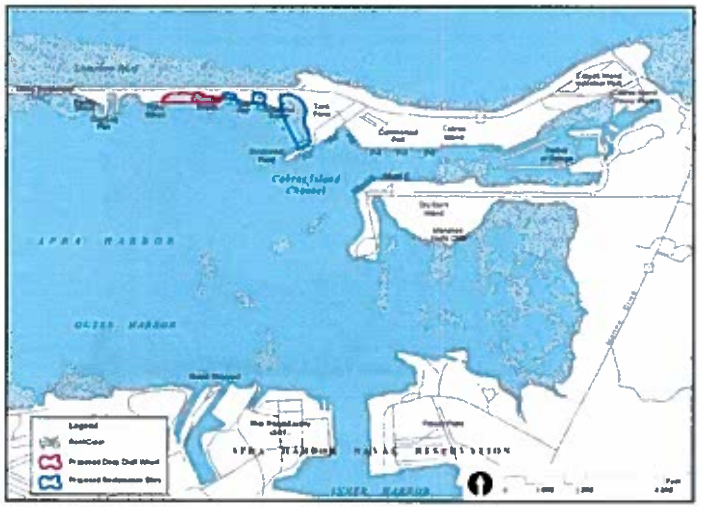
3) Alternative Design: Cellular Sheet Pile Wharf and Land Reclamation (see attached Figures 4 - 5)
- Wharf design consisting of concrete deck cast on top of filled cellular sheet pile foundation
- Wharf area requirement: 7.9 acres
- Wharf fill requirement: 315,470 cubic yards
- Land reclamation area: 16.67 acres

4) Alternative Location: Fixed Pier at Golf Pier and Southwest Point (see attached Figure 6)
- Fixed pier design consisting of contiguous wharf and operational backland areas
- Pier area requirement: 40 acres
- Pier fill requirement: 900,000 yd^3

Where to Submit Comments

Please submit written comments on the draft EIS to: Mr. James Hatashima, Project Manager, U.S. Army Corps of Engineers, Honolulu District, Civil and Public Works Branch (CEPOH-PP-C), Bldg. 230, Rm. 309, Fort Shafter, HI 96858-5440. E-mail: james.k.hatashima@usace.army.mil. Fax. (808) 438-0430. Comments must be postmarked by September 30, 2007.

Public Hearing Information Sheet



Location Map

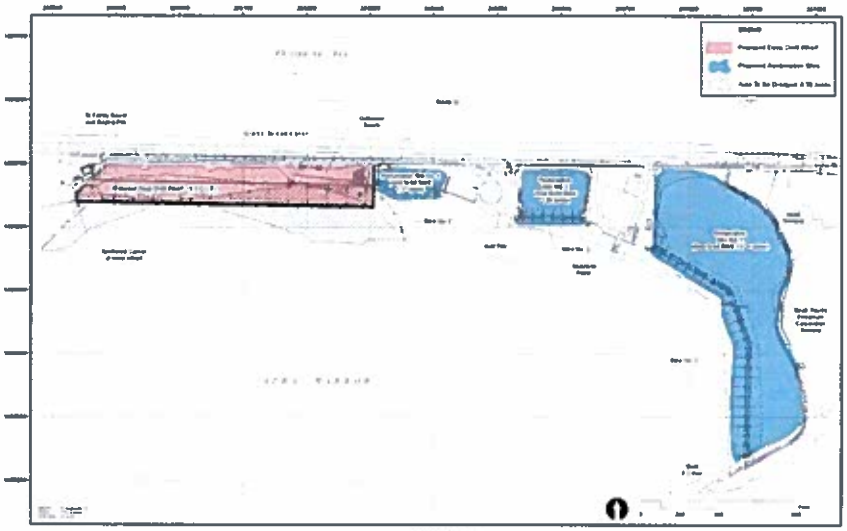


Figure 1

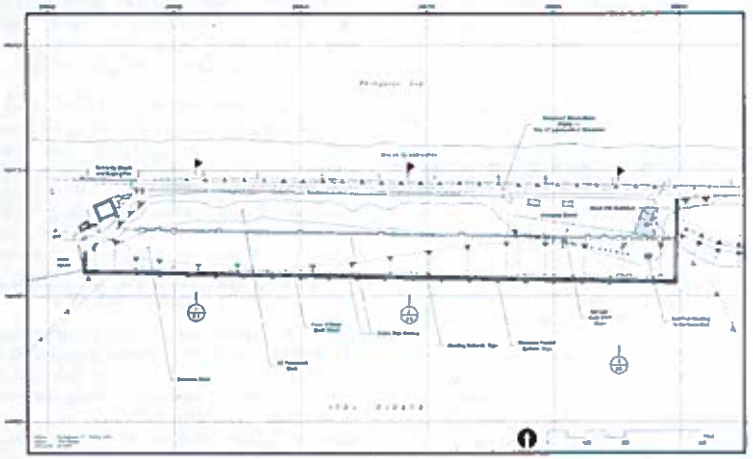


Figure 2

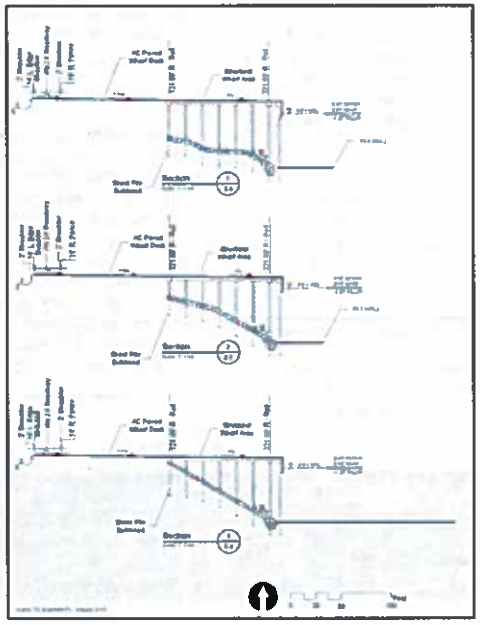


Figure 3

Draft Environmental Impact Statement
Master Plan for Deep-Draft Wharf and Fill Improvements

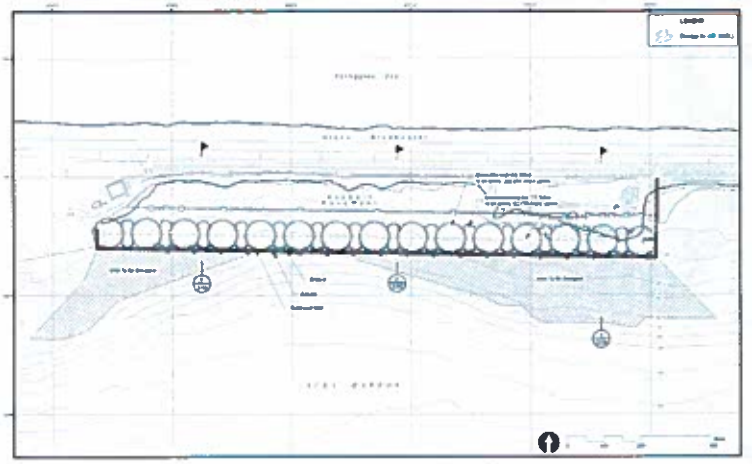


Figure 4

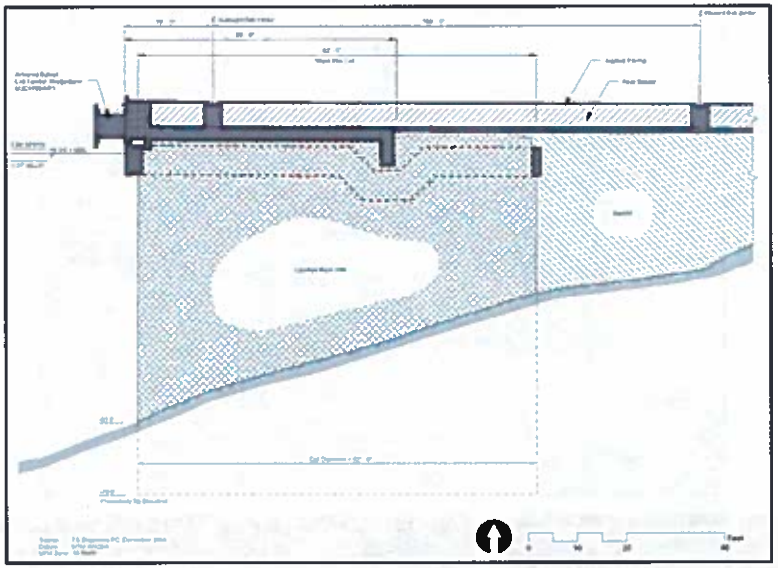


Figure 5

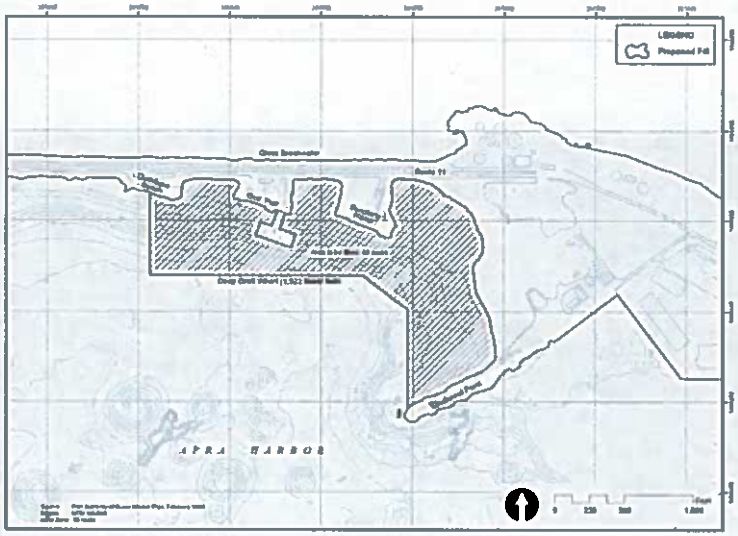


Figure 6

Draft EIS Public Hearing

August 27, 2007

Master Plan for Deep-Draft Wharf and Fill Improvements

Apra Harbor, Guam

Agenda

- Purpose of Public Hearing
- Project Background
- NEPA and the EIS Process
- Purpose and Need for the Project
- Alternatives Evaluated
- Environmental Analysis
- Project Schedule and Cost
- Public Involvement
- Questions and Answers

Purpose of Public Hearing

- Required Under NEPA
- Inform government agencies and public on the results of the Draft Environmental Environmental Impact Statement (EIS)
- Solicit public input into the Environmental Review process

Project Background

- U.S. Department of Commerce
  - Economic Development Administration (EDA) Grant
  - Federal Funding: Project compliance with National Environmental Policy Act (NEPA)
- U.S. Army Corps of Engineers (USACE)
  - Intergovernmental Cooperation Act
  - USACE conducts the NEPA evaluation
  - WCP, Inc.

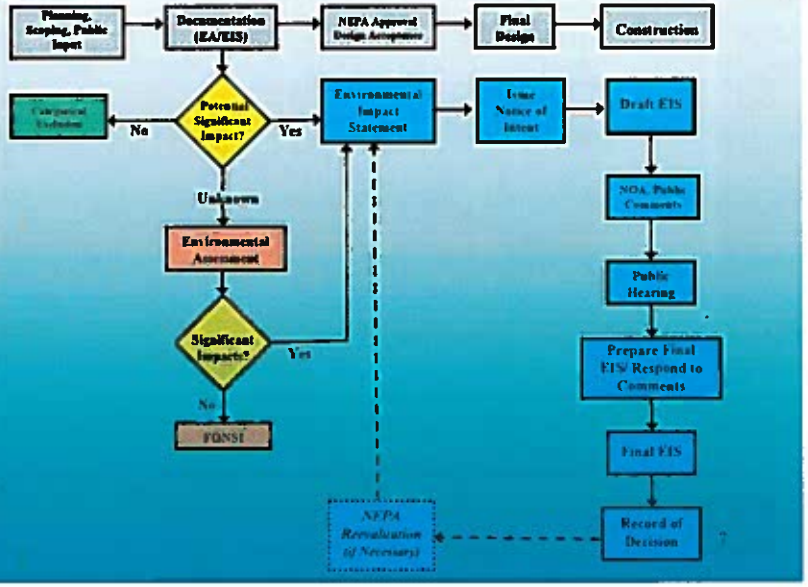
Project Area



NEPA and the EIS Process

- National Environmental Policy Act (or NEPA)
  - Law for the protection of the environment
  - Agencies must address potential impacts ofaction
  - Consider reasonable alternatives to proposed action
- Environmental Impact Statement (or EIS)
  - Most comprehensive documentation under NEPA
  - Identifies reasonable alternatives to the action
  - Identifies potential environmental impacts of action
  - Identifies mitigation measures

The NEPA/EIS Process



Purpose and Need

Existing Conditions

- Apra Harbor – Guam's Only Commercial Port
- Multiple Maritime Users
  - Cargo (Imports and Exports)
  - Tourism (Cruise Ships and Excursion Vessels)
  - Fisheries (Tuna Shipments)
  - Military (U.S. Navy)

- Harbor Operations and Constraints
  - Today port averages 1,300 port calls annually
  - Congested operating conditions
  - No increase in wharfage in past 30 years
  - No deep water berthing facility for new generation of container ships (Post-PANAMAX)
  - Limited container yard capacity

- Cargo Operations
  - 95% of all goods imported to Guam arrive by sea
  - Cargo accounts for over 70% of total port traffic
  - In 1980 cargo volume was 687,000 tons, in 2005 2,042,000 tons (almost 300% increase)
  - By 2025 cargo volume estimated to be 3,461,000 tons
  - Over next 20 years port will handle additional 1,419,000 tons annually (Approx. 60% increase)

- Summary of Purpose and Need
  - Cargo traffic will continue to increase as population and other cargo producing markets develop
  - Wharfage and storage/operational areas will need to increase to accommodate this growth
  - Need for wharf facilities capable of berthing larger deep-draft (55ft draft) vessels of today and tomorrow

Alternatives Analysis Process

Tier I

(Siting Criteria)

- Access to deep-draft channel
- Potential to develop a deep-draft wharf
- Availability/potential to develop 17 acres of backland
- Proximity to Apra Harbor

Tier II

(Operational Criteria)

- Navigational Access
- Dredging and Fill Requirements
- Available/developable backlands
- Access to Roads
- Proximity to existing commercial port infrastructure
- Development constraints/land use

Tier III

(Design Alternatives)

- Feasibility of design alternatives to meet operational requirements

Alternatives Analysis Process

Tier I

4 Alternative Locations Advanced

- Locations outside Apra Harbor
- Locations within Apra Harbor (3)

Tier II

3 Alternative Locations Advanced

- Site 1: Area south of Glass Breakwater/west of Cabras Island
- Site 2: Existing Commercial Port wharf facilities (Wharves F-4, F-5, F-6)
- Site 3: Former Naval SRF

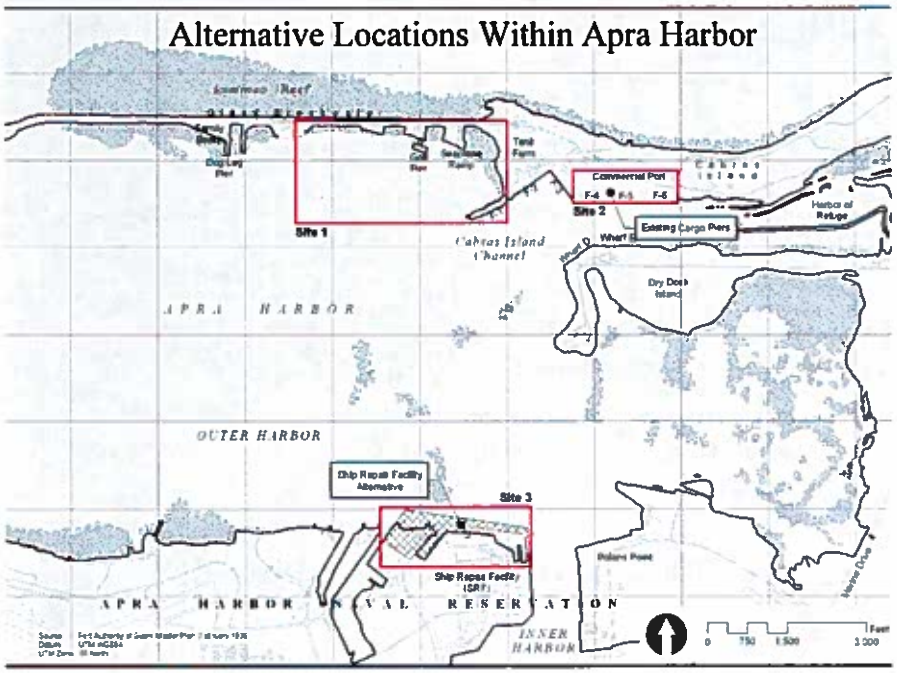
Tier III

1 Alternative Location Advanced (Site 1)

- 3 alternative designs advanced
  - Pier on Piles
  - Cellular Sheet Pile
  - Fixed Pier

Selection of Preferred Alternative

Alternative Locations Within Apra Harbor



Summary of Alternatives Evaluated

- 8 alternatives considered including No Action
- 4 alternative eliminated from further evaluation
- 4 alternatives carried forward for further evaluation
  - No Action – (Master Plan improvements would not occur)
  - Alternative #1 (Preferred Alternative)
  - Alternative #2 – Alternate Design
  - Alternative #3 – Alternate Design/Location
- Impacts of Proposed Project and Alternatives are similar

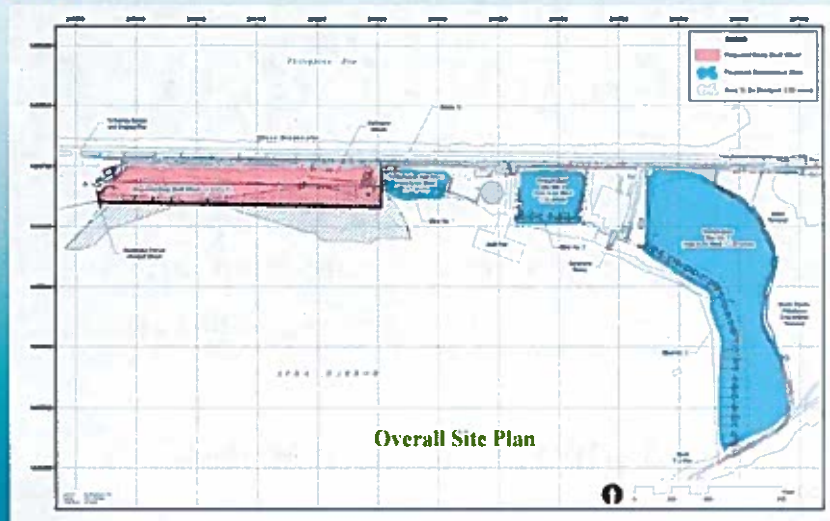
No Action Alternative

- Required by NEPA
- Proposed Master Plan Improvements would not occur
- Provides baseline for comparison of impacts

