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7 April 2016

Ms. Rachel Roque Director, Real Estate Division Commonwealth of the Northern Mariana Islands Department of Public Lands 2nd Floor, Joeten Dandan Commercial Building Saipan, MP 96950

#### RE: FINAL – Phase I Environmental Site Assessment Report for the Masalog Ammunition Depot, Pina, Tinian, CNMI Contract No. 600431-OC (DPL-15-003); USEPA Grant ID No. BF-00T27401-0

Dear Ms. Roque,

Enclosed are four (4) hard copies of the FINAL Phase I Environmental Site Assessment Report for the Masalog Ammunition Depot, Pina, Tinian, CNMI. Please provide your review of the document within the next business 10 days. If you have any questions or comments, please contact me at your convenience at 671-646-5231 x505. EA appreciates this opportunity to provide these Phase I and II ESA services to the CNMI DPL.

Sincerely,

Robert Shambach, P.G. Project Manager

cc: Tim Lang, TRL Project file:

Attachments



# FINAL

# Phase I Environmental Site Assessment Report Masalog Ammunition Depot Pina, Tinian, CNMI

Prepared for

Department of Public Lands Commonwealth of the Northern Mariana Islands PO Box 500380 Saipan, MP 96950

Prepared by

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> EA Project No. 63019.01 April 2016

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# LIST OF ACRONYMS

AAI ASTM AUL	All Appropriate Inquiries ASTM International Activity and use limitation
BECQ	Bureau of Environmental and Coastal Quality
CERCLA CFR CNMI CREC	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Code of Federal Regulations Commonwealth of the Northern Mariana Islands
DEQ DFEMS DMM DoD DPL	Controlled recognized environmental condition Department of Environmental Quality Department of Fire and Emergency Medical Services Discarded military munitions Department of Defense Department of Public Lands
EA ESA	EA Engineering, Science, and Technology, Inc., PBC Environmental Site Assessment
FEMA FOIA ft FUDS	Federal Emergency Management Agency Freedom of Information Act Feet Formerly Used Defense Sites
GPS	Global positioning system
HREC	Historical recognized environmental condition
MEC	Munitions and explosives of concern
REC	Recognized environmental condition
Unitek USACE USDA USEPA USGS UXO	Unitek Environmental Guam, Inc. U.S. Army Corps of Engineers U.S. Department of Agriculture U. S. Environmental Protection Agency U.S. Geological Survey Unexploded ordnance
WWII	World War II

# **EXECUTIVE SUMMARY**

EA Engineering, Science, and Technology, Inc., PBC (EA) has performed a Phase I Environmental Site Assessment (ESA) of a portion of the Masalog Ammunition Depot located on the eastern side of Tinian, Commonwealth of the Northern Mariana Islands (CNMI), within a plot of CNMI Public Land consisting of 429 hectares (1,085 acres). The Masalog Ammunition Depot consists of open revetments and covers an elongated area of approximately 96 hectares (237 acres) along the eastern portion of the island. The portion of the Masalog Ammunition Depot to be investigated as part of this Phase I ESA (the "subject site") is 12 hectares (30 acres) in size, and was constructed in approximately 1945.

The subject site has historically been used as an ammunition depot constructed during World War II.

This Phase I ESA identified the following recognized environmental conditions (RECs) in connection with the subject site:

- There is a potential for a significant number of United States ordnance and components within the subject site.
- It is anticipated that over the past 70 years a percentage of the munitions deteriorated and may have resulted in chemical munitions constituents being released to the environment as chemicals of potential concern to human and ecological receptors.

Based on the findings of this Phase I ESA, EA is presenting the following recommendation:

• It is the professional opinion of EA that further investigation is warranted in the form of a Phase II ESA to address the identified RECs at the subject site.

# 1. INTRODUCTION

# 1.1 LOCATION AND LEGAL DESCRIPTION

EA Engineering, Science, and Technology, Inc., PBC (EA) has performed a Phase I Environmental Site Assessment (ESA) of a portion of the Masalog Ammunition Depot located on the eastern side of Tinian, Commonwealth of the Northern Mariana Islands (CNMI), within a plot of CNMI Public Land consisting of 429 hectares (1,085 acres). The Masalog Ammunition Depot consists of open revetments and covers an elongated area of approximately 96 hectares (237 acres) along the eastern portion of the island. The portion of the Masalog Ammunition Depot to be investigated as part of this Phase I ESA (the "subject site") is 12 hectares (30 acres) in size, and was constructed between August 1944 and August 1945.

The subject site is located in a rural area. The subject site location, as depicted on a U.S. Geological Survey (USGS) Topographic Map, is shown on Figure 1 (Appendix A). An aerial photo of the subject site is shown on Figure 2 (Appendix A).