Preferred Alternative

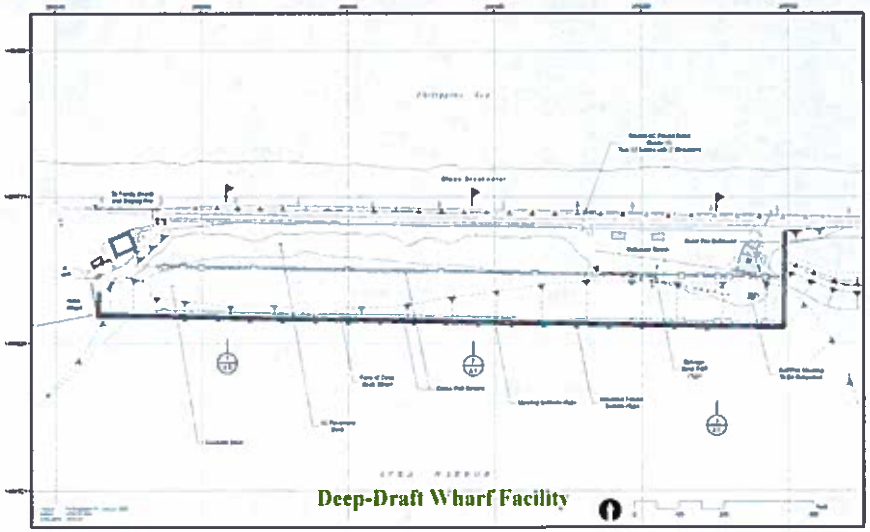
- Pier on Piles Wharf Design and Land Reclamation
  - Wharf design consisting of concrete deck with piled foundation
  - Wharf area requirement: 7.4 acres
  - Wharf fill requirement: 83,524 cubic yards
  - Dredge requirement: 180,600 cubic yards
  - Land reclamation area: 16.67 acres
  - Land reclamation fill: 285,762 cubic yards

Preferred Alternative

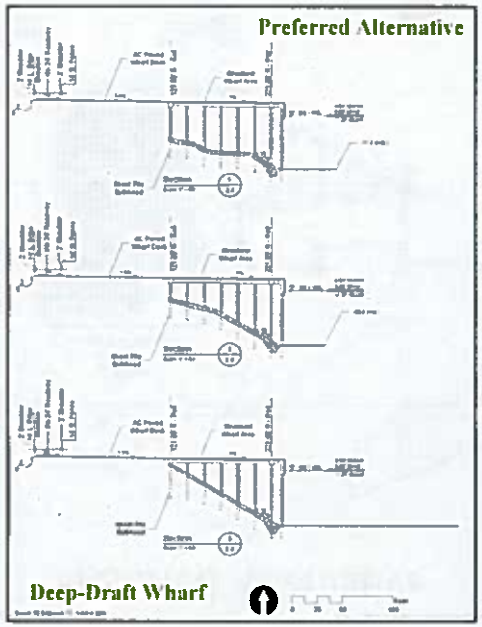


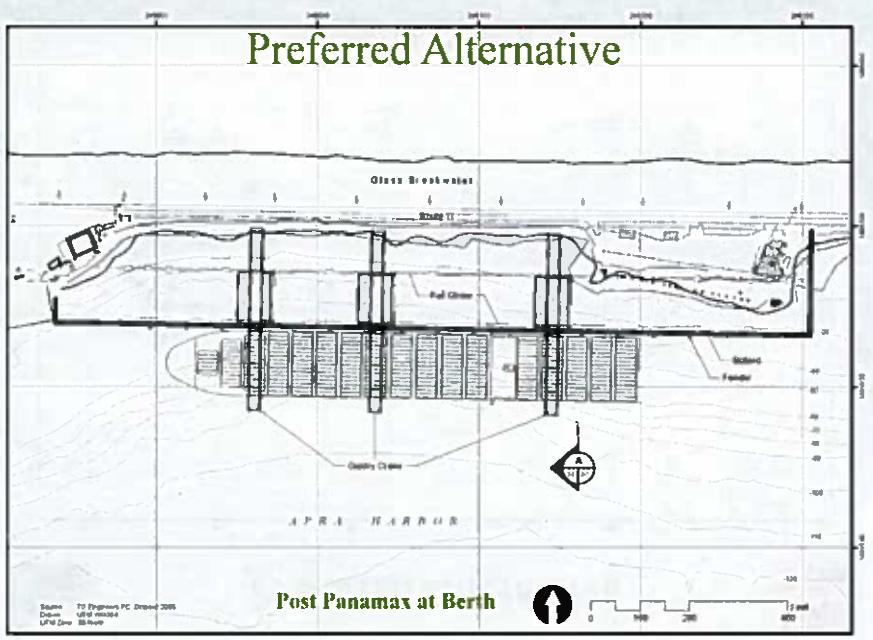
Overall Site Plan

Preferred Alternative

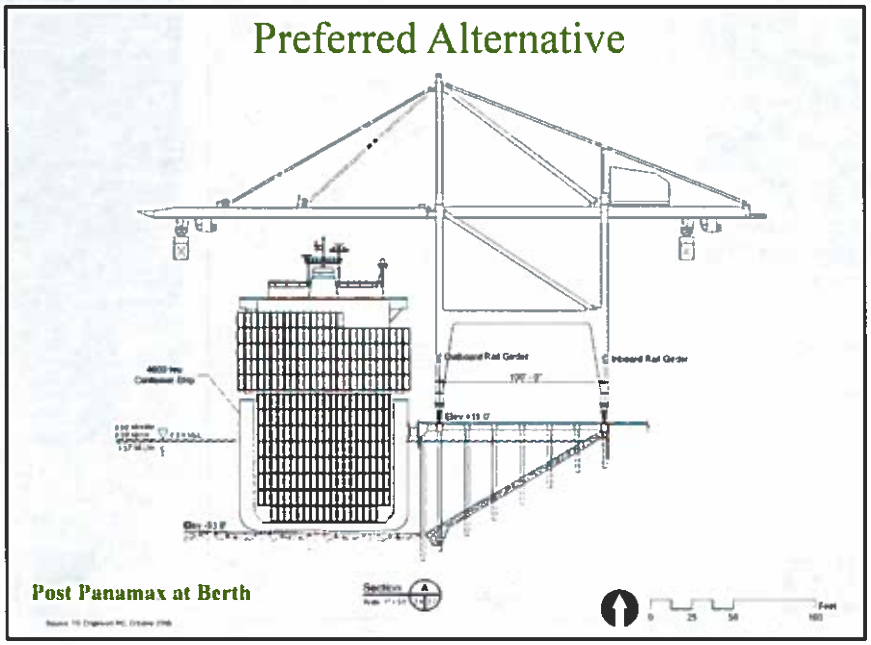


Deep-Draft Wharf Facility


Preferred Alternative
Deep-Draft Wharf

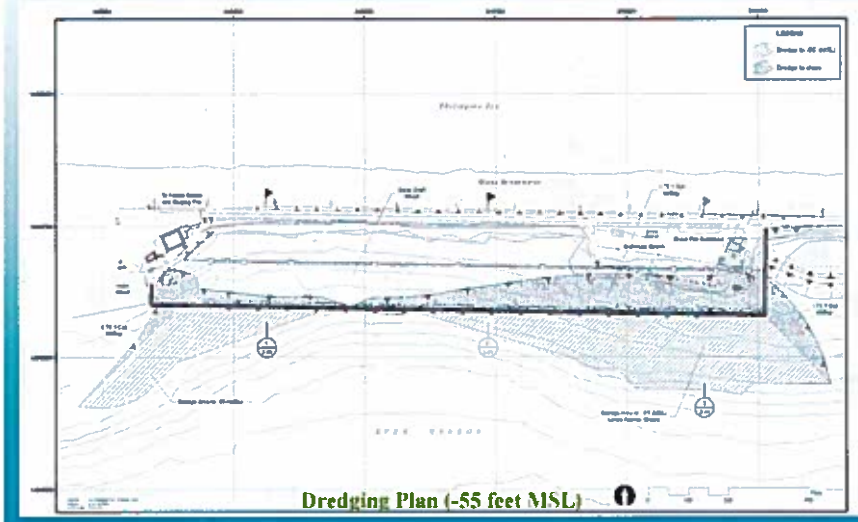

Preferred Alternative
Post Panamax at Berth

Preferred Alternative

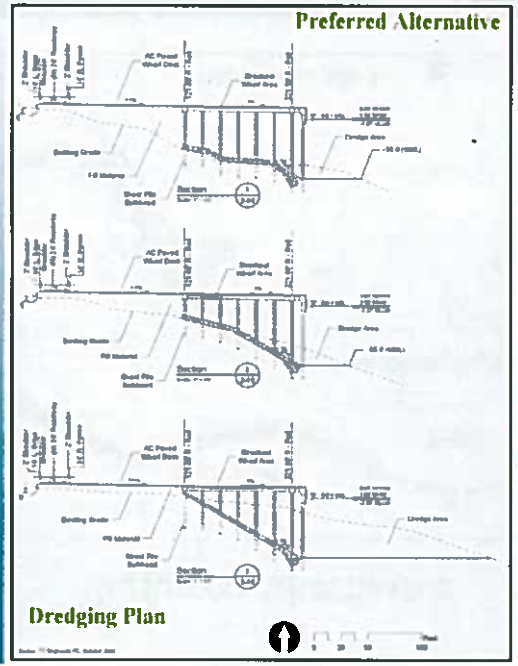


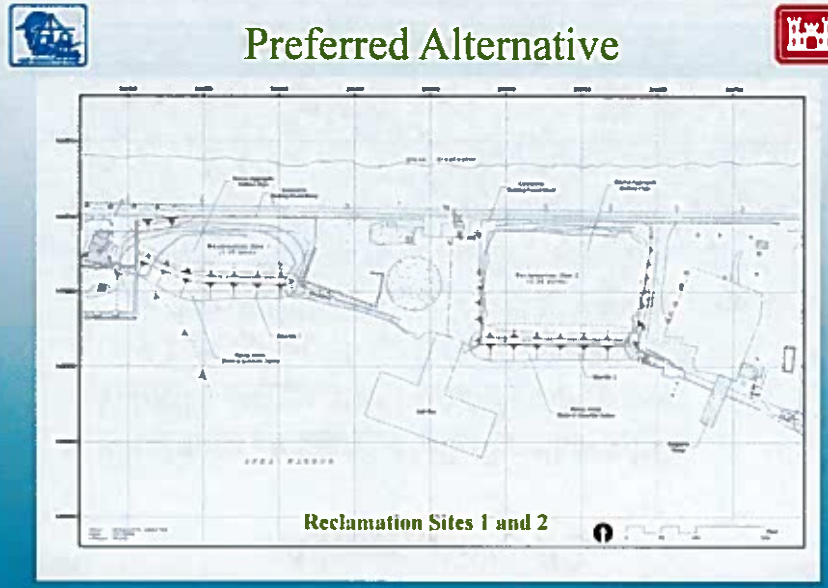
Post Panamax at Berth

Preferred Alternative

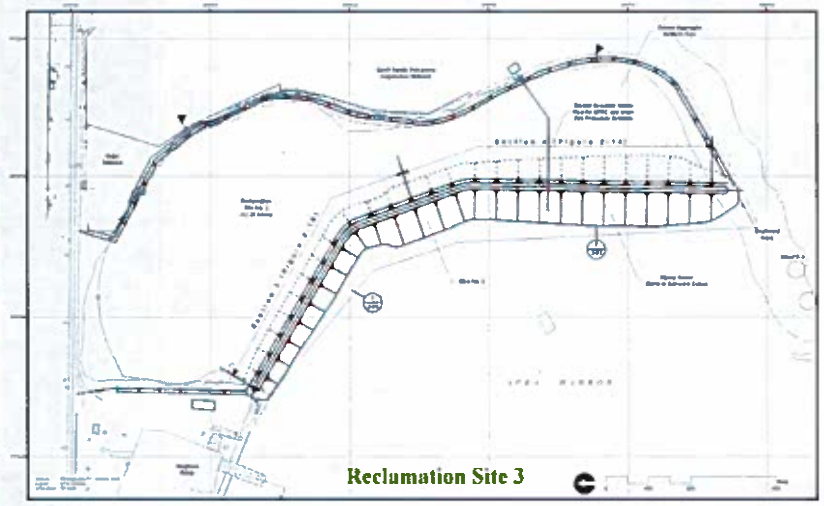


Dredging Plan (-55 feet MSL)


Preferred Alternative
Dredging Plan


Preferred Alternative
Reclamation Sites 1 and 2

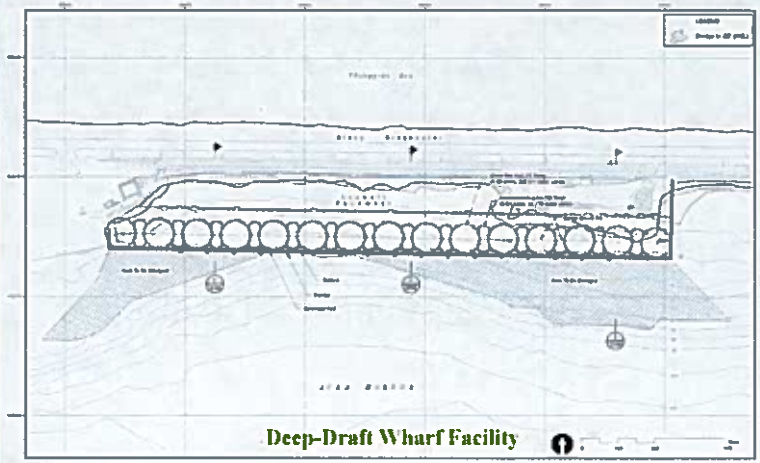
Preferred Alternative



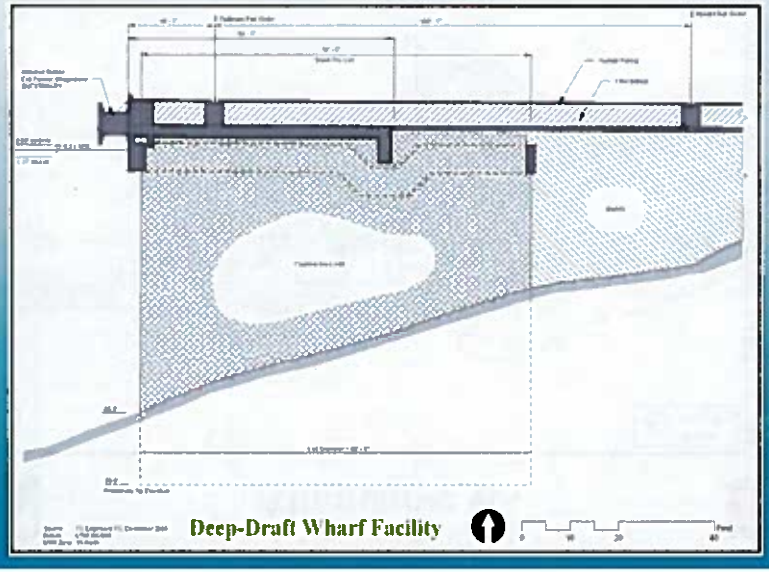
Alternative #2

- Alternate Design: Cellular Sheet Pile Wharf Design and Land Reclamation
  - Wharf design consisting of concrete deck cast on top of filled cellular sheet pile foundation
  - Wharf area requirement: 7.9 acres
  - Wharf fill requirement: 315,470 cubic yards
  - Wharf dredge requirement: 160,000 cubic yards
  - Land reclamation area: 16.67 acres
  - Land reclamation fill: 285,762 cubic yards

Alternative #2



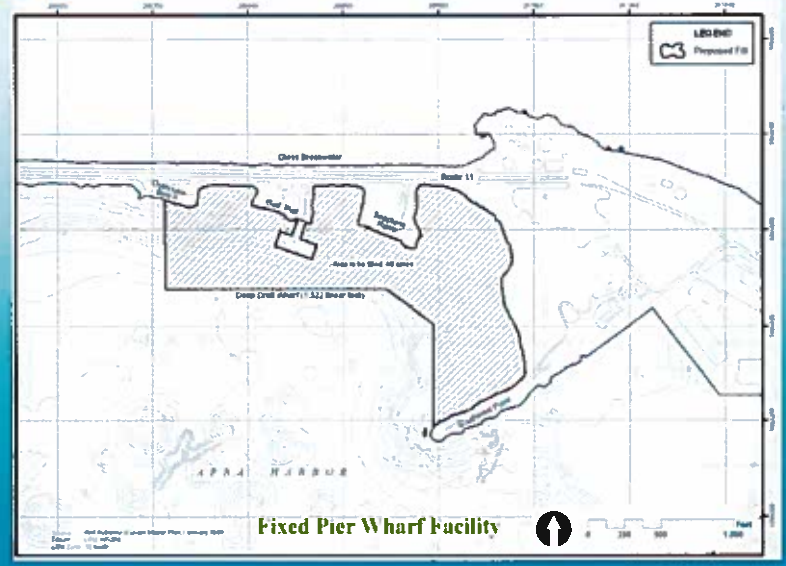
Alternative #2



Alternative #3

- Alternative Design/Location: Fixed Pier at Golf Pier and Southwest Point
  - Conceptual Plan
  - Fixed pier design consisting of contiguous wharf and operational backland areas
  - Pier area requirement: 40 acres
  - Pier fill requirement: 900,000 cubic yards

Alternative #3



Summary Comparison of Alternatives

Alternative	Project Component	Area Requirement (acres)	Dredge Requirement (Cubic Yards)	Fill Requirement (Cubic Yards)
Preferred (Pier on Piles)	Deep-Draft Wharf	7.46	180,821	83,524
	Reclamation Sites	16.67	-	285,762
Alternative #2 (Cell/Sheet Pile)	Deep-Draft Wharf	7.92	160,000	315,000
	Reclamation Sites	16.67	-	285,762
Alternative #3 (Fixed Pier)	Fixed Pier (Wharfage)	8.0	NA	100,000
	Backlands	32	-	800,000

Environmental Analysis

- Environmental Impact Statement (EIS)
  - Identifies reasonable alternatives to the action
  - Identifies potential environmental impacts
  - Identifies mitigation measures
- Technical Studies Conducted
  - Acoustical
  - Air Quality
  - Archaeology and Cultural
  - Biological and Water Quality
  - Coastal Engineering
  - Traffic

Analysis Approach

- Existing conditions investigated and baseline established
- Criteria developed to determine significance of potential impacts
- Potential impacts identified and evaluated against significance criteria
- Mitigation measures developed for potential impacts determined to be significant

Attributes of Environmental Analysis



Overview of Draft EIS Conclusions

- Potential Adverse Impacts for ALL Alternatives
  - Total of 48 potential adverse impacts identified
  - Less Than Significant (39)
    - No Action = 3
    - Preferred Alternative = 12
    - Alternative #2 = 12
    - Alternative #3 = 12
  - Significant (9)
    - No Action = 0 (1)
    - Preferred Alternative = 2
    - Alternative #2 = 2
    - Alternative #3 = 4

Comparison of Alternatives and Impacts

Environmental Attribute	No Action Alternative	Preferred Alternative	Alternative 2	Alternative 3
Land Use	NI	NI	NI	SI
Socio-Economics	NI	BI	BI	BI
Environmental Justice	NI	NI	NI	SI
Infrastructure and Utilities	NI	LSM	LSM	LSM
Traffic and Circulation	NI	NI	NI	LS
Cultural and Historic Resources	NI	LSM	LSM	LSM
Aesthetic Resources	NI	NI	NI	NI
Recreational Resources	NI	SI	SI	SI
Public Health and Safety	LSM	LSM	LSM	LSM
Coastal Zone Management	NI	LSM	LSM	LSM
Hydrology Drainage and Soils	NI	LSM	LSM	LSM
Air Quality	NI	LSM	LSM	LSM
Sediments and Dredge Material	NI	LSM	LSM	LSM
Hazardous Materials	LSM	LSM	LSM	LSM
Terrestrial Flora and Fauna	NI	NI	NI	NI
Wetlands	NI	NI	NI	NI
Marine Biological Resources	(SI)	SI	SI	SI
Protected Species	NI	LSM	LSM	LSM
Nonindigenous Invasive Species	LSM	LSM	LSM	LSM
Noise and Vibration	NI	LSM	LSM	LSM
Water Quality	NI	LSM	LSM	LSM

Preferred Alternative

- Impact #1: Recreational Resources
  - Deep-Draft Wharf situated between Hotel Wharf and Outhouse Beach
  - Recreational SCUBA diving could no longer occur in nearshore waters
  - Dive sites within Apra Harbor would not be affected

Reefs - Recreational Dive Sites



Sunken Vessels – Recreational Dive Sites



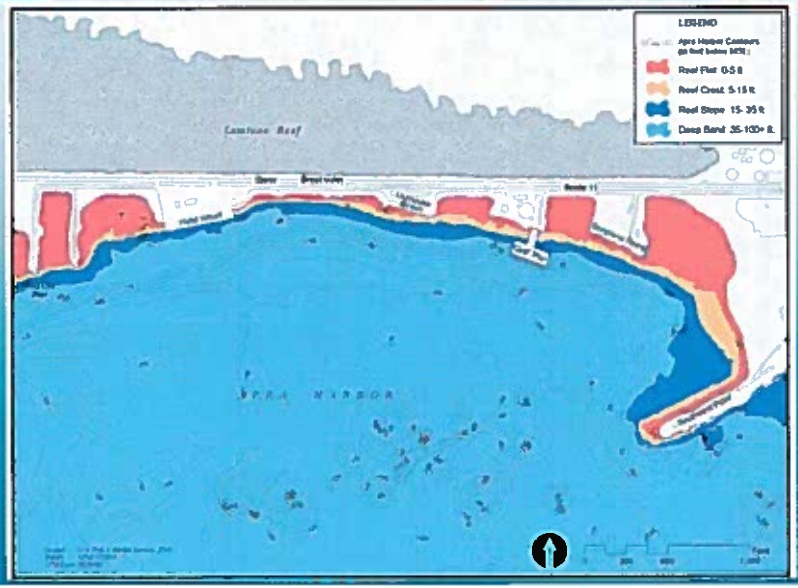
Preferred Alternative

- Impact #1: Recreational Resources
- Proposed Mitigation
  - Notify users and public prior to construction
  - Work together with users/stakeholders to identify issues/concerns and potential alternate dive locations
  - Consider development study/plan to address issues/concerns and recommend suitable alternate dive locations

Preferred Alternative

- Impact #2: Marine Biological Resources
  - Coral Reef and Deep Sand Habitat
  - 28.83 Total Acres Permanently Lost
    - 12.18 Acres - Deep-Draft Wharf Facility
    - 16.65 Acres – Filling of Reclamation Sites
  - Impact Sources
    - Wharf Construction, Dredge, and Fill Activities
    - Embayment Fill
    - Sediment Suspension
    - Operations (Anchoring & Mooring Lines)

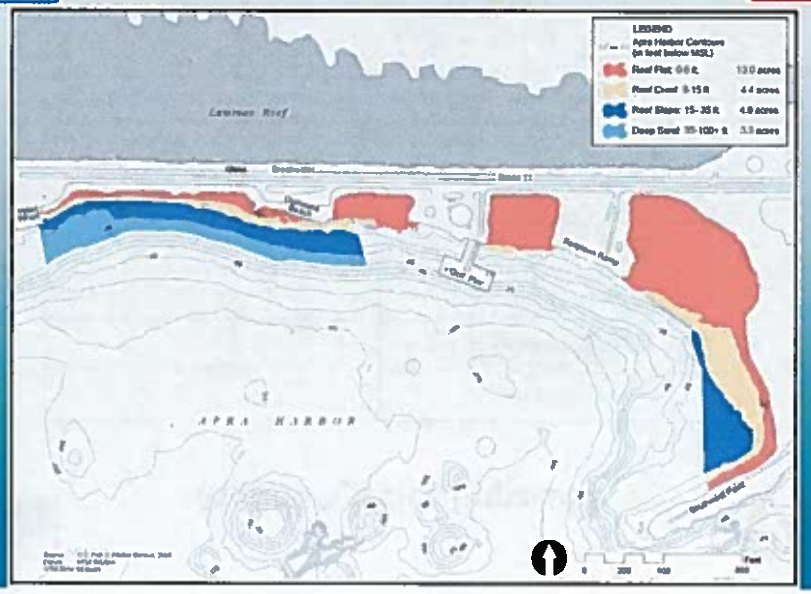
Benthic Habitat Types



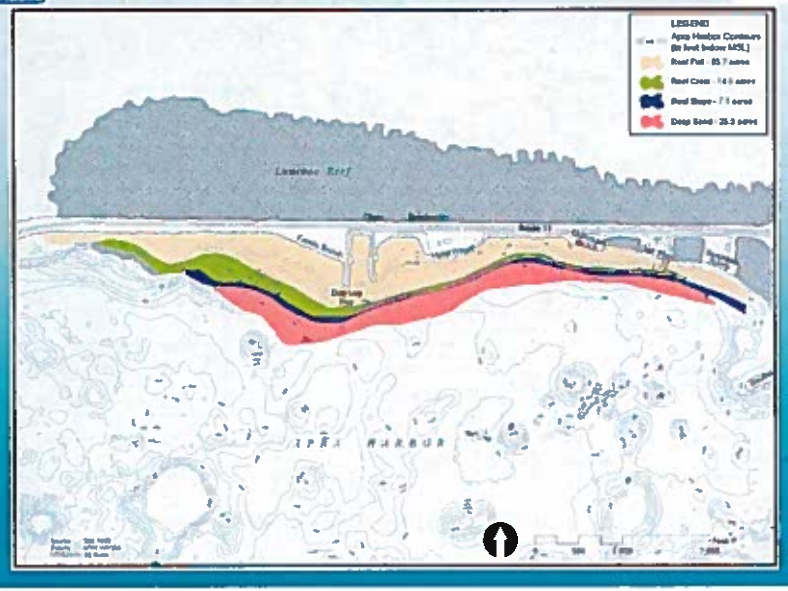
Benthic Habitats Impacted

Impact Source	Project Site(s)	Habitat Type	Area Impacted (in acres)	Impact Duration
Wharf Construction, Dredge, and Fill	Deep Draft Wharf	Reef Flat	1.39	Permanent
		Reef Crest	1.38	Permanent
		Reef Slope	2.91	Permanent
		Deep Sand	8.50	Permanent
Embayment Fill	Reclamation Sites 1,2, and 3	Reef Flat	11.84	Permanent
		Reef Crest	3.04	Permanent
		Reef Slope	1.97	Permanent
Sediment Suspension & Resuspension[2]	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	55.7	3 Years
		Reef Crest	14.6	3 Years
		Reef Slope	7.1	3 Years
		Deep Sand	25.5	3 Years
Sediment Deposition	Deep Draft Wharf, Reclamation Sites 1,2, and 3	Reef Flat	11.14	10 Years
		Reef Crest	2.92	10 Years
		Reef Slope	1.42	10 Years
		Deep Sand	5.1	1 Year
Anchoring & Mooring Lines	Deep Draft Wharf	Deep Sand	3.3	1 Year[1]

Benthic Habitat Impacted



Benthic Habitat Impacted (Sediment Suspension)



Marine Species Impacted

Species	No. Observed			
	Reef Flat	Reef Crest	Reef Slope	Deep Sand
Algae	5	10	10	-
Macro-invertabrates	22	63	68	-
Reef Fish	33	104	104	-
Coral Colonies	5	366	1,251	-
Totals	65	534	1,433	-

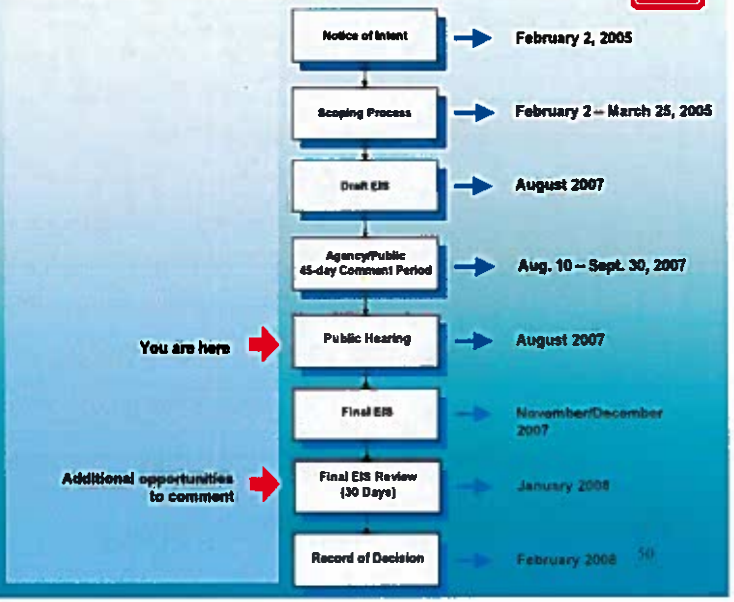
Preferred Alternative

- Impact #2: Marine Biological Resources
- Proposed Mitigation
  - Continued Consultation Under FWCA
  - Develop Compensatory Mitigation Plan
    - Develop Mitigation Measures
    - Identify Performance Standards
    - Develop Monitoring Program
  - Possible Compensatory Mitigation Measures
    - Coral Transplantation
    - Fish Aggregation Devices
    - Best Management Practices

Project Cost and Schedule

- Construction Cost Estimate : $83,192,500
  - Deep-Draft Wharf = $51,370,000
  - Filling Embayments = $31,822,500
- Construction Schedule
  - Construction Duration (2-4 years)
  - Construction Start Dates (Unknown)
    - Funding Uncertainties
    - Estimated 2021-2025

MASTER PLAN for DEEP-DRAFT WHARF and FILL IMPROVEMENTS EIS FLOW CHART and PROJECT DATES



Submitting Comments on Draft EIS

- Use comment sheet provided (submit tonight or mail in the pre-addressed form)
- Mail written comments to:

  U.S. Army Corps of Engineers, Honolulu District
  Civil and Public Works Branch, (CEPOH-PP-C)
  Rm. 309, Bldg. 230
  Fort Shafter, HI 96858-5440
  ATTN: Mr. James Hatashima, Project Manager

- Submit comments via Email or Fax

  Email: **James.K.Hatashima@poh01.usace.army.mil**
  Fax: **(808) 438-0430**

- Please submit comments in writing by:

  September 30, 2007

Thank You!

Questions?

DRAFT ENVIRONMENTAL IMPACT STATEMENT

MASTER PLAN FOR

DEEP-DRAFT WHARF AND FILL IMPROVEMENTS

Public Hearing Transcripts

August 27, 2007

Port Authority of Guam

Conference Room

Piti, Guam

WELCOME REMARKS BY MS. TARA PEREZ-STEFFY

TARA PEREZ-STEFFY:

Okay. Well welcome everybody to this evening's public hearing for the draft environmental impact statement for the master plan for the proposed deep draft and wharf and fill improvements at Apra Harbor. My name is Tara Steffy, and I will be facilitating this evening's meeting. It looks like we have a very small an intimate crowd here. So if you all want to move up, that's fine (laughs) or stay...

The agenda I believe is the next slide. But we will have three speakers for this evening. Dot Chargulaf from the Port Authority will be giving us some brief welcome remarks, and then following Dot we have James Hatishima from the Army Corp of Engineers giving us a project description, some project background and the background to the draft EIS process. And then for the meat of the presentation this evening we'll have Richard Stook from Wil Chee Planning.

I know at this point we only have one member of the public in attendance right now. So, if you do have any questions...(laughs)...Thank you for coming. First of all taking time out of your evening... If you do have any questions, I would appreciate it if you just wait until the end of the presentation and if you have any comments that you would like to make, we are recording this evening's meeting for the record for the EIS. So if you don't mind...If you could either stand up and project very loudly or if you would stand closer towards the podium because it's being recorded right here from this recorder. *(No problem)* Ok. Thank you!

So...Dot! Would you like to come up and make some brief remarks?

INTRODUCTION BY MS. DOT HARRIS

DOT HARRIS: *(1:38:10 – 3:29:26)*

Thank you Tara! Just as a brief introduction to this project... The new Warf deep draft project was originally identified in the 1999 Master Plan, Port Authority Master Plan and the 2001 Guam Comprehensive Economic Development Strategy. In that Economic Development it was identified as the lead project; and based on that recommendation the Port Authority of Guam received funding from the Economic Development Administration of the US Department of Commerce to do a two phase project which included the design...architectural and engineering design for the Warf itself and the Environmental Impact Statement. Conducting the design work for the project was TG Engineers and their subcontractors, Moffett and Nichols for the Environmental Impact Statement component. It was the Government of Guam had a contract with the US Army Corp of Engineers who has subcontracted Wil Chee Planning and Environmental who have boots on the ground with PCR Environmental.

I would like to introduce our Chairman of the Board, Mr. Monte Mesa who is in attendance and Mr. Ken Tagawa, our General Manager as well as Mr. Kin Cruz our Deputy General Manager...

Mr. Jim Hatashima with Army Corp, Mr. Richard Stook he is with Wil Chee Planning and Environmental. Mr. Tor Gudmon with TG Engineers. Our engineer manager Mr. Simeon Delos Santos, and on part of my staff...Mr. Henry Paulino.

And with that, I'll turn the presentation over to Richard to continue...or...to Jim, excuse me. Mr. Hatishima...

OVERVIEW BY MR. JAMES HATISHIMA

JAMES HATISHIMA:

Thank you very much. Also like to express my appreciation for coming tonight to attend the public meeting. This is the former presentation of the public meeting. I just have a few slides before I turn the presentation over to Richard.

First of all the agenda... I'll cover the purpose of public hearing, the project background, and the NEPA, and the EIS process; and then Richard will take over from there and discuss the purpose and need for the project, alternatives evaluated, environmental analysis, the project schedule and the cost, the public involvement, and then we'll rap up the public hearing with question and answers.

Okay. So the purpose of the public hearing is actually is required by NEPA. NEPA stand for National Environmental Policy Act, which was passed by congress. So the purpose of public hearing is to inform the government agency and the public on the result on the draft environmental impact statement. So right now the reason for having this public meeting is because we completed the

draft environmental impact statement, we are required to have a public hearing to notify the public. So basically why we're here is to solicit any public input / comments people may have on the draft EIS.

Just to give you a little background, I think Dot sort of covered most of the background information but, the Port Authority of Guam received a grant from EDA and they in turn returned the services of the Corp of Engineers, and I in turn hired the Wil Chee to be the consultant to prepare the draft environmental impact statement.

And that's about my portion...of the presentation...

PRESENTATION BY MR. RICHARD STOOK

RICHARD STOOK:

Good evening. My name is Richard Stook, I'm with Wil Chee Planning. Thanks everybody for coming. It's a small turn out, but I appreciate you coming.

As Jim had mentioned... in this slide here...this is the background...

The NEPA trigger for this project is the federal funding that came from the EDA. And just before I start, just to give everybody some type of bearings...this is the project area where we're gonna be talking about in outer Apra Harbor and this area her under the glass break water to the south of it and west of Cabras island...just so that everybody has an idea of what we are talking about. So with that, I would like to briefly discuss the NEPA and EIS process that Jim had mentioned. It's the National Environmental Policy Act. There was the - - it is the

major overwriting environmental law in the nation. Signed into law in 1970. Basically what it says is that all federal agencies need to address potential impacts of their actions and consider reasonable alternatives to their actions.

The EIS is a form of documentation under NEPA. It's the most comprehensive documentation, and in an EIS reasonable alternatives to the action, and the action are identified. Potential environmental impacts are identified and mitigation measures are identified.

Real quick...as an overall schematic of the NEPA and the EIS process – along the top you see where NEPA takes a project – starting from the planning and scoping all the way through to final design and construction. But where we're at right now in the NEPA process is documentation stage, and it could go either of three ways. It could be categorically excluded if there are no impacts. If impacts are unknown, it still needs to be determined if – and an environmental assessment is prepared if no significant impacts, A FONSI is prepared... finding no significant impact. But if there are significant impact it goes to where we're at, the environmental impact statement.

The Port Authority, essentially they knew from the beginning that this particular project would have significantly environmental impacts. So they went straight into the Environmental Impact Statement Phase. And this is the environmental statement process:

The notice of intent is issued – that we could prepare one. That was done back in February of '05. And the draft EIS is prepared, Notice of Availability is published in the federal registar to let people know that it's available. And the

public comment...a forty-five day public comment period begins, including this public hearing where we are tonight. And after receiving public comment from tonight's meeting and from agencies through review of the draft, the final EIS is prepared. After the final EIS is published, a record of decision is prepared by the decision-making agency, which would be the EDA in this case.

This particular route here...I just wanted to discuss...Sometimes in particular cases after a record of decision is issued, there's a NEPA evaluation if necessary. And this is common step in like master plan type EIS' that address a more programmatic approach rather than one specific project or projects where timing is over an extended period. And if projects change substantially, often times NEPA has to re-evaluate it to see if any supplemental environmental impact statements or work would need to be...would need to be undertaken for the project.

The passage of time doesn't specifically require a supplemental EIS, but the counsel on environmental quality per CEQ regulations. They recommend that after a period. If a period of five years lapses from the record of decision to construction, five years or more, its recommended that its re-evaluated whether or not additional environmental work would need to be undertaken.

Okay. So, after having gone over the overall NEPA process... First thing that needs to be identified for these projects... A purpose and need needs to be established and in developing the purpose and need, which the Port Authority did in developing their master plan and so forth... The first thing they always look at is existing conditions and I'm just gonna run through the purpose and need,

starting with the existing conditions.