# 1.2 PURPOSE

The purpose of the Phase I ESA is to identify, to the extent feasible pursuant to the process prescribed in ASTM International (ASTM) E1527-13, recognized environmental conditions (RECs) in connection with the property. An REC means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment, (2) under conditions indicative of a release to the environment, or (3) under conditions that pose a material threat of a future release to the environment. The ASTM E1527-13 practice constitutes all appropriate inquiries (AAIs) for the purpose of Landowner Liability Protections, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This report reflects the observations, information, and data collected by EA during the period of 15 December 2015 to 15 March 2016. Supporting documentation is provided in the appendixes as follows:

- Appendix A Figures
- Appendix B Photograph Log
- Appendix C Historical Research Documentation
- Appendix D-Regulatory Records Documentation
- Appendix E Supporting Documentation
- Appendix F Resumes.

# **1.3 DETAILED SCOPE OF SERVICES**

EA prepared this Phase I ESA in accordance with EA Proposal No. 0741164, dated 9 December 2014 and DPL Contract No. 600431-OC (DPL-15-003), under U. S. Environmental Protection Agency (USEPA) Grant ID No. BF-00T27401-0.

This Phase I ESA was performed in accordance with ASTM E1527-13 (Standard Practice for ESAs: Phase I ESA Process) and consists of a review of current and historic activities and conditions at the subject site and surrounding properties, including a non-intrusive visual inspection of the subject site; review of local, state, and federal regulatory database records; review of available historic records; and a survey of adjacent land uses. The site reconnaissance does not address non-ASTM considerations such as asbestos, lead-based paint, drinking water quality, or radon, nor does it include sampling or chemical analysis of soils, surface water, or groundwater or an intensive examination of facility hazards (compliance audit).

# 1.4 LIMITING CONDITIONS, DELETIONS, AND DEVIATIONS

None.

#### 1.5 LIMITATIONS AND EXCEPTIONS

EA does not warrant that there are no toxic or hazardous materials or contamination, nor does EA accept any liability if such are found at some future time, or could have been found if sampling or additional studies were conducted. EA does not assume responsibility for other environmental issues that may be associated with this subject site.

In view of the rapidly changing status of environmental laws, regulations, and guidelines, EA cannot be responsible for changes in laws, regulations, or guidelines that occur after the study has been completed and that may affect the subject site.

This report was prepared for the CNMI Department of Public Lands (DPL) by EA and is based in part on third party information not within the control of CNMI DPL or EA. While it is believed that the third party information contained herein will be reliable under the conditions and subject to the limitations set forth herein, neither CNMI DPL nor EA guarantee the accuracy thereof.

#### **1.6 SIGNIFICANT ASSUMPTIONS**

In expressing the opinions stated in this report, EA has exercised the degree of skill and care ordinarily exercised by a reasonable prudent Environmental Professional in the same community and in the same timeframe given the same or similar facts and circumstances. EA assumes that the client, as set forth in the contractual agreement, is also the User as defined by ASTM E1527-13. Documentation and data provided by the User, designated representatives thereof, or other interested third parties, or from the public domain, and referred to in the preparation of this assessment, were used and referenced. Consequently, EA assumes no responsibility or liability for the accuracy of such documentation or data.

The independent conclusions in this report represent EA's professional judgment based on information and data available to EA during the course of this assignment. The factual information regarding operations, conditions, and test data provided by the User or their representative are assumed to be correct and complete. The conclusions presented are based on

the data provided and reviewed, observations, and conditions that existed on the date of the onsite visit.

# 1.7 SPECIAL TERMS AND CONDITIONS

None.

#### **1.8 USER RELIANCE**

This report is exclusively for the use and benefit of CNMI DPL as shown on the cover page of this report. This report is not for the use or benefit of, nor may it be relied upon by, any other person or entity without the advance written consent of EA.

# 2. USER PROVIDED INFORMATION

A copy of the ASTM E1527-13 User Questionnaire was submitted to Ms. Rachel Roque and Mr. Tim Lang (DPL Consultant) for the purpose of requesting information in the following sections. Ms. Roque completed the questionnaire and returned it to EA. A copy of the completed questionnaire is included in Appendix E.

# 2.1 REASON FOR PERFORMING THE PHASE I ESA

According to Ms. Roque, this Phase I ESA is being performed to determine environmental conditions at the subject site for potential development.

# 2.2 ENVIRONMENTAL CLEANUP LIENS

Ms. Roque indicated that, to the best of her knowledge, she is not aware of any environmental cleanup liens against the subject site that are filed or recorded under federal, tribal, state, or local law.

# 2.3 ACTIVITY AND USE LIMITATIONS

Ms. Roque indicated that, to the best of her knowledge, she is not aware of any activity and use limitations (AULs), such as engineering controls, land use restrictions or institutional controls that are in place at the subject site and/or have been filed or recorded against the subject site under federal, tribal, state or local law.