Apra Harbor is Guam's only commercial port has multi-maritime users; cargo, tourism, fisheries, and the military. I'm sure you're all familiar with the harbor and its users. The harbor has some constraints in its operations. It, the port averages approximately thirteen hundred port calls annually. Operations within the port are congested, or there hasn't been any increase in wharfage to the port facilities in the past thirty years. There is no deep water birthing facility that could accommodate newer generation of larger cargo vessels, which they term "post panamax vessels," because these vessels are to big to pass through the Panama Canal...Is that correct Dot? Ok.... There's also limited back land or container yard space within the harbor.

Cargo operations at Apra Harbor – Ninety five percent of all goods are imported to Guam, they arrive by sea. Cargo accounts for seventy percent of all the total port traffic, and just some numbers in terms of the tonnage... Well for the past twenty-five years, from 1980-2005 the annual volume went from approximately 670,000 tons to over two million tons. It is projected that win the next twenty-five years the cargo volume will be a three in a half million tons which translates to about an additional almost one in a half tons annually that the port authority needs to contend with.

So that established the purpose and need for the project, and in summary...just these bullets summarize that the cargo traffic will continue to increase as population and cargo producing markets develop. Wharf age and storage operational areas will need to increase to accommodate that growth and

there's a need for wharf facilities capable of birthing larger deep draft vessels with a draft of fifty-five feet that are already operating today and may even have larger vessels over the next twenty or so years.

So, having established a purpose and need in the EIS process alternatives need to be developed to address meeting that need, and the EIS went through a three tier alternative development process. And... go through the three tiers real quick...

Tier one was with the siding criteria, which included access to deep draft channels potential to develop a deep draft wharf availability or potential to develop approximately seventeen acres of backland; and the site's location proximity to Apra Harbor. The tier two focus more on operation criteria including navigational access, dredge and fill requirements, available are developable backlands, access to roadways, proximity to existing commercial port infrastructure and development constraints with regard to existing or future land uses. And, the third tier was not location or site specific but it focused more on design alternatives, design criteria, the feasibility of different design alternatives to meet operational requirements.

Through the three-tier criteria analysis – this is a summary – there were four locations advanced in tier one. Locations within Apra Harbor, there were three and then locations outside the harbor were considered. But, any location outside of the existing commercial port and harbor were both technically and economically just not feasible. So, three alternatives were advanced to the two-tier stage, and we'll go over these sites in the next

slide.

Slide one is the area we're talking about just south of the glass breakwater and Cabras Island, and site two is renovating or modifying the existing commercial wharf facilities at wharfs F4 thru F6, and then site three was the former Naval ship prepare facility. Going through to the third tier, only one alternative site. One was advanced and within that site, alternative designs were considered and these three designs were considered: A pier on pile design, a cellular sheet pile design, and a fixed pier design. And after this three-tier process, a selection of a preferred alternative was attained.

So, in this slide you will see some of the areas that were looked at into what could be developed. And this is site one, what we'll be talking about where the proposed project is to be. Site two is the commercial port existing facilities and the ship repair facilities down here, former naval ship repair facility. Site three was eliminated from further evaluation basically due to the -- that site-two criteria of land use constraints. The availability, the retention of it by the military and also access to infrastructure within a military installation for a public commercial port would be essentially land locked like that. So, it was eliminated from further consideration.

Modification, renovation of existing wharf structures was considered but to modify them would structurally -- would compromise the structural integrity of the existing piers and wharfs and also, the channel here is very narrow and not very deep. And it would take much more dredging to get the, this area to a fifty-five foot draft. So, this was eliminated from further consideration as well, and this

was the site that was looked at for developing alternative designs for the wharf.

This is just a quick summary of the alternatives evaluated overall. There were eight alternatives considered including the no action. Four alternatives were eliminated from further evaluation and four were carried forward. The no action, which assumes master plan improvements, would not occur. Alternative one which is the preferred alternative was the pier on pile design, alternative two was the alternate design of a cellular sheet pile design, and alternative three was a fixed pier design, which was a conceptual plan within site one but it has slightly alternate location which we'll get into. And you'll see that impacts of the proposed project and alternatives are generally similar.

So what I'd like to do now -- not in detail but...quickly go over the... each of the alternatives in an inch of time. You know, keep it brief...

So... starting with the no action alternative; its required by NEPA to address this, and under the no action alternative the proposed master plan improvements would not occur. The no action alternative really provides a baseline of existing conditions which to compare the impacts to. The preferred alternative is the pier on pile wharf design. It's a wharf consisting of a concrete deck on a pile foundation, and these are some requirements of it – about seven in a half acres of area, it will require about 83,000...83 in a half cubic yards of fill for the wharf and about a hundred and eighty in a half cubic yards of dredging. Again, this is not a dredge project per say, but to get the wharf phase depths to required fifty five foot depths, it would need some dredging to bring it to depth, and this is the approximate volume it would be dredged.

The land and the reclamation sites, the three man made abatements that will be filled, covering an area of approximately sixteen in a half acres and would require a total fill of about two hundred and eighty five thousand, seven hundred cubic yards of fill material.

This is the overall site plan of the preferred alternative and also there are some posters up on the wall that you could look at after the lights go back on if any body is interested. But we'll go through some figures here now.

The overall site plan – This is the deep draft wharf facility between hotel wharf and outhouse beach. The shaded area notes the area that would need to be dredged to get to the fifty-five feet depth, and these are the three fill areas: reclamation sites one, two, and three. This is an overview of the deep draft wharf facility – and all these figures are in the appendix A of the draft EIS by the way. This is a cross section of the preferred alternative design with the pilings and pier on top of it. And, this is just a drawing of a post panamax container vessel at birth showing the three gantry cranes that the wharf will be equipped with. And this is a cross section of what it would look like with the gantry crane servicing the post panamax vessel at birth. As I said, I mentioned earlier... it would require some dredging to get the wharf phase to the adequate depths and shaded area, is the area that would be dredged. And in the next slide you could see this is the area that will require dredging, this would be the west side of the wharf phase. This would be more towards the middle, and this would be the east end of the wharf phase, the area that would need to be dredged. It shows the proposed fill reclamation sites. Site one is the smallest, just over one acre and just over two

acres is reclamation site two, reclamation site three is the largest – just over thirteen acres extending from southwest point to seaplane ramp. I don't have a slide with the elevations, but they're in elevations for some of the dikes... are on a poster up on the board there, and they're also again in the figures and the appendices of the EIS.

Quickly...run through alternative two... So alternative design, sheet pile – cellular sheet pile design, it's a concrete deck on filled cellular sheet piles on foundation. Area requirements – almost eight acres filled was considerably more of three hundred and fifteen thousand cubic yards of fill will be required. This will also need to be dredged to fifty-five foot depth, approximately one hundred sixty thousand cubic yards will need to be dredged, and the land reclamation sites are the same as the preferred alternative in terms of area and cubic yards of fill that will be required. This is just what the preferred alt.... I mean the alternative two would look like. These are the cells and the dredge area at the wharf phase and this is a cross section of where alternative two cellular sheet pile design will look like and there's the top of the wharf and this entire area would need to be filled under this alternative as opposed to the pilings.

A third alternative was an alternative design; slightly different location within site one and it was a conceptual plan, and in the master plan it was a fixed pier design extending between golf pier and southwest point. This was a conceptual plan, there's no design work for it but it was considered and it was advanced forth in the analysis because it did meet the feasibility requirements for the three tier alternative analysis criteria. So, it was considered as a feasible alternative. There's a fixed pier design consisting of a continuous wharf and operational backland area, it will cover approximately forty acres. The fill again is estimated what would be close to nine hundred thousand cubic yards of fill that has to be required for this particular alternative.

This is the conceptual layout of how that alternative three would be laid out and the deep draft wharf phase would be some where over here.

Okay, so this table summarizes the alternative with the conception of the no action alternative, the three alternatives along the left margin here and then just basically summarizes their area, dredge and fill requirements and as I mentioned earlier you could see for the deep draft wharf on the preferred alternative – pier on pile design is about eighty three in a half thousand cubic yards of fill required to construct that, and alternative two with the cellular sheet pile require of three hundred and fifty thousand. There are other reasons but this is one of the reasons that the preferred alternative was the preferred alternative. Again, there are no set numbers on this alternative three per estimates, but close to nine hundred thousand cubic yards of fill will be required for a fixed pier design for alternative design.

So, once the alternatives were established and could be brought forward for environmental analysis... I'd like to go over the environmental analysis. Actually one thing I would like to quickly go over real quick that I didn't mention in this slide is... one of the things that benefit to the preferred alternative and its not beneficial impact per say but, with the pier on pile design – having the piers as opposed to filled cellular sheet piles – Having the piers would provide approximately like three in a half almost four acres of submerged habitat that eventually over time marine life could re-establish itself underneath those pilings, whereas under these alternatives they'll probably be lost from it and could never be re-established.

For the environmental analysis there were some technical studies that were undertaken; there was an acoustical study, air quality study, archeological and cultural surveys, biological and water quality studies, coastal engineering studies and traffic studies. All of these technical studies are included in the appendices of the traffic environmental impact statement.

So, I want to quickly go over the analysis approach and then go over the findings of the analysis of the EIS and I want to focus on the preferred alternative, cause we don't have time to go over every single alternative and every environmental attribute and impact.

So, for the analysis approach basically existing conditions were investigated and baselines were established, criteria were developed to determine significance of potential impacts and these impacts were identified and evaluated against the significance criteria, and then mitigation measures were developed, and actually still are being developed for potential impacts determine to be significant. The environmental analysis evaluated three environmental areas – and real quick, these are the attributes that are within the areas: the physical, biological, and social are manmade environments. EIS looked at all of these hydrology soils; water resources, water quality sediments, air quality noise, natural disaster hazardous materials. Biology looked at terrestrial animals and plants and marine biological resources, threatened species and invasive species, and in man made environment we looked at historical and cultural resources, public health and safety, traffic, land use and coastal zone management issues, recreational and aesthetic resources, infrastructure, social economics and environmental justice, and construction. So ... direct construction and the secondary, your operational accumulative impacts were addressed to how they impact to meet these environmental attributes ... each of these environmental attributes.

This slide just provides a quick overview of the draft EIS conclusions. So before I go into the impacts ... this is just a quick summary. So this is a summary of impacts for all of the alternatives, just to summarize. There were a total of forty-eight potential adverse impacts identified. Thirty-nine of which were less than significant, and under each alternative it tells you how many there were: three of them, no action -- twelve, twelve, and twelve under each of the three other alternatives. There were nine

significant impacts identified. The no action alternative usually has zero, none because its basically status quo – nothing happens. But, in parenthesis we do have a one because it was recognized that under the no action it would be status quo and conditions in the port will continue to become congested; traffic will be congested and there will be an increase chance of a potential accidents. And if that were to happen it could result in significant impacts to the marine biological environment – some kind of hazardous material or oil spill...

Preferred alternative identified two significant impacts, as did alternative two and alternative three actually have four significant impacts. This is a table that summarizes and compares the alternatives and the impacts for each environmental attribute, and as you can see we don't have time to go into every single one of these attributes and each alternative. The NI stands for no impact, and the LSM stands for less than significant impact, but still requiring mitigation, and SI stands for significant impacts. This is the gray significant impact, the parenthesis for the no action. Preferred alternative and alternative two are identical significant impacts for the same resource environmental attributes. Recreational resources would be significantly impacted under these two alternatives, as would marine biological resources. These colors are suppose to be the same, I don't know why they're not they're all different shades. But, I blame my laptop because I don't get good color on it. Alternative three had two additional significance impacts, and that was under land use and environmental justice. But, just for this presentation I'm gonna stick to the preferred alternative so that we could get to... you know discussing the EIS; any questions. So having said that, we're gonna look at the preferred alternative. The impact, the first significant impact was the recreational resources. The deep draft wharf, as you could see from the figures is situated between hotel wharf and outhouse beach; and the recreational scuba diving in this area could no longer occur in these near shore waters with the construction of this proposed deep draft

wharf, which is a significant impact. But, did want to mention that the dive sites within Apra Harbor would not be affected by the proposed project. In these next to slides, show the dive sites – the recreational dive sites within the harbor in relation to the area we're talking about in terms of where the deep draft wharf would be and these near shore waters here which would be no longer accessible to divers; these would not be affected. Nor will the sunken vessels within the harbor be affected for divers considering the location of the proposed deep draft wharf.

So, under the preferred alternative the significant impact to recreational resources – proposed mitigation measures would be for PAG to essentially work with the users, notify users and the public as much in advance as possible to construction activites, whenever that may be an work together with the users and stakeholders to identify issues and concerns and then consider the development of a study or a plan to address these issues and concerns and recommend suitable alternative dive sites. But, basically its gonna require like more of a collaborative effort between the user groups, the public and the port authority to develop acceptable mitigation measures for the impact to this resource. And, under the preferred alternative the second significant impact was to the marine biological resources; and going into this project this is the one that was really not a surprise to anybody. They knew that coral was gonna be lost. So, I'd like to discuss that now...

About twenty-eight, almost twenty-nine acres of coral reef and deep sand habitat would be lost under the preferred alternative, about twelve acres would be lost as a result of the deep draft wharf facility construction. About sixteen and one half acres would be lost due to the filling of the man made abatements. There are different impact sources to each habitat types and these sources were identified as the wharf construction dredge and fill activities, fill of the embayments, sediments resuspension, and operations of the new facilities and anchor lines, etc.

So, in this figure it basically shows the project area and it shows the benthic, benthic meaning the marine or the underwater habitat types that would be impacted by the project, that are within the project area. So, there's reef flat in this and it indicates the depths, reef crests, and then reef slope, and then the deep sand habitat – which is at the greatest depths between thirty-five to about one hundred feet. But this basically gives you a visualization of affected habitat types in the project area.

The habitats impacted – this table summarizes the impact source that I just discussed; abatement fill, wharf construction sediment impacts, and operational impacts. It shows these impact sources and how it affects the different project sites and the habitat sites, the areas impacted and then the impact duration. So, you could see all this information looks like an awful lot in this table and it is, but its all in section 3.12 of the draft environmental impact statement. The permanent impacts would be to these habitat types, as a result of these impacts or construction of the wharf and fill of the abatements. This would be the areas of each habitat sites that would be permanently lost. Sediment impacts from dredging and so forth – these are the areas that would be impacted and this is the approximate duration of the impact for the habitats can clinchly re-establish themselves. This is a visual of the table for the preferred alternatives of the benthic habitats that will be impacted by the project. You can see reef flat would be the habitat that is most impacted – about thirteen acres of reef flat would be lost compared to the less than five acres of each of the habitat types under the preferred alternative. Sediment suspension – sediment that is kicked up during construction and operations, these are the habitat types that would be impacted as a result of sediment suspension and reef suspension; again, reef flat over fifty acres much larger of an area relative to the other habitat types that would be impacted. The marine species that are present in these habitats are summarized in these tables – they're algaes four groups: algaes macro invertebrates, I'm not a marine biologist but micro invertebrates are like octopus,

things like that. Then there is reef fish, and then the coral colonies – these two columns are highlighted – reef crest habitat and reef slope are highlighted because relative to deep sand and reef flat, this is where the majority of the highest abundance of the species were, and the reef slope were the richest in species abundance adversity well almost one and a half thousand species in this particular habitat type. If you'll notice the reef flat only at sixty-five and this is the habitat type that would be the greatest, most greatly impacted by the project.

So, for these significant impacts to the marine biological resources, the proposed mitigation measures would be continued consultation under the fish and wildlife coordination act that is required to undergo this coordination, and it was already started. Fish and wildlife coordination act is where the Corps works together with the US Fish and Wildlife Service, National Marines Fishery Service, as well as local Guam agencies – which is Aquatic Wildlife and Resources to assess the impacts to a project and develop some kind of compensatory mitigation strategy or plan.

The result of this consultation is what they call 2B Report, and this is currently in the draft stage and it still needs to be finalized by the publication of the final EIS. So the Corps. is in the process of continuing this consultation with the appropriate agencies and from that, a development of compensatory mitigation plan should come about. This compensatory mitigation plan should address the development of mitigation measures should identify performance standards as well as develop a monitoring program. The EIS discusses some possible compensatory mitigation measures including coral transplantation as a possible mitigation measure, fish aggregation devices for best management practices which includes things like limiting construction or operations, or to times when coral is not spawning, again I'm not a marine biologist but, the biologist who work on this... it could include one or any of these or other mitigation measures that could be developed through this compensatory mitigation process.

So that was a summary of the significant impacts of the preferred alternative, and I would just like to go over briefly the cost and schedule... the latest numbers on the project – the construction cost total is around 83 million dollars, 51 of which would be for the deep draft wharf facility and the filling of the man made abatement about 31 million.

The draft EIS has different numbers than this because we just got these numbers today. I think the draft EIS has a total of I think 67 million dollars for the project cost and but that'll be updated to the most – the latest cost estimates of 83 million.

The construction schedule for this project is a tricky one. The construction duration, have a handle on that would probably take two to four years to complete all the project components an d that could be phased as to when and what could occur first. But the actual construction and start dates time at this time is unknown, mainly due to funding uncertainties. The draft EIS estimated – I've used the time frame of 2021 to 2025, we've discussed it and wanted to keep the time frame consistent with some of the planning documents, in particular the traffic management plan that extended out to 2020, 2025 for Guam. When doing our traffic analysis, we really needed to have some type of a time frame for a traffic engineer to assess the impacts over time. So, again this is kind of a question mark and this is why I also went over ... If you remember that NEPA diagram, I went over the NEPA re-evaluation if necessary... again, since funding is uncertain, it may be a possibility that supplemental EIS work and environmental work will be required. If it occurs in the next five years, maybe not... but anything over five years – it will be re assessed whether or not additional work or environmental studies would need to be done. Should additional or supplemental environmental studies be undertaken, it would be teetered off of this draft EIS; cause they've been trying to eliminate the amount of paper that you could produce, so basically would use this as a foundation – this EIS a foundation and address more specific environmental issues, whatever ten years down the road, we'll do that.

This is just a quick flow chart of the EIS project in process with some dates to give you an idea of where we are at. Like I said, the notice of intent was published more than two years ago and we and we had a public scoping meeting as well in the same room to get public input that occurred between February and March '05. The draft EIS was published just this month in '07 and the forty-five day comment period started August 10th, the notice of availability was published in the August 10th Federal register, and the comment period will end September 30th. Actually the forty-five day with the extent is September 24th, but it was decided just to give everybody an extra week to get the comments in, because the more comments the better the process and the analysis.

This is where we are at today, the public hearing, which is required as Jim said under NEPA to have this address the EIS. These dates, in discussion with the Corps, are estimates because as I've said, consultations are ongoing with other regulatory agencies that are required. The port has initiated the consultation process but obviously cannot speak for scheduling or timing for other agencies, which include federal and territorial agencies. So, it was just estimated that end '07 around November / December perhaps the final EIS could be completed and published, and after the final EIS is published there is a 30 day review period which would give the public additional opportunity to provide comments. You do have another opportunity to provide comments after this meeting, that is estimated to be sometime in January '08. Again, based upon the schedule the record of decision could be as obvious as February '08. Again, these are not set in stone. So with regards to submitting comments and public participation in the draft EIS process, you can submit comments on the draft EIS by using the... there's a comment sheet provided at the front, anybody can take one just fill it in. It even has Jim's preprinted address on the other side you could fold it up, tape it and put a stamp on it or you could mail your written comments to James Hatishima at the Army Corp in Honolulu or you could email Jim or you could fax him. Just as long as

you submit your comments in writing by September 30th that's the end of the public comment. So with that, I would like to say thanks for listening if you have questions or answers, I'll try to answer them as best as we can. Thank you very much.

PRESENTATION CLOSING BY: TARA PEREZ-STEFFY

TARA PEREZ-STEFFY:

So that would end our... the presentation portion of our meeting this evening and we would like to move into the public comment period of the meeting. I said earlier, but I believe I said that before a few members of the public joined us tonight – that we are recording tonight's meeting to be transcribed in the EIS, and if you do have a comment its being recorded here in this recorder – if you do have a comment, if you could come up here that would be best of course but I don't want to discourage you from actually submitting a comment if you don't want to do that, that's fine. If you want to do it from where you are seated that's fine but speak as loudly and as clearly as possible and also so that we get your name and any organization or company or business or agency that you're representing and if you could state that also clearly for the record. We forgot to mention, I don't know if anybody needs the restrooms they're outside of the door back there, actually directly across from the entrance to the room here. If you could keep your comments of course related and on topic to the action to this draft EIS we'd appreciate that, and also if you could keep them to a minimum, I mean maximum of 5 minutes we'd also appreciate that. So having said that... is there anybody that would like to make a comment

for the record this evening just raise your hand, and we can take your comment. Anybody? Ok.

COMMENT BY: JIM BRANT

JIM BRANT:

Hi my name is Jim Brant, I'm the director of training for Micronesian Divers association whose primary industry is you know the recreational, you know scuba which from the presentation we saw is one of the areas that has a significant impact as far as...You know the scope of the work that's happening here. You know the... and I wouldn't say that I'm a spokesman for the recreational dive industry but I have been involved in that industry here for the last 30 years.

One of the things that I mean, obviously progress is gonna happen whether I want it to happen or not – I mean I'm in full agreement of that alright, but I mean obviously I have... or you know the scuba industry has their own interest as well... One of the things that has happened over a period of time is systematically because of progress, we have lost safe places to conduct recreational training activities alright and regardless of what happens is that's not gonna stop and you know people are still gonna go in the water, but they're gonna have fewer desirable places to do so alright. Then what's gonna happen eventually and what does happen is people maybe make poor choices because the show's gotta go on. Someone's gonna get hurt and someone does get hurt and people are gonna say, "well gee we need to do something." Well if you sit back and look at it what has been done and we have been doing it for over the

last twenty years is systematically taking away the places that work. You know and I appreciate the concern of the environmental impact study, you know statement as finding an alternative site but you can't just pick any site alright. You know Apra Harbor is an area where there... it is a relatively protected body of water. But there are times when the north side of Apra Harbor is protected but the south side is not alright and so if you just moved to a different spot, it may not work as far as... because it depends on the exposure. One of the nice things is that outhouse beach and along the inside of the glass break water has is that it protects us from the prevailing trade winds, which blow basically half the year, alright. So you can find a very calm spot but if you look over the outside of the breakwater, you know its very rough and pounding. If you go to the south side of Apra Harbor, which is basically on the navy side alright, which is not an not an option for anybody who does not have base access or privileges, you know it starts, and the wind blows in and it gets heavy there. So even folks that.... From the military will move over to that side because that's a preferred way for it to happen. Alright... So basically what we would like to see, what I would like to see is enough thought goes in that we do not lose another spot and that it works and then I realize that tourism is a very big thing here alright, and you know I appreciate that but I'm not even speaking from the tourist end of it. I'm talking about the local and military folks and the people that call Guam their home alright, you know that need a place to have... you know that we can have you know safe training locations. Obviously if we have that, it will benefit the tourist too. Because I'm not saying you know like to just make accessible to us.

Presently outhouse beach is shared by you know, both tourist and the local diving community so, we need to have a place like that where you can have safe training with that kind of exposure you know, be protected. So, if that's being considered and we can work that out, I think that that would be definitely a benefit. I mean from a very greedy point of view, I hope it never happens you know, but I expect it will happen. So, if it could be done where you know all interest you know especially a significant impact ones could happen I think that would be great. So... that's my comments thank you very much.

RICHARD STOOK:

You know, Thanks for the comment, and you know again we'll speak to Dot about that. She had been mentioning that the Recreational Water Use Management Plan needs to be updated and so forth. Thank You for saying we need a collaborative effort and public and stakeholder inpout. So thanks for the comment.

I just want to ask, how many members of the public came in after the presentation started? The only reason I ask is, I know it's a small turnout but I have... I brought some extra copies of the draft EIS on disk, and just members of the public – if anybody didn't get a copy of the EIS just want to give it to them..... is there anybody else? There are two more, I'll leave them on the front and if there are left over feel free to grab one, just an electronic version of the draft EIS.

TARA PEREZ-STEFFY:

Is there anybody else here tonight that would like to make a comment? No? Okay. Well as Richard said in his presentation, the last slide – and I just want to reiterate just to remind everyone, tonight of course you had the opportunity to make a comment but it wasn't your last opportunity, you will have future opportunities. But, before September 30th you can either submit a comment on the written comment form that's located on the table in the back and place your comment on the lines designated and place a stamp on it, seal it and mail it or you can fax them to Mr. James Hatishima, Project Manager from the Army Corps of Engineers or email them or mail them directly in a form of your choice and all of his information, his contact information is included in the fact sheet that's provided at the table up by the entrance on the bottom right hand corner under where to submit comments. Just as a reminder again that your comments for this portion of the draft EIS are due no later including post mark, no later than September 30th of 2007. So that's a little bit longer than just a month from now. Ok? And that will be the end of the 45 day comment period for the draft EIS. So with that, if there are no further comments for this evening we want to thank you for taking the time out of your evening to join us, we thank you for your interest in the project and also... please indicate – if you didn't sign in, sign in on the sheet at the back and indicate there if you would like to be given a copy of the final EIS if you didn't already do that. Ok. So thank you again for your attendance.

APPENDIX O

Draft EIS Comments

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Pacific Southwest Region
1111 Jackson Street, Suite 520
Oakland, California 94607

IN REPLY REFER TO:
ER# 07/714

Sent via First Class mail

5 October 2007

James Hatashima
U.S. Army Corps of Engineers
Honolulu District
1018 Palm Drive
Honolulu, HI 96814

Subject: Review of the Draft Environmental Impact Statement (DEIS), for the Apra Harbor Master Plan for Deep Wharf and Fill Improvements, Implementation, Guam.

Dear Mr. Hatashima:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) for the Master Plan for Deep-draft Wharf and Fill Improvements at Apra Harbor, Guam.

The following comments are provided in accordance with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 *et seq.*; 83 Stat. 852] (NEPA); and other authorities mandating Federal oversight of environmental resources including the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended (FWCA); the Federal Clean Water Act [33 U.S.C. 1251 *et seq.*; 62 stat. 1155], as amended (CWA); and the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat. 884], as amended (ESA).

The proposed action would upgrade the civilian commercial port of the Territory of Guam by constructing a 1,500 linear foot deep-draft wharf and reclaiming 17 acres in three shallow, coral reef embayments for use as additional cargo container storage area. These harbor improvements would accommodate Post-Panamax cargo vessels, cruise ships, and also provide contingency berthing facilities for U.S. Navy military vessels, including Nimitz Class aircraft carriers.

While the DEIS has included a detailed impacts analysis and a commitment to scale compensatory mitigation to replace projected resource loses via a Habitat Equivalency Analysis (HEA), it falls short of being a comprehensive and adequate decision-making document.

Four significant issues remain unresolved, including: 1) the lack of viable compensatory mitigation measures; 2) the lack of an adequate CWA Section 404(b)(1) analysis for the disposal of dredge and fill material; 3) the proposed non-water dependent filling of two nesting beaches for federally protected sea turtles; and 4) the extremely distant timeline for project implementation. In addition to the general comments provided below, we have enclosed specific comments on the DEIS in Appendix 1 to this letter.

The DEIS does not appear to meet Army Corps of Engineers requirements for a 404(b) (1) analysis[1]. Coral reefs are considered a type of special aquatic site and proposed actions that will result in dredging or filling such sites are required to be "water dependent" in order for the proposed action to occur.

For proposed actions that are not inherently water dependent, "...practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise."[2] Additionally, "...all practicable alternatives to the proposed discharge, which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise."[3]

We believe that the filling of over 16 acres of coral reef habitat for the installation of backland container yards does not meet the necessary "water dependent" requirement and that practicable alternatives with lower associated environmental impacts have not been fully investigated in the DEIS. Alternatives that considered use of container storage areas outside of Apra Harbor appear to have been removed from the analysis solely because of their distance to the proposed wharf, while the use of non-water dependent backland cargo container storage areas remained part of the analysis.

Additionally, failure to fully consider 404(b)(1) guidelines in this planning document, and instead delay consideration of these requirements until application of a CWA Section 404 permit, will produce a planning document that does not fully disclose the necessary information with which to make sound environmental decisions.[4] We believe that without a valid 404(b) (1) analysis of alternatives, this DEIS cannot be finalized. We recommend that an appropriate 404(b)(1) analysis be conducted, and, as appropriate, all viable alternatives to reclaiming over 16 acres of coral reef for backland cargo container storage be rigorously analyzed in the DEIS.

The proposed harbor improvements will cause the permanent loss of over 24 acres of coral reef and result in adverse impacts to additional acreage as result of construction-related and future operational activities. Two compensatory mitigation projects have been proposed in the DEIS: Fish Aggregation Devices (FADs) and coral transplantations. Neither proposed mitigative action has been scaled using Habitat Equivalency Analysis (HEA), and it is our position that neither are viable projects that will compensate for the potential permanent loss of the coral reef ecological functions that will result from the proposed harbor improvements.

[1] CFR 40 Part 230 Section 404(b) (1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Available online at http://www.usace.army.mil/cw/cecwo/reg/40cfr230.pdf.
[2] CFR 40 Part 230 Section 404(b) (1). Section 230.10(a)(3)
[3] CFR 40 Part 230 Section 404(b) (1). Section 230.10(a)(3)
[4] CFR 40 Part 230 Section 404(b) (1). Section 230.10 (a) (4) states that a 404(b) analysis of alternative must be included in NEPA documentation, either the Final EIS or a Supplemental EIS.

FADs are primarily fishery management tools and their value in coral reef restoration is questionable, primarily because they aggregate existing pelagic fish stocks, rather than enhance overall production. The ecological services anticipated to be lost extend beyond those that can be replaced by FADs, and whatever value they may have cannot be scaled to compensate for coral reef losses.

Additionally, evidence exists that FADs may contribute to the over-fishing of some species[5] and may result in the long-term loss of ecological function. Coral transplantation has had mixed success, particularly in the Pacific[6], often resulting in poor transplant survival and little ecological benefit.

Additionally, transplantation of coral to already impacted reefs will do little to improve reef health without concurrent reductions of relevant existing ecological stressors and, therefore, is expected to do little to offset losses. In a review of compensatory mitigation projects on Caribbean coral reefs, coral transplantation and mooring buoys were specifically identified as inappropriate and inadequate for mitigating permanent dredging impacts to coral reefs[7].

We acknowledge that efforts to transplant corals that will otherwise be lost has value, but it cannot be scaled appropriately, and, therefore, will not replace lost the ecological functions and serve as valid compensatory mitigation. We support National Research Council (NRC) guidelines[8] that recommend a watershed approach be used when developing and implementing mitigative actions.

A viable mitigation plan should be developed with the direct input of Federal and territorial resource agencies and it should be included in the Final EIS and Record of Decision. The PIFWO has worked with other Federal and Territorial agencies to develop mitigation plans for a similar project in Apra Harbor, and they can provide valuable input into development of appropriate mitigative actions for the proposed project. Pacific Islands FWO's continued early involvement in the planning process is critical to ensure that mitigative actions are initiated either before or, at latest, concurrent with the start of the proposed project, as recommended by the NRC[9] and required as a condition of issuance of a CWA Section 404 permit.

While the Fish and Wildlife Service shares jurisdiction with National Marine Fisheries Service (NMFS) over federally threatened green (*Chelonia mydas*) and endangered hawksbill (*Eretmochelys imbricata*) sea turtles, we have sole jurisdiction over these species when they are on shore. Green sea turtles have experienced severe population depletion due to nesting habitat

[5]Don Bromhead, D., J. Foster, R. Attard, J. Findlay, J. Kalish. 2003. A Review of the impact of fish aggregating devices (FADs) on tuna fisheries. Final Report to Fisheries Resources Research Fund, Dept. of Agriculture, Fisheries & Forestry, Canberra, Australia. 121 pp. Available online at: http://affashop.gov.au/product.asp?prodid=12777.

[6]Bentivoglio, A. 2003. Final Report: Compensatory Mitigation for Coral Reef Impacts in the Pacific Islands. Pacific Islands Fish and Wildlife Office. 36 pp. Available online at: http://www.fws.gov/pacificislands/worg/pcrmreport.pdf.

[7]U.S. Fish and Wildlife Service. 2004. Final Report: Investigation sof Mitigation for Coral Reef Impacts in the U.S. Atlantic: South Florida and the Caribbean. USFWS Southeast Regional Office. 97 pp. Available online at: http://www.coralreef.gov/library/pdf/Atl%20write-up.pdf.

[8]National Resource Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. National Academy Press, 2101 Constitution Ave., NW, Box 285, Washington, D.C. 267 pp.

[9]National Resource Council, *op. cit.*

destruction[10] and over-exploitation of eggs and individuals for food, oil and other products[11]. In particular, human development has had an increasingly serious impact on green sea turtle nesting beaches.

Based on information from the Guam Division of Aquatic and Wildlife Resources, sea turtles are commonly observed in the project area, and are known to nest within the proposed project site in at least two different locations. The DEIS does not contain information on the most recently documented nesting location, and we recommend that this information be included. Both of these documented turtle nesting beaches would be destroyed by the proposed action.

Additionally, we find the determination of no adverse impact to this species to be unsupported. The status of turtle nesting on Guam is currently unclear, but may be improving slightly; however, data at this time are uncertain due to recent changes in survey methodologies.

Regardless, the proposed action will have adverse effects on known green sea turtle nesting locations. Therefore, we recommend contacting our office regarding initiation of section 7 consultation.

According to the DEIS, proposed project construction is not anticipated to begin until 2021 or later. Environmental documents are generally considered to be accurate for approximately five years after they have been written. Therefore, this DEIS appears to be extremely premature.

Nevertheless, if a Final EIS and Record of Decision for the proposed action are to be prepared, the mitigation recommendations of a Final FWCA Report from the Department should be incorporated into the analyses and decisions included in those documents. If project construction will not be initiated until 2021, a new or supplemental EIS, including a new or supplemental FWCA Report from the Department, will be required prior to the start of any work.

Additionally, there are specific comments in the following Appendix 1.

[10]Amerson, A.B. 1971. The natural history of French Frigate Shoals, Northwestern Hawaiian Islands. Atoll Res. Bull. 150: 1-120.

[11]Balazs, G.H. and M. Chaloupka. 2004. Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. Biol. Conserv. 117: 491-498.

APPENDIX I
Specific Comments on the DEIS for the Master Plan for Deep-draft Wharf and Fill Improvements at Apra Harbor, Guam

Section 3.6.4 Environmental Consequences (page 97). We commend the plan to shield lights to reduce unnecessary light pollution. In addition to having impacts on nearby communities, night time lighting can adversely affect sea turtles and birds protected under the Migratory Bird Treaty Act, which have not been considered in the DEIS. We recommend that lights be shielded to reduce impacts to these species. If assistance with developing appropriate light shielding specifications is needed, we encourage you to contact our office for assistance.

Section 3.6.4 Proposed and Potential Mitigation Measures (page 99). Outhouse Beach is an important location used for introductory level SCUBA diving instruction. The Pacific Association of Dive Industry estimates that over 5,000 entry level certifications were issued in Guam in 2004[12], and it has long been recognized that Guam has few coral sites appropriate to conducting this type of activity. The displacement of divers into other locations will result in increased adverse impacts at those locations. The DEIS needs to better examine the potential indirect impacts to coral reefs resulting from the displacement of introductory levels divers into other locations. We recommend that the DEIS include an estimate of the number of divers displaced by the proposed action and include a discussion of appropriate alternate sites to which these divers may move. Using the available literature on SCUBA diver-related damage, we also recommend that the DEIS assess the potential impact of these displaced divers on these alternate locations and include this impact in the HEA and compensatory mitigation plan.

Section 3.6.4 Proposed and Potential Mitigation Measures (page 99). Tumon Bay has been proposed as an alternative to Outhouse Beach as a potential substitute diving location. Tumon Bay is a Territorial Marine Protected Area (MPS), and, while diving is a permitted action, commercial operations may be required to obtain a permit to operate and conduct introductory-level training courses (see Guam Public Law 27-87). Additionally, increasing numbers of divers will increase the damage to Tumon Bay's coral reefs, a result that is inconsistent with the MPA. We recommend that Tumon Bay be removed as an example of an alternative site at which to conduct introductory SCUBA diving training.

Section 3.11.4 Environmental Consequences (page 131). It is unclear why the effects of typhoon on contaminated sediments would only occur under the No Action alternative. The proposed dredging operations will not remove all contaminated sediments from Apra Harbor or deepen all parts of the harbor. Typhoon generated waves would still have the potential to stir harbor sediments in all proposed alternatives. If this impact is truly associated with only the No Action alternative, we recommend that the discussion of this potential impact be clarified. Otherwise, we recommend that the proposed impact be discussed for all alternatives.

Section 3.11.4.2 Construction Impacts (page 135). We commend the inclusion of the sediment modeling in the DEIS. We are concerned, however, that the analysis treats the environmental impact from different sediment size classes as equal. Fine sediments present a greater risk to

[12]Porter, V., T. Leberer, M. Gawel, J. Guiterrez, D. Burdick, V. Torres, and E. Lujan. 2005. The state of coral ecosystems of Guam. In *Status of Coral Reef Ecosystems of the United States and the Pacific Freely Associated States 2005* (J. Waddell, ed.). NOAA Technical Memorandum NOS NCCOS 11. NOA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Springs, MD. Pp. 442-87.

coral reef organisms than coarser sediments and can have adverse impacts at concentrations as low as 4-5 mg/cm^2 in as short as 1 hour of exposure[13]. The sediment threshold used for the impact assessment (37 mg/cm^2) was derived from general sediment studies and may not be best value to assess impacts from the fine, nutrient rich sediments of Apra Harbor. We recommend that this threshold for sediment impacts either be lowered to or include a secondary impact threshold of 5 mg/cm^2 when assessing the potential impacts expected to result from the proposed dredging operations.