# 2.4 SPECIALIZED KNOWLEDGE OR EXPERIENCE

Ms. Roque indicated that she does not have any specialized knowledge or experience of the operations conducted on the subject site or nearby properties.

# 2.5 RELATIONSHIP OF PURCHASE PRICE TO FAIR MARKET VALUE

Ms. Roque indicated that the reason for the Phase I ESA is not related to a purchase of the subject site; therefore, the relationship of the purchase price to fair market value is not applicable.

# 2.6 COMMONLY KNOWN OR REASONABLY ASCERTAINABLE INFORMATION

Ms. Roque was questioned regarding commonly known or reasonably ascertainable information about the subject site that would help the Environmental Professional to identify conditions indicative of releases or threatened releases such as past uses of the subject site, specific chemicals that are present or once were present at the subject site, spills or other chemical releases that have taken place on the subject site, or any environmental cleanups that have taken place at the subject site. Ms. Roque indicated that although she was not aware of all past uses, she was aware that it was used during WWII for ordnance storage with revetments.

#### 2.7 OBVIOUS INDICATORS OF CONTAMINATION

Ms. Roque indicated that the subject site and the adjacent sites were WWII ammunition storage areas.

#### 2.8 OTHER USER PROVIDED INFORMATION

No additional information was provided by the User as part of this Phase I ESA.

# 3. RECORDS REVIEW

# 3.1 PHYSICAL SETTING SOURCES

#### 3.1.1 Topography

The subject site is located on the USGS 1999 Tinian 7.5-minute topographic quadrangle map, as shown on Figure 1 in Appendix A. The elevation of the subject site is relatively flat at approximately 200-240 feet (ft) above mean sea level.

The nearest surface water feature shown on the topographic map is the Pacific Ocean located approximately 0.4 miles to the east of the subject site (Figure 2 in Appendix A).

#### **3.1.2** Soils

Review of the U.S. Department of Agriculture (USDA) Soil Survey of Tinian, dated 2014, indicates that the subject site is located in an area comprised of Chinen clay loam, Chinen very gravelly sandy loam, and Takpochao-Rock outcrop soil types with estimated slopes between 3 and 15 percent (Appendix E).

The Chinen soil series is considered to be a well-drained soil with shallow to medium runoff and moderate permeability.

The Takpochao-Rock soil series is considered to be a well-drained soil with medium to rapid runoff and moderate permeability (USDA Natural Resources Conservation Service 2016).

#### 3.1.3 Geology

Review of the Geologic Map of Tinian, published by the USGS and dated 2000, indicates that the subject site lies within the Mariana Limestone. The Mariana Limestone is of Pliocene to Pleistocene age. It is composed of fine to coarse-grained fragmented limestone. Small voids and caverns are common in surface exposures (USGS 2000) (Appendix E).

#### 3.1.4 Wetlands and Floodplain

Review of information from the U. S. Department of the Interior National Wetland Inventory Map of Tinian (Appendix E), indicated no wetland areas were located on the subject site. The nearest surface water to the subject site is the Pacific Ocean located approximately 0.5 miles to the east (U. S. Fish and Wildlife Service 2016).

In addition, the Federal Emergency Management Agency (FEMA) flood insurance maps (Appendix E) indicated the subject site is not located in a flood plain (FEMA 2006).

#### 3.1.5 Groundwater

The Commonwealth Utilities Corporation public system extracts water from one horizontal Maui-type well (Maui Well #2) located approximately 0.75 miles southwest of the subject site (Figure 4). Before Maui Well #2 was put into service, the public system extracted water from Maui Well #1. Maui Well #1 is currently out of service due to old equipment and difficulty obtaining repair parts (Department of the Navy 2015).

Depth to groundwater in the vicinity of the subject site is approximately 200 ft below ground surface. Groundwater is the potable water supply source for residents in Tinian (USGS 2000).

# **3.2 RECORD SOURCES**

A regulatory database report as typically provided by a third party vendor such as Environmental Data Resources, Inc. was not available for Guam; therefore, regulatory information pertaining to the subject site and the surrounding area was obtained via contacting the following agencies.

Furthermore, the following distances were used to assess potential for vapor migration to impact the subject site from offsite properties with impact from petroleum hydrocarbon contaminants of concern (COCs) and/or COCs included in Table X6.1 of the Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions (E2600-10). Petroleum hydrocarbon chemicals of concern are those volatile petroleum hydrocarbon compounds that are a subset of the COC list and that readily biodegrade to carbon dioxide or water by soil microbes in aerated environments.

- Upgradient Sites—528 ft (1/10 miles) for sites with petroleum hydrocarbon COCs, and 1,760 ft (1/3 miles) for sites with volatile or semivolatile COCs.
- Crossgradient Sites—528 ft (1/10 miles) for sites with petroleum hydrocarbon COCs, and 1,760 ft (1/3 miles) for sites with volatile or semivolatile COCs.
- Downgradient Sites—100 ft for all.