Section 3.11.4.3 Operational Related Impacts (page 137). The DEIS discusses sediment impacts associated with the maneuvering of Post-Panamax vessels. It is unclear if this chronic impact to adjacent reefs has been considered in the impact assessment or for proposed compensatory mitigation. This impact will occur as a result of the proposed project and must be included in the compensatory mitigation plan. We recommend the DEIS consider chronic sediment suspension resulting from vessel maneuvering by estimated the spatial and temporal boundaries and the resulting environmental damage of this potential impact.

Section 3.11.5 Proposed and Potential Mitigation Measures (page 139). We commend the inclusion of the Best Management Practices (BMPs). While stated elsewhere in the DEIS, the provision to halt dredging 10 days pre- and post-coral spawning is not included in list of BMPs. We recommend that this BMP be provided to make this list comprehensive.

Section 3.12.2 Terrestrial Environment (page 150). Sasa Bay Wetlands are a Territorial MPA. We recommend the DEIS be changed to reflect the protected status of the Sasa Bay wetlands.

Section 3.12.3.1 General (page 153) and Appendix A. The color key for water depths in Figure 3-11 appears to be incorrect. We recommend that Figure 3-11 be reviewed and corrected if necessary.

Section 3.12.3.2 Coral Reefs (page 162 through 163). While it is doubtful that the conclusions will change, the comparison of species numbers between the different reef zones should be conducted using mean species per site and not total species observed in each zone. The number of transects surveyed in the reef flat was lower than in other coral reef zones. With the reduced survey effort, a lower total number of colonies and species observed would be expected. We recommend that comparisons of colony numbers and species observed be conducted using standardized values.

Section 3.12.3.1 General (page 154 through 168). Deep sand was not surveyed as part of the Fish and Wildlife Coordination Act Report. Including this reef zone in Table 3-21 through 3-25 creates the impression that no species are present in this zone and is misleading. We recommend that the column for "Deep Sand" be removed from Tables 3-21 through 3-25.

Section 3.12.3.1. General (pages 163 and 169). Tables 3-24 and 3-26 contain erroneous total values for number of species. Many species occur at multiple sites and this value is not additive within the table (e.g., Table 3-23 shows only 24 coral species, but Table 3-24 shows 104 total species). We recommend that the total values for the number of species be corrected in both tables.

[13]Fabricius, K. E. and E. Wolanski. 2000. Rapid smothering of coral reef organisms by muddy marine snow. *Estuar. Coast. Shelf Sci.* 50: 115-20.

Section 3.12.3.3 Reef Fish (page 171). The snail *Nerita polita* is an algal grazer[14]. We recommend that Table 3-28 be corrected and that appropriate changes be made to the discussion of diets.

Section 3.12.3.3 Reef Fish (page 171). The DEIS accurately points out that comparisons between fish landings at the two DAWR sites may be misleading. Without having data on fisherman effort and catch per unit effort (CPUE), it is difficult to get an accurate picture of the fisheries at the two sites. If the data is available, we recommend including estimates of fisherman effort and CPUE in the DEIS.

Section 3.12.6.3 Potential Compensatory Mitigation (page 188). We support the implementation of BMPs to reduce the potential impacts to federal trust species as a result of the proposed action. The suspension of dredging activities around the summer coral spawning events is commended. However, in Guam corals spawn during the months of June, July and August[15], and we recommend that dredging operations be curtailed during all three months.

Section 3.13.2 Affected Environment (page 192). The text description of the location of the sea turtle nest within the project area does not agree with the location on Figure 3-18. Additionally, a second turtle nest was documented by DAWR in the summer of 2007. We recommend that both the text and the figure be corrected to reflect the actual location of both documented sea turtle nests.

Section 3.15 Noise (page 210 through 221). It is relevant to include a discussion of underwater noise in the DEIS. The dredging and increased shipping activity that will result from the proposed project will alter the underwater sonic landscape of Apra Harbor, potentially impacting marine life and people. Apra Harbor is a popular recreational location, especially for divers and increases in underwater noise may adversely impact this industry. Underwater noise may also adversely impact threatened or endangered sea turtles and other trust species. We recommend that an analysis of underwater noise be included in the DEIS.

If you have questions regarding any of the above comments please contact PIFWO Fish and Wildlife Biologist Dwayne Minton at 808-792-9445.

Section 3.11.2.1, Coastal Waters, Table 3.18, Summary of Selected Guam Water Quality Standards and Measured Parameters in Apra Harbor, and Table 3-19, Water Quality Characteristics for Apra Harbor, (pages 128-129). There seems to be a discrepancy between the reporting units for several parameters in the two tables, which may create some confusion for the public when attempting to compare measured constituent concentrations with applicable water-quality standards.

For example, Table 3-18 presents the dissolved oxygen (DO) standard as a percent of saturation; whereas, the values listed Table 3-19 for DO appear to be reported as mg/L even though the column heading indicates percent of saturation. Similarly, Table 3-18 presents the standards for nitrate plus nitrite in mg/L, but Table 3-19 presents the measured data for this parameter in ug/L. Consistent reporting of constituent values would improve the analysis.

[14]Kay, E.A. 1979. Hawaii Marine Shells. Reef and Shore Fauna of Hawaii, Section 4: Mollusca. Bishop Museum Press, Honolulu HI. 653 pp.
[15]Richmond, R. H. and C. L. Hunter. 1990. Reproduction and recruitment of corals: comparisons among the Caribbean, the tropical Pacific and the Red Sea. *Mar. Ecol. Prog. Ser.* 60: 185-203.

If you have any questions concerning the above specific comment to Section 3.11.2.1, please contact Lloyd Woosley, Chief of the USGS Environmental Affairs Program, at (703) 648-5028 or at lwoosley@usgs.gov.

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port

Patricia Sanderson Port
Regional Environmental Officer

cc:
Director, OEPC
FWS, CNO
Chief, USGS EAP

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 - Fax: (808) 973-2941

OCT 15 2007

Mr. James Hatashima
US Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, HI 96858

Dear Mr. Hatashima:

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service Pacific Islands Regional Office (NMFS) has reviewed the draft Environmental Impact Statement (DEIS) for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor, Piti, Guam, which describes a project proposed by Port Authority of Guam (PAG) for modifications to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. The Proposed Action consists of a master plan to design for two commercial harbor improvement projects. The projects include: 1) the construction of a new 1,500 linear foot deep-draft wharf along a man-made breakwater and 2) the fill of approximately 17 acres of reclaimed land in three shallow man-made embayments within Apra Harbor. The proposed project would provide additional cargo container storage area, and berthing facilities capable of accommodating the newest generation of large deep-draft container vessels and cruise ships. The proposed wharf improvements would also provide contingency berthing facilities for U.S. Navy military vessels, including Nimitz Class aircraft carriers.

An estimated 102.9 acres of marine habitat including reef flat, reef crest, reef slope and deep sand, would be impacted as a result of sediment suspension and resuspension during construction activities. In addition, approximately 20.58 acres would be impacted as a result of sediment deposition, and 3.3 acres are anticipated to be impacted due to temporary placement of anchors and mooring lines for dredges and other equipment. Of the total 102.9 acres of marine habitat that would be adversely impacted, 22.33 acres consists of coral reef habitat that would be permanently lost as a result of the Proposed Project.

The DEIS acknowledges that this area contains not only high live coral coverage, but also high fish diversity and biomass. Therefore, the permanent loss of this coral reef habitat constitutes a significant impact to the biological resources of the area. The document also acknowledges the need for an essential fish habitat consultation with NMFS and the development of an adequate compensatory mitigation plan with NMFS and the other pertinent resource agencies. We feel that

the document does an adequate job describing the potential project impacts and methods to minimize and compensate for those impacts. However, we believe it could be improved by the incorporation of the following comments and recommendations.

NMFS Habitat Conservation Division offers comments in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), (16 U.S.C. § 1855(b)(2)), Coral Reef Executive Order 13089, the Fish and Wildlife Coordination Act of 1934 and the National Environmental Policy Act. Since this project involves essential fish habitat (EFH), the process is guided by the requirements of our EFH regulations (50 C.F.R. §§ 600.905 - 930), which mandate the preparation of EFH Assessments and generally outline each agency's obligations in this consultation procedure. Although comments under the Endangered Species Act are mentioned briefly, a decision on the need for consultation will be made by our Protected Resources Division.

Magnuson-Stevens Fishery Conservation and Management Act

Background. Pursuant to the MSA, the Secretary of Commerce, through NMFS, is responsible for the conservation and management of fishery resources found off the coasts of the United States. *See* 16 U.S.C. 1801 *et seq.* Section 1855(b)(2) of the MSA requires federal agencies to consult with NMFS, with respect to "any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act." The statute defines EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity." 16 U.S.C. 1802(10). Adverse effects on EFH are defined further as "any impact that reduces the quality and/or quantity of EFH," and may include "site-specific or habitat-wide impacts, including individual, cumulative or synergistic consequences of actions." 50 C.F.R. § 600.810(a). The consultation process allows NMFS to make a determination of the project's effects on EFH and provide Conservation Recommendations to the lead agency on actions that would adversely affect such habitat. *See* 16 U.S.C. 1855(b)(4)(A).

Essential Fish Habitat
The proposed project site is located in an area that has been identified as essential fish habitat under the following Western Pacific Regional Fishery Management Council Fishery Management Plans (FMPs): Pelagics (eggs and larvae), Bottomfish (eggs and larvae), Crustaceans (eggs, larvae, juveniles, and adults), and Coral Reef Ecosystem (eggs, larvae, juveniles and adults. Outer Apra Harbor has also been designated as a habitat area of particular concern under the FMP for Coral Reef Ecosystem of the Western Pacific Region. The DEIS states that "potential impacts to EFH would be addressed through consultation and coordination with NMFS". We will defer our final EFH comments in the form of conservation recommendations once an EFH assessment is received, but would suggest that the conservation recommendations be included in the final EIS.

Impact Analysis and Mitigation

The DEIS states that the proposed harbor improvements will impact over 28 acres of coral reef habitat and create additional impacts from construction and operation activities. Federal mandates require compensatory mitigation to replace the lost ecological function of these resources. The DEIS proposes two mitigation options: Fish Aggregation Devices (FADs) and

coral transplantation. NMFS believes that these types of projects may be inadequate to sufficiently replace the proposed permanent loss of coral reef ecological functions resulting from the proposed harbor improvements.

The mitigation should be designed to replace the lost ecological function of the reef resources impacted by this action. FADs are fishery management tool used to aggregate pelagic fish to improve harvesting efficiency; they do not increase fish stocks. Examination of this tool in the Pacific has revealed that FADs may contribute to the overfishing of some species and may actually lead to a decrease in overall ecological function. While the use of pillags recommended in the preferred alternative will allow the area to be used by fish and other species, it will not have the same functions as the community that the project proposes to remove.

Coral transplantation in the Pacific has met with limited success. Projects have resulted in poor transplant survival and little ecological benefit. The USFWS has specifically identified coral transplantation and mooring buoys as inappropriate and inadequate for mitigating permanent dredging impacts to coral reefs, based on a review of compensatory mitigation projects on Caribbean coral reefs. We recommend that the PAG work with the Federal and territorial resource agencies, including NMFS, to develop a viable mitigation plan to be included in the Final EIS and Record of Decision.

One of the major impacts to coral resources associated with this project is the creation of the three Land Reclamation Sites. This will create a significant impact to coral resources and greatly restrict public access to remaining resources. However, the DEIS clearly states that: "At the present time PAG does not have specific development plans for the three reclamation sites...." The DEIS also lacks any discussion of non-fill alternatives for the reclamation areas. This does not appear to justify the need for the reclamation as specified in the Army Corps of Engineers guidelines for a 404(b)(1) analysis. We recommend that the DEIS be edited to include a 404(b)(1) analysis and the assessment of alternatives that do not involve the reclamation of over 16 acres of special aquatic sites.

Protected Resources

The reclamation may also remove foraging habitat for both the threatened Green Sea Turtle (*Chelonia mydas*) and the endangered Hawksbill Sea Turtle (*Eretmochelys imbricata*). The Guam Division of Aquatic and Wildlife Resources has documented turtles at these sites on a regular basis during aerial surveys and documented two nesting beaches within the project area. As noted in the DEIS, the reclamation sites will fill in access to a documented green sea turtle nesting site.

Finally, the DEIS appears to be premature. The document states that the project is anticipated to begin no sooner than 2021. As the environment can change greatly in a short time, environmental documents are generally only accurate for approximately five years. If project construction will not be initiated until 2021, a new or supplemental EIS will be required, and updated EFH and Section 7 consultations may also be necessary.

We appreciate the opportunity to comment on this project and look forward to working with the PAG and Corps of Engineers to allow for the needed improvements to Outer Apra Harbor while affording the maximum amount of protection to NMFS trust resources

Sincerely,

William L Robinson

William L. Robinson
Regional Administrator

Enclosure: NMFS Specific Comments on Apra Deep Draft Harbor DEIS

cc: Western Pacific Fishery Management Council, 1164 Bishop Street, Suite 1400, Honolulu, HI 96813
U.S. Fish and Wildlife Service, Environmental Services, P.O. Box 50088, Honolulu, HI 96850
Guam Environmental Protection Agency, P.O. Box 22439 GMF, Barrigada, Guam 96921
Guam Division of Aquatic and Wildlife Resources, Department of Agriculture, 192 Dairy Road, Mangilao, Guam 96923
Guam Bureau of Planning, Coastal Management Program, P.O. Box 2950, Hagatna, Guam 96932
Cristi Reid, NOAA Office of Program Planning and Integration ,1315 East-West Highway, SSMC III, Room 15727, Silver Spring, MD 20910

NMFS Specific Comments on Apra Deep Draft Harbor DEIS

Section 3.2.4.1 Fishing: This section does not adequately address the loss of the nearshore areas along the breakwater for recreational fishing. These areas are frequently used by recreational fishermen and although the final use of the reclamation sites is not clear, access to these areas is likely to be limited during construction and after completion due to port operations and security based on current port operations. The harvestable resources will also be limited by the removal of the reef resources during construction.

Section 3.2.4.1 (p. 61) Public Services: The Sea Plane Ramp is the closest public ramp suitable for launching local government rescue, response, and research vessels in Apra Harbor. The closure of this ramp during construction and/or during operations may limit the services available to the public by government safety and resource agencies and could result in the loss of life or other resources if another viable entry point is not identified or created.

Section 3.3.1 Stormwater Infrastructure: With the increase in non-permeable surfaces it will be necessary to include stormwater infrastructure. Direct release may have a detrimental effect to the water quality and thus the health of resources and humans in the harbor. The DEIS should include infrastructure to minimize the release of contaminants into the harbor.

Section 3.6.2 Affected Environment (p. 95) The list of dive sites listed in this document is not complete. Divers frequent sites such as the Tokai Maru/Cormoran, Kitsigawa Maru, Dog Leg Reef, Family Beach, and others that are closer to the project site than Western Shoals. These sites may be affected by construction impacts including reduced visibility, noise, and vessel traffic.

Section 3.6.4 Proposed and Potential Mitigation Measures (p. 99) The displacement of divers from Outhouse Beach is a serious concern. This displacement started after the increase in security after September 2001 and has already shifted some of the diving activity to the nearby Piti Bomb Holes Marine Preserve. The DEIS needs to assess the impacts of diver displacement to other locations. The DEIS should include an estimate of the number of divers that will be displaced by the proposed action and include alternative sites to which these divers may move. The DEIS should assess the potential impacts of these divers on these alternate sites based on the literature available on SCUBA diver-related damage. These impacts should be included in the HEA and compensatory mitigation.

The alternative site identified in the DEIS, Tumon Bay is a territorial Marine Preserve, and therefore may not be an effective choice. Guam DAWR is instructed to regulate activities in the preserves to prevent damage to the coral reef ecosystem and facilitate public access (PL 27-87). In addition, the Tumon Bay Preserve does not provide the necessary depth range for diver certification, only the most basic experiential SCUBA programs. We recommend that the PAG work with the local resource agencies, Guam Coastal Management Program and DAWR, to identify new site options outside of the

territory's marine preserves. This may require the purchase of land or creation of infrastructure to facilitate diving at new locations.

Section 3.9.4. Environmental Consequences (p. 119) The alternatives should address stormwater impacts. The increase in non-permeable surfaces and traffic may result in increased contamination of water resources and may impact coral reef resources and fish species normally consumed by humans.

Section 3.11.4.2. Construction Impacts (p. 136) As sediment testing has not been completed and may change prior to the start of this project, it is recommended that the DEIS include a plan to assess sediments for contaminants, and properly handle and dispose of contaminated sediment if it is dredged up so that these contaminants are not released back into the environment.

Section 3.11.4.3 Operations Related Impacts. The impact assessment should include the consideration of sediment re-suspension and release of nutrients caused by ships using the proposed wharf. These impacts may result in long-term loss of habitat and should be included in the HEA and compensatory mitigation.

Section 3.11.5. Best Management Practices (p. 139) Include the provision to halt dredging ten days before and ten days after coral spawning. It may be prudent to suspend or curtail dredging activities during the months of June, July, and August, when corals spawn.

Section 3.12.2 Terrestrial Environment (p. 150). A large portion of the Sasa Bay Wetland lies within the territorial Sasa Bay Marine Preserve. We recommend that the DEIS include the protected status of this area.

Section 3.12.3.2. Coral Reefs There is a lot of variation across the impact zone and the areas surveyed. We recommend that the summary tables be modified to reflect the relative diversity of sites rather than the zones. Also, the comparison of the number of colonies in different zones is not normalized based on the survey effort and thus provides a skewed assessment of the results (fewer reef flats were sampled than other zones). Much of the fauna within the project footprint is more abundant at night. We recommend that nocturnal survey's be conducted to document the abundance of these species.

Also, the deep sand zone should be removed from tables 3.21-3.25 as it was not sampled during the survey work for the FWCA report.

Section 3.12.3.3 Tables 3-24 and 3-26. The number of species across the sites is not additive – many of the fish and coral species were observed at a number of sites. For example Table 3-26 shows that 569 species were observed, but in actuality only 131 species were recorded from all of the sites. Please correct these numbers to prevent confusion regarding the site's diversity.

Section 3.12.3.3 Reef Fish. (p. 163-164). The level of detail between the USFWS and AECOS fish surveys is quite different. The USFWS report references in situ visual surveys conducted by experts, while ABCOS used a camera from the ship which misses many smaller fish. Please clearly indicate the methods used and which survey is being referenced in the beginning of the paragraph to avoid confusion between these survey methods. (e.g. ABCOS stated that butterflyfish were the most diverse family but USFWS report found that a number of other families have similar or greater diversity).