There are no vapor intrusion issues as there are no onsite structures, there are no known or reported releases of hazardous substances or petroleum products with the prescribed search distances and gradients, and groundwater is approximately 200 ft bgs.

# 3.2.1 Federal Regulatory Environmental Records

EA submitted a Freedom of Information Act (FOIA) request to the USEPA for information regarding petroleum storage and releases of hazardous materials and/or petroleum products or other environmental issues at the subject site.

USEPA indicated that a brief search of USEPA databases only came up with a Phase I ESA conducted in July 2014. A copy of that report was received from CNMI DPL and is summarized in Section 3.3.6.

In addition, a search on the USEPA Envirofacts website indicated that there are no USEPA Regulated Facilities within 1 mile of the subject site (Appendix D).

The Department of Defense (DoD) is responsible for cleaning up properties that were formerly owned, leased, possessed, or operated by DoD. Such properties are known as Formerly Used Defense Sites (FUDS). The Army is the executive agent for the program and the U.S. Army Corps of Engineers (USACE) is the organization that manages and executes the program. A FUDS inventory database is available online through the USACE. There are no FUDS sites within 1 mile of the subject site (USACE 2013) (Appendix D).

# 3.2.2 CNMI BECQ Regulatory Environmental Records

EA submitted a FOIA request to the CNMI Bureau of Environmental and Coastal Quality (BECQ) to obtain information regarding petroleum storage and releases of hazardous materials and/or petroleum products or other environmental issues at and near the subject site. Information from this request was still pending during report finalization.

EA will issue an addendum letter to the Client should any environmentally significant information be received from CNMI BECQ. Documentation of the FOIA request is presented in Appendix D.

# 3.2.3 CNMI Department of Fire and EMS

EA submitted a FOIA request to the CNMI Department of Fire and Emergency Medical Services (DFEMS), Tinian Fire Department regarding information regarding hazardous materials and/or chemical inventories and Emergency Planning and Community Right-to-Know Act records. Mr. Ignacio P. Kiyoshi, Resident Deputy Commissioner of the Tinian DFEMS indicated that the DFEMS had no information or records on file regarding the subject site. Documentation of the FOIA request is presented in Appendix E.

# **3.3 HISTORICAL USE INFORMATION**

During World War II (WWII), large quantities (estimated to be in the millions of pounds) of ammunition and ordnance were stored at the Masalog Ammunition Depot, including the portion which constitutes the subject site by the United States of America in anticipation for use during attack and impending invasion of Mainland Japan. Following WWII, much of this ordnance was left in their storage locations on the islands of Saipan and Tinian. Several ordnance storage sites on Tinian and Saipan consisted of strategically positioned earthen revetments including the Masalog Ammunition Depot which was designed to support of the B 29 bomber airfields on Tinian.

A memorandum from the United States Navy Department dated 15 February 1945 requests that the  $50^{\text{th}}$  Battalion erect ten 20 ft x 50 ft prefabricated magazines for the storage of fuses and pyrotechnics at the Masalog Bay Bomb Dump (Appendix E).

The volume of ordnance stored on the Masalog Ammunition Depot, including the portion which constitutes the subject site remains unknown. However, complete rounds, partially exploded munitions, and munitions and explosives of concern (MEC) from previous removal efforts (performed at the end of WWII), and burial pits containing discarded military munitions (DMM) are still suspected to be on the subject site. It is anticipated that over the past 70 years a percentage of the munitions have deteriorated and may have resulted in chemical munitions constituents being released to the environment as chemicals of potential concern to human and ecological receptors. A 2008 survey of remaining MEC conducted by AMPRO, LLC consultants indicates that MEC items are scattered about the property. The survey recommended a complete vegetation removal to assess the level of risk presented by the remaining MEC.

# 3.3.1 U.S. Geological Survey Topographic Maps

A 1944 topographic map from the U.S. Army Forces in the Central Pacific Area and a USGS topographic map dated 1999 were reviewed as part of this assessment. Copies of the topographic maps are presented in Appendix C. The results of this review are included in Table 1.

Date	Source	Subject Site	Adjacent Properties
1944	USAF	The subject site shows general	No information shown regarding adjacent
		topographic features and a Japanese railroad track transecting the site, likely	properties.
		used for sugar cane plantations.	
1999	USGS	The subject site is in a wooded area. A	Adjacent properties appear similar to the
		road runs through the southern and	subject site.
		eastern portions of the subject site.	

 Table 1 U.S. Geological Survey Topographic Review

# 3.3.2 Aerial Photographs

Aerial photographs dated 1945, 2003, 2005, 2008, 2013, and 2015 were reviewed as part of this assessment. Copies of the aerial photographs are presented in Appendix C. Observations made from the reviewed aerial photographs are presented in Table 2.

Date	Source	Subject Site	Adjacent Properties
1945	Don Farrell	Prefabricated magazines are visible as well as additional construction areas on and near the subject site.	Prefabricated magazines are visible north of the subject site. Other adjacent properties are covered with vegetation. Areas west of the subject site have been cleared.
2003	Google	The subject site is covered with heavy vegetation. A road is visible running through the eastern portion of the subject site.	The adjacent properties are covered with heavy vegetation. A road is visible northeast and southwest of the subject site.
2005	Google	The subject site is similar to the previous aerial photograph.	The adjacent properties are similar to the previous aerial photograph.
2008	AMPRO,	The subject site is covered with heavy	The adjacent properties are similar to the

 Table 2 Aerial Photograph Review

h				
Date	Source	Subject Site	Adjacent Properties	
	LLC	vegetation with a few cleared areas most likely due to the unexploded ordnance (UXO) survey. A road is visible running through the eastern portion of the subject site.	previous aerial photograph.	
2013	Google	The subject site appears similar to the previous aerial photograph.	The adjacent properties are similar to the previous aerial photograph.	
2015	Google Earth	The subject site appears similar to the previous aerial photograph.	The adjacent properties are similar to the previous aerial photograph.	

#### Table 2 Aerial Photograph Review

#### **3.3.3** Fire Insurance Maps

According to the Library of Congress, no Sanborn fire insurance maps were available for the subject site or the adjoining properties.

#### 3.3.4 Recorded Land Title Records

No chain-of-title report for the subject site was provided by the User for review as part of this Phase I ESA. In addition, no environmental lien and AUL search for the subject site was provided by the User for review as part of this Phase I ESA.

The property is owned by CNMI DPL. In order to fulfill the requirements of the ASTM E1527-13 Phase I ESA Standard, a formal review of title and judicial records for environmental liens and activity and use limitations associated with the subject site would be required of the User.

# 3.3.5 Zoning/Land Use Records

Review of zoning and land use information available from the CNMI DPL identified that the subject site is currently zoned as undesignated public land, which is defined as public lands without a specified use (Department of the Navy 2015).

# **3.3.6 Prior Environmental Reports**

# 3.3.6.1 Unexploded Ordnance Survey

A UXO survey was completed in 2008 for the subject site (AMPRO, LLC 2008). The UXO survey found a significant number of ordnance and components located within the search area. Ordnance items found included 500 pound incendiary bombs, 10 pound incendiary bomblets, fragmentation bombs, incendiary cluster adapters, and components and other miscellaneous ordnance components. Based on the ordnance items encountered and surveyed, AMPRO, LLC concluded the area was used for primarily incendiary type US air dropped ordnance. Several of the revetments showed what appear to be detonation holes within and immediately outside the revetment structures. AMPRO, LLC interpreted these signs as evidence of attempts to dispose of the ordnance by "blowing it in place" which was a standard method of disposal used at the end of WWII.

Based on the results of the survey and the historical information, AMPRO, LLC concluded this site is contaminated with unexploded ordnance which will be encountered during the construction phase.

Recommendations made by AMPRO, LLC included:

- Monitoring for the presence of UXO during the Clearing and Grubbing phase of site preparation.
- DO NOT BURN any rubble piles as any UXO within may detonate upon exposure to heat and flame.
- A UXO Clearance should be initiated upon completion of the Clearing and Grubbing construction phase.

#### 3.3.6.2 Phase I ESA

A Phase I ESA was conducted in 2014 by Allied Pacific Environmental Consulting for the 292-acre Masolog Site. The Masolog Site is a narrow strip of land along the shoreline along the Pina Plateau (CNMI 2014). The following RECs were found at the site:

- UXO Historical records of prior land use as well as historical photographs and common knowledge identified the project site as the former Ordnance dump for munitions. During the site investigation, UXO were encountered including: 15 AN/M-65 1,000pound general purpose bombs, an AN/M-57 250-pound general purpose bomb, a MK 53 350-pound depth bomb, and a suspected anti-tank landmine.
- Former Military Activities on Site Historical records and photographs, the types of structures and presence of UXO at the site, along with common knowledge establish that DoD activities were conducted on the subject site.

# 4. SITE RECONNAISSANCE

# 4.1 METHODOLOGY AND LIMITING CONDITIONS

The site is located within the former Masalog Ammunition Depot on Tinian, CNMI. This particular site has not been widely investigated. It is known that the site had ordnance stockpiles, but the nature and extent of the MEC is unknown. A UXO survey for the general area was completed in 2008 by AMPRO, LLC. A site visit/reconnaissance and interviews were conducted during two days, 4 and 5 January 2016 by Mr. Robert Shambach of EA and Mr. Carl Lindlau of Unitek Environmental Guam, Inc. (Unitek). No representative from the DPL was on site.