(p. 171) The fisheries data presented in this report is not very useful. A better indicator of the areas use for fishing would be a metric of total harvest by weight, catch per unit effort, and fishing effort. If available, this information should be include in the DEIS.

Section 3.12.5.2 Alternative 2 (p. 180) The last paragraph of this section is very confusing. It appears to say that the cellular sheet pile will act as a FAD but also that Alternative 2 will not have the same resource benefits as alternative 1. Alternative 2 will provide much less habitat for fish and other organisms due to the cellular sheet pile design. Please clarify this paragraph to indicate that this option will not provide the same level of habitat for coral reef organisms.

Section 3.12.5.2 Alternative 3 (p. 181-182). This table does not include the impacts from anchoring & mooring lines. These factors should be considered and if necessary included in the table.

Section 3.12.6.2 Compensatory Mitigation Plan Development (p. 183) NMFS commends the recommendation to use the HEA method and the consideration of the 6 step strategy proposed in Bentivoglio (2003). However, we recommend that additional mitigation options be formulated. As the DEIS clearly states, FADS are designed to attract pelagic species. They do not provide habitat and will do nothing to mitigate the loss of coral reefs and reef fish. They also will not replace opportunities for fishermen displaced by the project as FADs are normally located off shore requiring a boat. In the case of the piers, the access is likely to be limited to recreational fishermen. There will likely be some growth of organisms on the pier; however, these will be different from existing communities. The pier may also encourage the growth of invasive species which may displace native species on artificial substrate. Coral transplantation has not had a successful track record as compensatory mitigation in the Pacific region. Many projects have failed. In addition, coral transplantation will not restore all of the lost ecological function as it will only transplant one component of the coral reef community. We strongly recommend that you work with the Federal and Territorial resource agencies to consider other alternatives in your mitigation plan.

Best Management Practices (p. 188). We strongly support BMPs, but recommend that you develop these further. Also, you may want to consider curtailing dredging operations during June-August due to the variability of the coral spawning.

Section 3.13.2 Sea Turtles (p. 192). The sea turtle nest was located east of the seaplane ramp as illustrated in Figure 3-18. We recommend that this be corrected. Another nest

was documented in the vicinity of the project during 2007 and it should also be considered during the development and selection of the alternatives. This project will directly impact sea turtle nesting and foraging area and section 7 consultations with USFWS and NMFS is strongly recommended.

Section 3.14.2. Marine Non-Indigenous Invasive Species. We are pleased to see the consideration of marine non-indigenous invasive species in this plan and commend the PAG for requiring ballast water management. With the planned increase in vessel visits, larger ships, and an increase in artificial substrate, we recommend that the PAG develop a monitoring plan for marine invasives as part of the planning for the proposed action. This could include tank sampling, monitoring of the new wharf for invasives, and a plan for dealing with invasives if they should become entrenched. The introduction of *Cartjoa riisei* in Hawaii has caused serious damage to precious coral resources in Hawaii and is often found on artificial substrates such as piers.

Section 13.15 Noise. Underwater noise should be considered in the DEIS. The noises associated with construction impacts can cause harm to sea turtles, humans, and other organisms in the water. Sound travels further, faster underwater and the impacts may be broader than expected. This is of particular concern for divers visiting sites near the proposed wharf.

Section 4.4 Cumulative Impacts. The cumulative impacts of this project do not appear to be sufficiently addressed by this document. This is partly due to the extended time frame for the project which is not scheduled to begin until 2021. We recommend that this section be revised, particularly as more information about the U.S. Marine Corps relocation and the construction of a Transient Carrier Berth is released. This expansion may result in serious changes to the harbor and the cumulative impacts of both of these projects as well as the others listed must be considered.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

October 15, 2007

U. S. Army Corps of Engineers
Honolulu District
ATTN: Mr. James Hatashima, Project Manager
Civil and Public Works Branch (CEPOH-PP-C)
Rm. 312, Bldg. 230
Fort Shafter, HI 96858-5440

Subject: Draft Environmental Impact Statement (DEIS) for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor, Guam, Mariana Islands (CEQ # 20070339)

Dear Mr. Hatashima:

The U.S. Environmental Protection Agency (EPA) has reviewed the above-referenced document pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act. Our detailed comments are enclosed. We appreciate the Corps of Engineers deadline extension to October 15th to accept EPA's comments.

The project proposes to construct a new 1,500 linear foot deep-draft wharf along the Glass breakwater in Apra Harbor and fill approximately 17 acres of Apra Harbor to create operational backlands to support wharf operations. Based on our review, we have rated the DEIS as Environmental Objections – Insufficient Information (EO-2) (see enclosed "Summary of Rating Definitions"). Our objections are based on the significant direct impacts to the marine environment and coral reefs from project dredge and fill operations. The Preferred Alternative 1 would result in the permanent loss of some 29 acres of coral reef and impact up to 150 acres of marine habitat through sedimentation and anchor damage. We recommend evaluation of less damaging alternatives for the fill/creation of operational backlands to reduce impacts to marine resources, including coral reefs, and to demonstrate that the least environmentally damaging practicable alternative (LEDPA) available to achieve the project purpose is being pursued. Additionally, we oppose the proposed compensatory mitigation described in the DEIS as inadequate to compensate for the lost functions and values of over 150 acres of marine habitat and recommend a comprehensive approach be taken regarding marine habitat and coral reef assessment and mitigation for Apra Harbor.

EPA appreciates the opportunity to review this DEIS. EPA is available to discuss our comments and intends to work with the Corps to reduce the impacts identified above. When the FEIS is released, please send one hard copy and CD to this office at the address above (mail code: CED-2) and one hard copy and CD to Wendy Wiltse at our Honolulu Office at EPA-PICO,

300 Ala Moana Blvd., Box 50003, Room 5-152, Honolulu, HI 96850. If you have any questions, please contact me at 415-972-3846 or Karen Vitulano, the lead reviewer for this project, at 415-947-4178 or vitulano.karen@epa.gov.

Sincerely,

Nova Blazej, Manager
Environmental Review Office

Enclosure: Summary of EPA Rating Definitions
EPA's Detailed Comments

cc: Michael Molina, U.S. Fish and Wildlife Service
Gerry Davis, National Marine Fisheries Service
George Young, US Army Corps of Engineers
Mike Gawel, Guam Environmental Protection Agency

SUMMARY OF EPA RATING DEFINITIONS

This rating system was developed as a means to summarize EPA's level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the EIS.

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

ADEQUACY OF THE IMPACT STATEMENT

Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

EPA DETAILED COMMENTS FOR THE MASTER PLAN FOR DEEP-DRAFT WHARF AND FILL IMPROVEMENTS AT APRA HARBOR, GUAM, OCTOBER 15, 2007

Purpose and Need/Alternatives Analysis

In addition to the dredge and fill for the construction of a new commercial wharf, the preferred alternative includes depositing 285,752 cubic yards of fill in 16.67 acres of Apra Harbor at 3 reclamation sites (p. 30). The Draft Environmental Impact Statement (DEIS) states that the Port Authority of Guam (PAG) has no specific development plans at the present time for the 3 reclamation sites, but intends to have them remain open for the eventual use as additional operating backland and container yard space in support of the wharf (p. ES-3, 29). Indeed, the criteria used to identify reasonable alternatives included the provision of 16 to 20 acres of operational backland area for container storage and other support infrastructure (p. 19, 22). The actual need for an area of this size, however, is not explained.

As the EIS states, the project will require a Clean Water Act (CWA) Section 404 permit from the U.S. Army Corps of Engineers (USACE). Pursuant to 40 CFR 230, the project must comply with the Federal Guidelines for Specification of Disposal Sites for Dredged or Fill Materials, promulgated pursuant to Section 404(b)(1) of the CWA ("404(b)(1) Guidelines"). The purpose of the 404(b)(1) Guidelines is to restore and maintain the chemical, physical, and biological integrity of waters of the United States. These goals are achieved, in part, by controlling discharges of dredged or fill material (40 CFR 230.1(a)). Fundamental to the guidelines is the principle that dredged material or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that it is the least environmentally damaging practicable alternative (LEDPA) available to achieve the project purpose. The applicant bears the burden for clearly demonstrating that the preferred alternative is the LEDPA. The DEIS does not evaluate a range of alternatives for operational backland nor identify the LEDPA for this element of the project.

> *Recommendation:* The Final EIS (FEIS) should include and analyze a reasonable range of alternatives for container storage and support infrastructure space, per the 404(b)(1) Guidelines. Alternatives should include upland solutions such as a mixture of on- and off-site space, space made available by shifting some operations from the existing Commercial Port to the new facility, the open commercial port lands directly east of wharf F-6 proposed for containment of dredge spoils (p. 31), the damaged portions of wharf F-5 that are unable to support operations (p. 39), the portion of Cabras Island planned to further expand the container yard (p. 35), and filling a smaller portion of the land reclamation sites.
>
> The FEIS should also evaluate a range of alternatives for disposal of the projected volume of dredged material. The 404 permit applicant bears the burden for clearly demonstrating that the preferred alternative for disposal of dredged material is the LEDPA, and that alternative disposal sites in upland areas have been evaluated.

Compensatory Mitigation for Coral Impacts

EPA agrees that the preferred alternative would result in significant adverse impacts to marine habitats (p. 178). The permanent loss of coral reef ecosystem under the preferred alternative is estimated at 28.83 acres (p. 176). In addition, temporary impacts from sedimentation, turbidity,

and anchor damage may be as high as 127 acres. Coral reef ecosystems are in decline worldwide and are threatened with further degradation from overfishing, pollution, climate change, and other stresses. Significant impacts of this magnitude should first be minimized.

Compensatory mitigation will be required per CWA Section 404 for any unavoidable impacts to coral reefs due to filling, temporary impacts from dredging, and for construction-related impacts. The compensatory mitigation described in the DEIS (p. 186-188) is inadequate to compensate for the lost functions and values of over 150 acres of marine habitat, including coral reefs. The DEIS proposes fish aggregation around pier pilings and coral transplantation as compensatory mitigation. Pier pilings can only compensate for a very small portion of the functions of the coral reef ecosystem that presently exists at the impact site, and this proposal has not been scaled using a Habitat Equivalency Analysis (HEA).

The DEIS also proposes coral transplantation as part of the compensatory mitigation plan. EPA considers transplantation of moveable corals from within the project footprint to be a "best management practice" required for all projects that permanently impact corals. We encourage transplantation but do not recommend crediting transplantation toward compensatory mitigation. Any compensatory mitigation project will need to be a major effort such as watershed reforestation, construction of stormwater treatment facilities, establishment and enforcement of a permanent marine protected area, etc.

Recommendation: EPA recommends that any compensatory mitigation to coral reefs be scaled using Habitat Equivalency Analysis (HEA) to determine the appropriate size of the mitigation project. HEA should take into account the extent of temporary and permanent impacts, recovery time, and uncertainty of success.

EPA recommends a comprehensive approach be taken regarding marine habitat and coral reef assessment and mitigation for Apra Harbor, especially since several wharf projects that involve impacts to coral reefs in Apra Harbor are in planning stages. An assessment and ranking of coral reef condition and marine habitats throughout the harbor for use in avoiding future marine construction is recommended, as well as a coordinated approach for mitigation, possibly by the establishment of a coral mitigation bank or fund. A coordinated approach, rather than project by project, would promote significant mitigation projects with a higher likelihood of success and survival in perpetuity. The project proponent should also coordinate efforts with the mitigation workgroup that is working on a mitigation strategy for the future military buildup.

A compensatory mitigation plan should be prepared in accordance with the Honolulu District Army Corps of Engineers Mitigation and Monitoring Guidance in close cooperation with local Guam agencies, EPA, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, and the Corps of Engineers. The mitigation plan should include funding and specify responsible parties to ensure success of the mitigation in perpetuity.

The mitigation should include a monitoring plan for a minimum of 5-10 years. Given the slow recovery time of coral reefs (decades to hundreds of years), monitoring may be

required for decades to determine the success of the project. Monitoring must be scientifically based and designed to measure progress toward specific performance standards, as identified in the mitigation plan.

A post-construction assessment of the actual impacts to corals should also be conducted. This assessment will assist in the planning, HEA calculations, and implementation of management practices for future marine construction projects in Guam. If impacts in excess of those accounted for in the compensatory mitigation plan are found, additional mitigation should be implemented.

Water Quality Sedimentation Impacts

Suspended sediment from dredge and fill activities can settle out of the water column and smother corals and other benthic invertebrates (p. 176) as well as re-suspend contaminants in the water column (p. 138). Coral polyps and larvae are particularly vulnerable to suspended sediment, and re-suspended contaminants can chemically alter coral gametes and larvae and prevent normal fertilization and development. Sediment deposits on coral and rock also prevent recruitment of juvenile corals.

The DEIS indicates that project sedimentation could impact over 102 acres of marine habitat with deposition on over 20 acres (p. 176). EPA has objections regarding this level of impact and strongly recommend strict adherence to best management practices (BMPs) during dredging to minimize water quality impacts.

Recommendation: The following BMPs should be included in the FEIS and Record of Decision. The FEIS should attempt to quantify the environmental benefits of BMP implementation and, as stated above, include a post-construction assessment of actual impacts so knowledge of BMP effectiveness can be utilized for future projects.

- The active dredge area should be contained within floated silt curtains that extend to the harbor bottom, bubble curtains, and/or sheet piles.
- Monitoring and surveillance should occur regularly during dredging hours to ensure that no turbidity plume is escaping from the containment area.
- EPA recommends that monitoring and surveillance be conducted by an independent party.
- If conditions are too rough or windy to contain the plume, dredging should cease until conditions subside.
- Dredging should cease during periods of coral spawning.

Air Quality

The proposed project site is located in the 3.5 kilometer radius Piti Power Point nonattainment area for sulfur dioxide (SO2). This means that the area currently does not meet health-based National Ambient Air Quality Standards for this pollutant. The DEIS does not provide estimates of SO2 emissions associated with the operational phase of the project. It does not discuss applicability of general conformity or whether the project would result in emissions that exceed de minimis emissions thresholds. The DEIS also does not discuss applicability of nonattainment New Source Review (NSR) permitting requirements.

Because of the nonattainment status, it is especially important that the proposed project include mitigation measures to reduce emissions of SO2 during both the construction and operational phases. The DEIS identifies dust control measures that could be used during construction to reduce particulate emissions from dust sources, but no measures are identified to reduce sulfur dioxide emissions during either the construction or operational phases of the project. Diesel combustion from ships is a significant source of sulfur dioxide.

Recommendation: Include estimates of operational emissions of SO2 in the FEIS and discuss these results in terms of general conformity and NSR permitting requirements. A useful resource for estimating pollutant emissions from shipping and port-related sources can be found at: http://www.westcoastdiesel.org/wkgrp-marine.htm#management. EPA recommends that the project proponent contact Guam EPA and EPA Region 9 to discuss applicability of nonattainment NSR for this new stationary source.

The FEIS should identify mitigation measures to reduce marine vessel SO2 emissions in the immediate harbor area to the fullest extent feasible, as well as emissions from other operating sources including commercial harbor craft, cargo handing equipment and trucks. Emissions reductions from ships can occur through a combination of cleaner fuel, engine modifications, add-on retrofits and other measures. "Hotelling" emissions from large marine vessels can be reduced by "cold ironing" (where a cleaner alternative source of power is provided to ships at dock) or using clean fuels in installed generators. In addition, switching fuel from 2.7% to 1.5% sulfur fuel oil within 40 nautical miles of port can reduce sulfur dioxide emissions by 44%[1]. We note that the Piti Power Plant switches to low sulfur fuel when certain meteorological conditions result in increased sulfur dioxide levels. EPA recommends the project include a comparable plan as a mitigation measure for this project to reduce air quality impacts.

Utilities / Project Description

The project will require construction of a new central wastewater lift station and upgrades to the potable water distribution system (p. 67), as well as additions to the power distribution system and a utility service transformer that would connect to a future utility power source (p. 68). The project also requires Route 11 to be raised along the wharf backland area by 5 feet to match the proposed grade of the deep-draft wharf deck. These project elements are necessary for operation of the deep-draft wharf but are not included in the project description in the DEIS.

Additional information on utility infrastructure capacity for the project should also be included. For example, it is not clear whether there is sufficient water available for the project. The DEIS states that potable water service would be provided via a connection to the existing 12" diameter pipe adjacent to the site along Route 11, and that water requirements for post-Panamax vessels are estimated to be approximately 1,000 gallons per minute (gpm); however, the DEIS also states that Cabras Island is serviced by the Guam Waterworks Authority and the U.S. Navy, and the GWA line has a capacity of 250 gpm (p. 66). The DEIS does not demonstrate that adequate potable water for the project is available.

[1] Fournier, Anthony. 2006. "Controlling Air Emissions from Marine Vessels: Problems and Opportunities. Available: http://www.westcoastdiesel.org/files/sector-marine/Fournier%20Marine%20Emissions%20Problems%20and%20Opportunities.pdf

The DEIS states that the anticipated vessel sanitary sewer discharge would flow to the Hagatna Treatment Plant (p. 67). We note that the Hagatna Treatment Plant is currently operating under a waiver from meeting secondary wastewater treatment requirements, per Clean Water Act Section 301(h). The current waiver application does not account for an increase in flow from the project and could affect continuance of the waiver depending on the characteristics and volume of wastwater to be discharged to the Hagatna Treatment Plant.

Recommendation: In the FEIS, include the descriptions of all utility upgrades necessary for construction and operation of the project in the project description in Chapter 2 and elsewhere, and assess impacts from these elements of the project. Provide detailed information regarding potable water system capacity and power sources. Identify the quantity and source of fill needed to raise the road by 5 feet. Indicate whether the Hagatna wastewater treatment plant has sufficient capacity to receive wastewater loads from the project, and identify whether the collection system is sufficient to handle the additional flows. Discuss how the project may impact the current 301(h) waiver and what coordination and planning has occurred with the Hagatna Treatment Plant. Clarify whether the existing power distribution line along Route 11 has sufficient capacity for berthing post-Panamax vessels, or if the 2nd proposed power system would only be needed for Nimitz Class Air Craft Carriers.

Project Schedule / Need for Supplemental EIS

The DEIS indicates that project construction will occur between 2021 and 2025 (p. 8). Because construction will occur so far in the future, the FEIS will need to be carefully reexamined prior to construction to determine if the criteria in 40 CFR 1502.9 compel preparation of an EIS supplement. Council on Environmental Quality guidance states that if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, a supplemental EIS must be prepared for an old EIS so that the agency has the best possible information to make any necessary substantive changes in its decisions regarding the proposal (40 Most Asked Questions, #36). Because of the substantial changes that are planned in relation to the relocation of the Marine Corps forces to Guam by the Department of Defense, it is likely that significant new circumstances will be identified.

Recommendation: EPA recommends that the Port Authority of Guam and/or the Corps of Engineers plan for the financial resources that will be needed to supplement the FEIS, as necessary, prior to project construction. In the FEIS, discuss the process that will be used for reevaluating the FEIS for supplementation.