Weather conditions at the time of the assessment were partly cloudy with temperatures in the high 80's degrees Fahrenheit for both days.

#### 4.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The subject site is located in a rural area.

#### 4.3 CURRENT USE OF THE PROPERTY

The subject site is currently vacant.

#### 4.4 INTERIOR OBSERVATIONS

As there were no encountered structures during the site reconnaissance, no interior observations were made.

#### 4.5 EXTERIOR OBSERVATIONS

On 4 January 2016, EA and Unitek personnel mobilized to Masalog Ammunition Depot, Pina, Tinian to conduct the site visit and reconnaissance of the subject site. Personnel arrived at the subject site at 9:00 am for a site brief and safety meeting. Unitek personnel were on site to perform MEC avoidance during the site walk. The reconnaissance commenced at the northeastern portion of the subject site and a meandering path was performed across the former roadways and open revetments (Figure 5 and Appendix B). In the afternoon, the southcentral portion of the subject site, north of the access road was investigated. Approximately one-third of the subject site was observed by meandering through the subject site. The path and areas of vegetation variances were recorded with Global Positioning System (GPS) coordinates. Two of the parallel former roadways were identified north of the current roadway and several open revetments were observed and recorded with GPS (Figure 5). Metallic items located were on or near the ground surface and most of the items occurred in and around the observed revetments. No visible evidence was observed during the site reconnaissance of any prefabricated magazines or quonset huts. Most metallic items were munitions-related debris and various bomb components. The items were not an explosive hazard but did resemble parts of incendiary bombs (Appendix B Photo Log, Photo 12). Other mechanical parts and scrap metal were located throughout the subject site (Photo 13). The field visit and site walk were completed at 4:00 pm and personnel exited the subject site.

On 5 January 2016, EA and Unitek personnel arrived on site at 9:00 am for a site brief and safety meeting. The portion of the subject site south and east of the current access road was investigated for any signs of munitions and hazardous materials. The corner survey marker in the southern portion of the subject site was observed, cleared, and marked with survey flagging tape (Appendix B, Photo 14). GPS locations were also recorded. Survey stakes marked with pink flagging tape were observed along the southeastern boundary of the subject site, approximately every 100 ft. Areas of vegetation variances were recorded with GPS coordinates (Appendix B, Photo 11). Metallic items located were on or near the ground surface and most of the items occurred in and around the observed revetments. Most metallic items were munitions debris and various bomb components. The items were not an explosive hazard. Other mechanical parts and scrap metal were located throughout the southeastern portion of the site. The field visit was completed at 11:20 am and personnel exited the subject site.

A copy of Unitek's Field Operations Report is included in Appendix E.

# 4.6 CURRENT USE OF ADJOINING PROPERTIES

The adjacent properties are currently undeveloped.

# 5. INTERVIEWS

Documentation of the interviews conducted as part of this investigation is contained in Appendix E.

#### 5.1 OWNER

Additional information obtained via an interview with Ms. Roque with CNMI DPL, subject site owner, has been incorporated in Section 2 of this report. A copy of the record of communication is included in Appendix E. In addition, pertinent information obtained from a prior Phase I ESA report has been incorporated and referenced in Section 3.3.6 of this report.

#### 5.2 **KEY SITE MANAGER**

The subject site is currently undeveloped land and, therefore, no key site manager was available to be interviewed.

#### 5.3 **OPERATOR/OCCUPANT**

The subject site is currently undeveloped land and, therefore, no current operators or occupants were available to interview.

#### 5.4 STATE AND/OR LOCAL GOVERNMENT OFFICIALS

Additional information obtained via an interview with Ms. Roque with CNMI DPL, subject site owner, has been incorporated in Section 2 of this report. A copy of the questionnaire is included in Appendix E.

#### 5.5 ADDITIONAL INTERVIEWS

None.

# 6. EVALUATION

#### 6.1 FINDINGS

The findings presented below identify known or suspected De Minimis conditions, historical RECs (HRECs), controlled RECs (CRECs), and RECs.

#### 6.1.1 De Minimis Conditions

No De Minimis conditions were identified.

#### 6.1.2 Historical Recognized Environmental Conditions

No HRECs were identified.

#### 6.1.3 Controlled Recognized Environmental Conditions

No CRECs were identified.

#### 6.1.4 Recognized Environmental Conditions

The following RECs were identified:

- There is a potential for a significant number of US ordnance and components within the subject site.
- It is anticipated that over the past 70 years a percentage of the munitions deteriorated and may have resulted in the release of chemical munitions constituents to the environment as chemicals of potential concern to human and ecological receptors.