Cumulative Impacts

The DEIS does not include the relocation of Marine Corps forces to Guam as a reasonably foreseeable future action. This project will substantially impact Guam's infrastructure and land use and includes pier/waterfront improvements for berthing a transient nuclear aircraft carrier which will include dredge and fill operation in Apra Harbor. The project will increase the total permanent population by at least 15% not including up to 20,000 contract laborers or Navy transient aircraft carrier personnel.

Recommendation: In the FEIS, update statements that predict future commercial, industrial and residential growth patterns to occur at similar rates as the recent past. Identify the magnitude of the Marine Corps relocation project in terms of potential impacts to resources and infrastructure and growth inducement, and consider these impacts in the cumulative impacts analysis. This reevaluation would be appropriate for a supplemental EIS closer to the date of construction, as mentioned above.

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October 16, 2007

Mr. James Hatashima
U.S. Army Corps of Engineers, Honolulu District
Civil and Public Works Branch
Rm.309,Bldg.230
Fort Shafter, Hawaii 96858-5440

Subject: Draft Environmental Impact Statement deep Wharf Draft and Fill Improvements

Dear Mr. Hatashima:

The Department of the Agriculture (DOAg)has reviewed the Draft Environmental Impact Statement (DEIS) for the Master Plan for Deep-Draft Wharf and Fill Improvements at Apra Harbor, Guam. The following comments are provided in accordance with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 *et seq.;* 83 Stat. 852] (NEPA); and other authorities mandating Federal oversight of environmental resources including the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.;* 48 Stat. 401], as amended (FWCA); the Federal Clean Water Act [33 U.S.C. 1251 *et seq.;* 62 stat. 1155], as amended (CWA); and the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.;* 87 Stat. 884], as amended (ESA).

The proposed action would upgrade the civilian commercial port of the Territory of Guam by constructing a 1,500 linear foot deep-draft wharf and reclaiming 17 acres in three shallow, coral reef embayments for use as additional cargo container storage area. These harbor improvements would accommodate Post-Panamax cargo vessels, cruise ships, and also provide contingency berthing facilities for U.S. Navy military vessels, including Nimitz Class aircraft carriers. Harbor improvements will impact over 28 acres of coral reef habitat and create additional impacts from construction and operation activities.

The DEIS does not provide for an adequate and comprehensive decision making document. However, the DEIS does include a commitment to scale compensatory mitigation to replace projected resource loses through the use of a Habitat Equivalency

Analysis (HEA). The primary concerns include: 1) the lack of adequate compensatory mitigation plans for coral reef; 2) the lack of an adequate CWA Section 404(b)(1) analysis for the disposal of dredge and fill material; 3) the proposed filling of two nesting beaches for federally protected sea turtles; 4) lack of consideration for no-fill alternatives to the proposed project and 5) the distant start date for project implementation.

The proposed harbor improvements will result in the permanent impact of over 22 acres of coral reef habitat. Two mitigation options are proposed in the DEIS: 1) Fish Aggregation Devices (FADs) and 2) coral transplantation. These options will not replace the loss ecological functions of coral reef resources as required by federal mandates. Furthermore, a HEA was not used to determine the replacement value of the resources that may potentially be lost, and the DoAg already deploys FADs.

FADs are fishery management tools designed to aggregate existing fish stocks, mainly pelagic fish stocks, to improve harvesting. This is why it is questionable as to how FADs are being scaled to compensate for the lost ecological functions of coral reef resources. FADs may actually contribute to overfishing and decrease ecological functions in the long term.

There has been mixed success with the use of coral transplantation, particularly in the Pacific, often resulting in poor transplant survival and little ecological benefit. A review by the U.S. Fish and Wildlife Service identified coral transplantation as inappropriate for mitigating permanent dredging impacts to coral reefs. Transplanted corals may save a small component of the reef but the overall ecological function will not be replaced. Furthermore, corals that are transplanted to impacted reefs will improve reef health at a minimum and will not offset losses because of existing ecological stressors.

As an alternative, DoAg recommends that PAG coordinate and work with the local and federal trust agencies in developing an appropriate compensatory mitigation plan using the HEA to be included in the Final EIS and Record of Decision.

Three land reclamation sites will be created as stated in the DEIS, which will have significant impacts to coral reef and endangered species (sea turtles) resources. The DEIS does not appear to meet Army Corps of Engineers requirements for a 404(b)(1) analysis because it lacks any discussion of non-fill alternatives for the reclamation areas. Practicable alternatives with lower associated environmental impacts have not been fully investigated in the DEIS. In order to make an environmental decision, DoAg recommends that a 404(b)(1) analysis be conducted, all alternatives to the land reclamation be analyzed appropriately, and included within the DEIS.

DoAg monitors sea turtle activity for both the threatened Green Sea Turtle (*Chelonia mydas*) and the endangered Hawksbill Sea Turtle (*Eretmochelys imbricata*) around the island to include Apra Harbor. DOAg is concerned about the lost of turtle nesting sites due to reclamation and the lost of turtle foraging areas within the reclamation areas. There will be no access to sea turtle nesting areas with the fill from the reclamation sites. Sea turtle nesting sites and habitats have been destoryed particularly from development resulting in declines in sea turtle population. DoAg recommends that a section 7 consultation be conducted in regard to the sea turtles to address sea turtles and the nesting area. The DEIS states that there is a determination of no adverse impact to these species. The status of nesting sea turtles and the number of nesting sites on Guam is still uncertain and may be few but DoAg continues to collect information on sea turtle nesting activity. Therefore, DoAg does not agree with the determination of no adverse impacts and considers it unsupported.

The DEIS states that the proposed project construction is not anticipated to begin until 2021 or later. Because the environment and conditions can change from now until 2021, environmental documents are generally accurate for approximately five years after they have been written. The DOAg recommends that our comments and mitigation recommendations be included within the Final EIS and record of decision if the NEPA process continues to move forward and a new or supplemental EIS be required if project construction begins in 2021 prior to the start of any work.

Specific Comments

1. – 3.12.3.2 – fifth paragraph lists two fish species (Chaetodon auriga and Chlorurus sordidus) as coral species.
2. – 3.12.6.3- FADs - The construction of the wharf may act as a FAD for some pelagic species. However, this does not replace the loss of ecosystem function and habitat that construction of the wharf will cause. FADs act only as fish attracters, and potentially increase catch for human fishers. As FADs primarily attract pelagic species, while the habitat that will be negatively impacted is utilized by benthic species, the wharf cannot be seen as comparable.
3. -3.12.6.3- Coral Transplantation- Coral transplantation has, at best, a mixed history of success on Guam. Within two years of transplantation, virtually all the corals in the Kolinsky 2002 study had died. High mortality after the first year is the norm. The lost coral reef habitat and function would take longer than one year to regenerate without the added impact of sedimentation from this project. With the additional stress due to construction impacts, the result would be a virtual 100% loss of coral from this activity. Coral transplantation would not be an acceptable mitigation for local resource agencies.
4. – 3.12.6.3- Best Management Practices- While some stony corals spawn according to the lunar cycle in mid to late summer, many others exhibit a monthly spawning cycle. Stops in the construction may be coordinated with these other coral species as well. Additionally, the western most point of the Glass breakwater has been identified as a spawning aggregation site for several species of reef fish. Breaks in construction should be allowed as to not interfere with these spawning events as well.
5. – 3.13.2- Sea Turtles affected habitat- A green sea turtle nest was found directly behind the proposed land reclamation site number three. If this site is filled, access to a nesting beach would be denied for this threatened species. Sea turtles

exhibit site fidelity for nesting areas, and cannot be relocated. Blocking access to this nesting beach would likely end this turtle's useful reproductive life. A Section 7 consultation would be required due to this effect.

6. – 3.6.4 – Proposed Mitigation for loss of Outhouse beach Diving Services- The proposed mitigation for the loss of Outhouse Beach includes developing Tumon Bay as a beginning dive location. This is unacceptable to DAWR. Beginning divers demonstrate poor diving skills, including buoyancy control. His leads to increased damage to the substrate, especially live corals. Tumon Bay is a Marine Protected Area (MPA), and this damage is contrary to the purpose of the MPA, which is to protect marine organisms and their habitat. DAWR has already seen the damage increased usage can do to an MPA. After September 11, 2001, access to the port diving locations was severely restricted to commercial entities. Many businesses relocated their activities to the Piti Bombholes MPA. This has resulted in damage to seagrass beds and corals in the MPA. Additionally, feeding of fish in this location has caused unnaturally high populations of reef fish in a small area. This increases pressure on the food resources of the area when human feeding is not occurring. DAWR would prefer an alternate site be developed as a commercial and beginning dive site.
7. The EIS will need to specify the proper disposal of dredge materials. Dredge material will need to be properly disposed of and secured to prevent wildlife from consuming potential toxic materials.
8. Construction at the project site will have an impact on migratory and residential birds that uses the area for foraging and resting. Observations of migratory birds in the area includes, tattlers, sandpipers, shear water, intermediate egret, pacific reef heron, brown booby, brown noddy, black noddy, white fairy tern. Residential birds observed in the area includes, yellow bittern, and Philippine turtle dove. If any bird species found foraging or nesting in the area during construction, the project would need to cease until the bird removes itself on its own.

DoAg appreciate the opportunity to comment on this DEIS. If you have questions regarding these comments please contact Jay Gutierrez at 671 735-3980 or jaytgutierrez@yahoo.com.

PAUL C. BASSLER

GUAM ENVIRONMENTAL PROTECTION AGENCY

AHENSIAN PRUTEKSION LINA'LA GUAHAN

P.O. Box 22439 GMF • BARRIGADA, GUAM 96921 • TEL: 475-1658/9 • FAX: 477-9402

Mr. James Hatashima
U.S. Army Corps of Engineers, Honolulu District
Civil and Public Works Branch
Room 309, Building 230
Fort Shafter, HI 96858-5440
Fax: (808) 438-0430
Email: James.K.Hatashima@poh01.usace.army.mil

OCT [illegible]

SUBJECT: Comments on the DEIS for the proposed Deep-Draft Wharf and Fill Improvements at Apra Harbor, Guam.

Dear Mr. Hatashima:

The Guam Environmental Protection Agency has reviewed the Draft Environmental Impact statement (DEIS) for the Master Plan for the Proposed Deep-Draft Wharf and Fill Improvements at Apra Harbor, Piti, Guam. We wish to provide the following comments for the record and for consideration in completing the Final EIS or any Supplemental EIS on this project.

The Project proposes to create, for the Port Authority of Guam, a 1,512 foot long new deep-draft (55 feet below mean sea level) wharf. Also included is the filling of approximately 17 acres of adjacent shallow water marine environment for container storage and port operations. Approximately 102.9 acres of marine habitat are estimated to be impacted by sediment from dredging during construction. And over 22 acres of coral reef would be permanently lost.

GENERAL COMMENTS

The overall timelines for implementation should allow for the urgency due to military expansion needs on Guam and in the Marianas. Alternative escalated timelines for construction should be suggested and associated timelines for necessary permits and phases of implementation should be considered and presented. Lack of availability of funding for implementation may be overcome through privatization or Federal prioritization of funding.

The general compensatory mitigation mentioned for coral reef losses is not appropriate. We highly recommend that the Port Authority or the ACOE develop a comprehensive mitigation plan, based on input from cooperating agencies and use of the Habitat

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950-5588

FACSIMILE TRANSMITTAL

TO : US Army COE

ATTENTION: JAMES HATASHIMA

FAX NUMBER: (808) 438-0430

FROM: M. Gawel

FAX NUMBER: 477-9402

SENT BY: M.G.

DATE: Oct. 15 '07

Number of Pages including this page: 6

RE: Comments on DEIS for Guam Port Expansion

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Appendices A, B, C, F and K are well done and informative.

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Guam Environmental Protection Agency appreciates this opportunity for reviewing and commenting on this DEIS and asks that our concerns be addressed in the Final EIS. If you have any questions on our review and comments, please contact our Acting Chief Planner, Mike Gawel at (671) 475-1646, or e-mail Mike.Gawel@guamepa.net

Sincerely,

LORILEE T. CRISOSTOMO
Administrator

Cc: Manager, Port Authority of Guam
Guam Department of Agriculture, DAWR
Guam Coastal Management Program
Historic Preservation, DP&R
US EPA Region 9
Pacific Islands Fish and Wildlife Office
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Administrator

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Guam Coastal Management Program
Historic Preservation, DP&R
US EPA Region 9
Pacific Islands Fish and Wildlife Office
NMFS PIRO, Honolulu

BUREAU OF STATISTICS AND PLANS
(Bureau of Planning)
Government of Guam

Felix P. Camacho
Governor of Guam

Michael W. Cruz, M.D.
Lieutenant Governor

P.O. Box 2950 Hagåtña, Guam 96932
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Alberto "Tony" Lamorena V
Director

OCT 16 2007

Mr. James Hatashima
U.S. Army Corps of Engineers, Honolulu District
Civil and Public Works Branch
Rm. 309, Bldg. 230
Fort Shafter, HI 96858-5440

Subject: Comments on the DEIS for the Proposed Deep-Draft Wharf and Fill Improvement at Apra Harbor, Guam

Dear Mr. Hatashima:

The Bureau of Statistics and Plans (BSP) has reviewed the Department of the Army Corps of Engineers Draft Environmental Impact Statement (DEIS) for the Master Plan for Deep-Draft Wharf and Fill Improvement at Apra Harbor, Piti, Guam, dated, July 2007. According to the DEIS, "the purpose and need for the Proposed Project is to provide Guam with a wharf facility capable of accommodating today's largest deep-draft wharf commercial cargo, passenger, and military vessels and to increase operational backland capacity for containerized cargo operation to meet the future demands for these services within the Apra Commercial Harbor." The harbor is in need of improvements to meet anticipated future demands of the island's commercial port operations by providing additional cargo container storage area, and berthing facilities and increased landside capacity for commercial port cargo storage and handling operations.

The DEIS indicates that the proposed improvements would not extend beyond the Apra Harbor Commercial Port Property, and would not promote long-term land-use incompatibilities. It also states that the Port Authority of Guam (PAG) is proposing Master Plan improvements to Apra Harbor for the purpose of improving maritime access and services to the island of Guam. The Master Plan improvement projects include:

1) construction of approximately 1,500 foot x 215 feet new wharf east of Hotel Wharf, in addition to the existing 3,930 lineal feet with an average draft of only 35 feet, and

2) reclamation/placement of approximately 500,000 cubic yards of fill over 17 acres of submerged lands in three (3) areas along the east end of the Glass Breakwater.

Improvements would include construction of a pier on piles, deposition of approximately 83, 525 cubic yards of fill material over approximately 7.5 acres, and construction and installation of mechanized cargo container handling equipment. Improvements would include construction of rock revetments, and the eventual development of operational backland facilities, and dredging of

submerged land to a depth of 55 feet adjacent to the proposed 1,500 foot deep-draft wharf face to accommodate larger deep draft commercial and military vessels.

Preferred Alternatives

The DEIS identified several alternatives for further analysis, but the proposed project, Pier on Piles Deep Draft Wharf and Land Reclamation has been considered as the Preferred Alternative. The Alternate Design Alternative is the Cellular Sheet Pile Deep-Draft Wharf and Land Reclamation; and the Alternate Location Alternative is Golf Pier/Southwest Point Fixed Pier.

General Comments:

- A Memorandum of Understanding (MOU) was signed on April 12, 2001 between the Department of the Navy and the Government of Guam for the beneficial use of dredge material from the Navy construction dredging project in Inner Apra Harbor for proposed PAG construction Projects. Approximately 188,665 cubic yard portions of the U.S. Navy's estimated 407,000 cubic yards construction dredge spoils being stockpiled in a confined disposal facility (CDF) located at Orote are at the Naval Base, could be utilized by PAG. However, additional geotechnical and chemical analyses of the dried dredge material would need to be conducted to determine its suitability as a fill material for the propose Master Plan Projects. Proper disposal of Dredged materials and how they are secured must be included in the Final EIS, ensuring that potential toxic materials are not accessible to aquatic and wildlife.

- The Bureau is concern how the proposed activities could be achieved based on the project schedule and cost, page 8 of the DEIS when the "Specific start dates for project construction have not been determined. The projected build-out year for the Proposed Project was set to the year 2025. The projected construction period for the Proposed Project would be between the years 2021 - 2025. We are also concern that the result of review of this current DEIS may no longer be applicable by the time of the actual construction phase for the projects. With the span of several years, changes may occur, circumstances will change with time, and new information will come to hand. Environmental review decisions made at this time may be obsolete and inappropriate due to changes in the environment, the commitment of resources such that they cannot be recovered, as well as, with the changes in the laws, rules and regulations.

- Mitigation measures should be identified for environmental degradation of highly sensitive area with diverse critical wildlife, fish, and coral resources. Viable alternatives must be developed based on input and approval from the cooperating development and resource of agencies for the coral reef losses, using the Habitat Equivalency Assessment. A Comprehensive Mitigation Plan should be incorporated as part of this DEIS. Mitigations must also be provided for the loss of recreational resources including the Outhouse Beach and other diving, fishing and snorkeling access, and areas affected by the proposed expansion activities.

Nevertheless, we appreciate that the ACOE is aware and recognized that this project has to comply with the policies and objectives of the Guam Coastal Management Program (GCMP), in accordance with the Coastal Zone Management Act (CZMA) of 1972, as amended (16 U.S.C. 1451 et.seq.). Although Table 3-1 of the DEIS listed and enumerated the Policies of the GCMP that are applicable to the proposed project, it failed to include an analysis and/or discussion on how the impacts on the development and resource policies of the GCMP are being addressed.

Thank you for the giving us the opportunity to comment.

Sincerely,

ALBERTO A. LAMORENA V
Director

cc: PAG
GEPA
DoAg/DAWR
DPR/GHPO
DLM
DPW
Office of the Governor
Jparks/BMillhouser
Mayor of Piti

PUBLIC COMMENT FORM

PUBLIC HEARING
FOR THE
DRAFT ENVIRONMENTAL IMPACT STA
MASTER PLAN FOR DEEP-DRAFT WHARF AI
AT APRA HARBOR

This form offers a convenient way for you to provide comments reg
Statement for the proposed improvements at Apra Harbor. Please w
fold the form, tape, stamp, and mail. Thank you!

To: James Hatashima, U.S. Army Corps of Engineers, Honol
Civil & Public Works Branch, CEPOH-PP-C
Rm. 309, Bldg 230, Ft. Shafter, Hawaii 96858-5440

Subject: Draft Environmental Impact Statement for the
Master Plan for Deep-Draft Wharf and Fill Improvements a

We oppose any development that eliminates dive sites known as Outhouse/Divers Beach. This site is in prevailing winds on Guam, so it ~~offshore~~ is usable when sites are not. This is especially valuable for dive training (dive instructors). Furthermore, we are deeply concerned to the aggressive destruction of coral reef habitat in dredging and construction required for this project.

The developers for this project need to make the case business terms that this project will be worth the cause to critical reef habitats.

Signed: [signature] Dat

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