# 6.2 **OPINION**

Based on the results of this Phase I ESA, including the results of the site reconnaissance, interviews, and records review, EA is of the opinion that there is a potential that the identified RECs have impacted the environmental integrity of the subject site and further investigation is required to address them.

#### 6.3 CONCLUSIONS

EA has performed a Phase I ESA in conformance with the scope and limitations of ASTM E1527-13 of the Masalog Ammunition Depot, the property. Any exceptions to, or deletions from, this practice are described in Section 1.4 of this report. This Phase I ESA has revealed the following RECs:

- There is a potential for a significant number of US ordnance and components within the subject site.
- It is anticipated that over the past 70 years a percentage of the munitions deteriorated and may have resulted in chemical munitions constituents being released to the environment as chemicals of potential concern to human and ecological receptors.

#### 6.4 DATA GAPS

A data gap is defined by ASTM E1527-13 as a lack of or inability to obtain information required by this practice despite good faith efforts by the Environmental Professional to gather such information. Data gaps may result from the incompleteness in any of the activities required by this practice including, but not limited to, the site reconnaissance, interviews, and historical research. Failure to achieve the historical research objectives identified in the Standard is termed a data failure and is a type of data gap.

Data Gap **Significance and Rationale Reason for Occurrence** Historical data gap A large gap between historical This data gap was not considered significant. aerials/topographic maps. Based on the results of this Phase I ESA, the identification of additional historical sources is unlikely to lead to the identification of additional RECs. Information is No response received with regard As long as information is provided, this data gap is insignificant. Information has been received to the subject site. pending from the CNMI DEQ from a number of other sources, and based on the results of this Phase I ESA it is unlikely that information from the CNMI DEQ would lead to identification of additional RECs.

The following data gaps were identified:

# EA Engineering, Science, and Technology, Inc., PBC

# 6.5 SIGNATURE(S) OF THE ENVIRONMENTAL PROFESSIONAL(S)

"I declare that, to the best of my professional knowledge and belief, I meet the definition of an Environmental Professional as defined in Section 312.10 of 40 Code of Federal Regulation (CFR) 312." "I have the specific qualifications based on education, training, and expertise to assess a property of the nature, history, and setting of the subject property. I have developed and performed the All Appropriate Inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."

Robert Shambach, P.G. Environmental Professional

A resume for personnel assigned to this project: Mr. Robert Shambach, P.G. is presented in Appendix F.

7/2016

# 7. NON-SCOPE CONSIDERATIONS

#### 7.1 **RECOMMENDATIONS**

The following recommendation, though not required under the ASTM E 1527-13 standard, is provided as a courtesy to CNMI DPL.

• It is the professional opinion of EA that further investigation is warranted in the form of a Phase II ESA to address the identified RECs at the subject site.

# 7.2 ADDITIONAL SERVICES

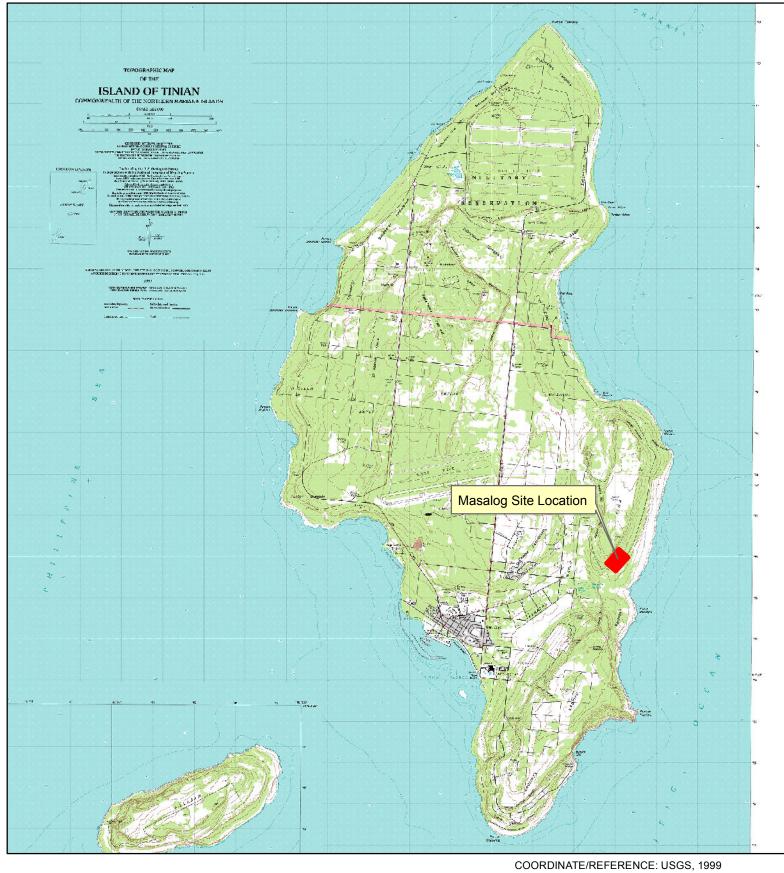
No additional services were requested by the User or performed as part of this Phase I ESA.

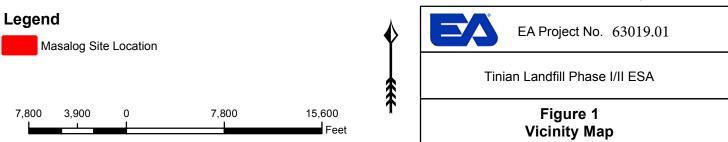
#### 8. REFERENCES

- AMPRO, LLC. 2008. Unexploded Ordnance Survey, Proposed Tinian Landfill Site, Tinian, CNMI. November.
- Commonwealth of the Northern Mariana Islands (CNMI) Bureau of Environmental and Coastal Quality (BECQ). 2014. *Phase I Environmental Site Assessment, CNMI BECQ Tinian Masolog Site.* July.
- Department of the Navy. 2015. Draft Environmental Impact Statement/Overseas Environmental Impact Statement for Commonwealth of the Northern Mariana Islands Joint Military Training. April.
- Federal Emergency Management Agency. 2006. Flood Insurance Rate Map Panel 6900000180C. Revised April 3.
- Unitek Environmental Guam, Inc. 2016. Field Operations Report, Munitions and Explosives of Concern Anomaly Investigation Support, Masalog Ammunition Depot. January.
- United States Army Corp of Engineers. 2013. Northern Marianas FUDS Inventory. Dated September 30, 2013.
- United States Department of Agriculture Natural Resources Conservation Service. 2016. Web Soil Survey accessed January 21.
- United States Fish and Wildlife Service. 2016. National Wildlife Inventory accessed January 21.
- United States Geologic Society. 2000. Ground-water resources of Tinian, Commonwealth of the Northern Mariana Islands.

Appendix A

Figures







## Legend

Site Boundary



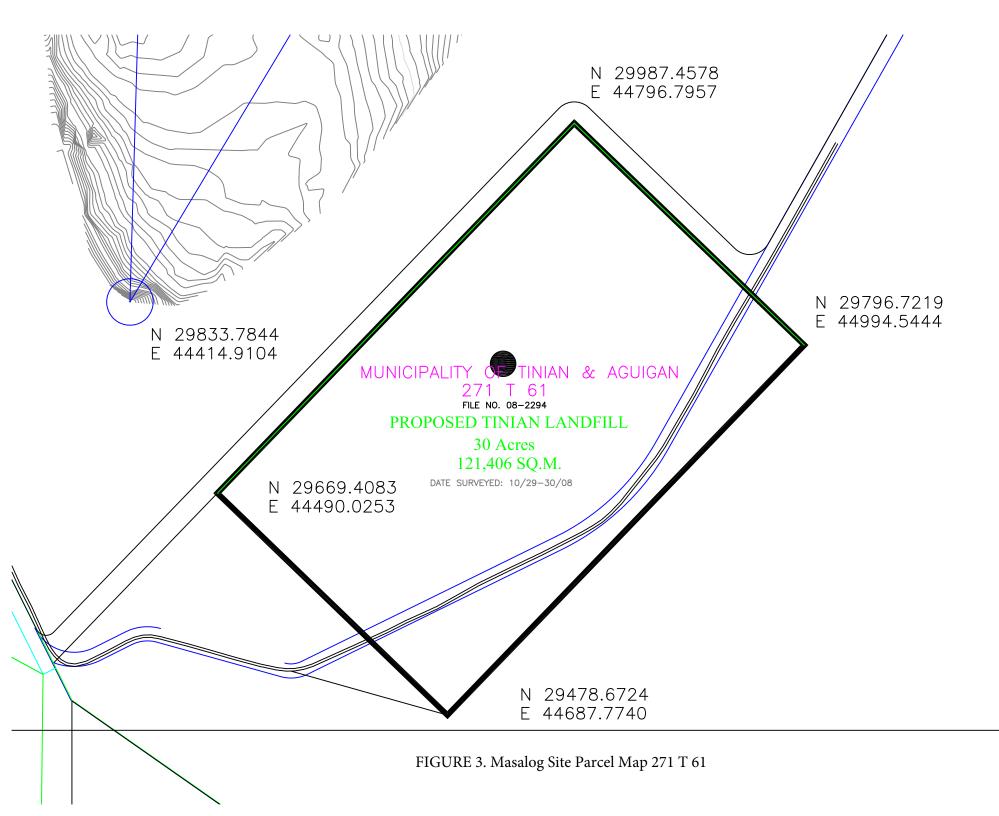
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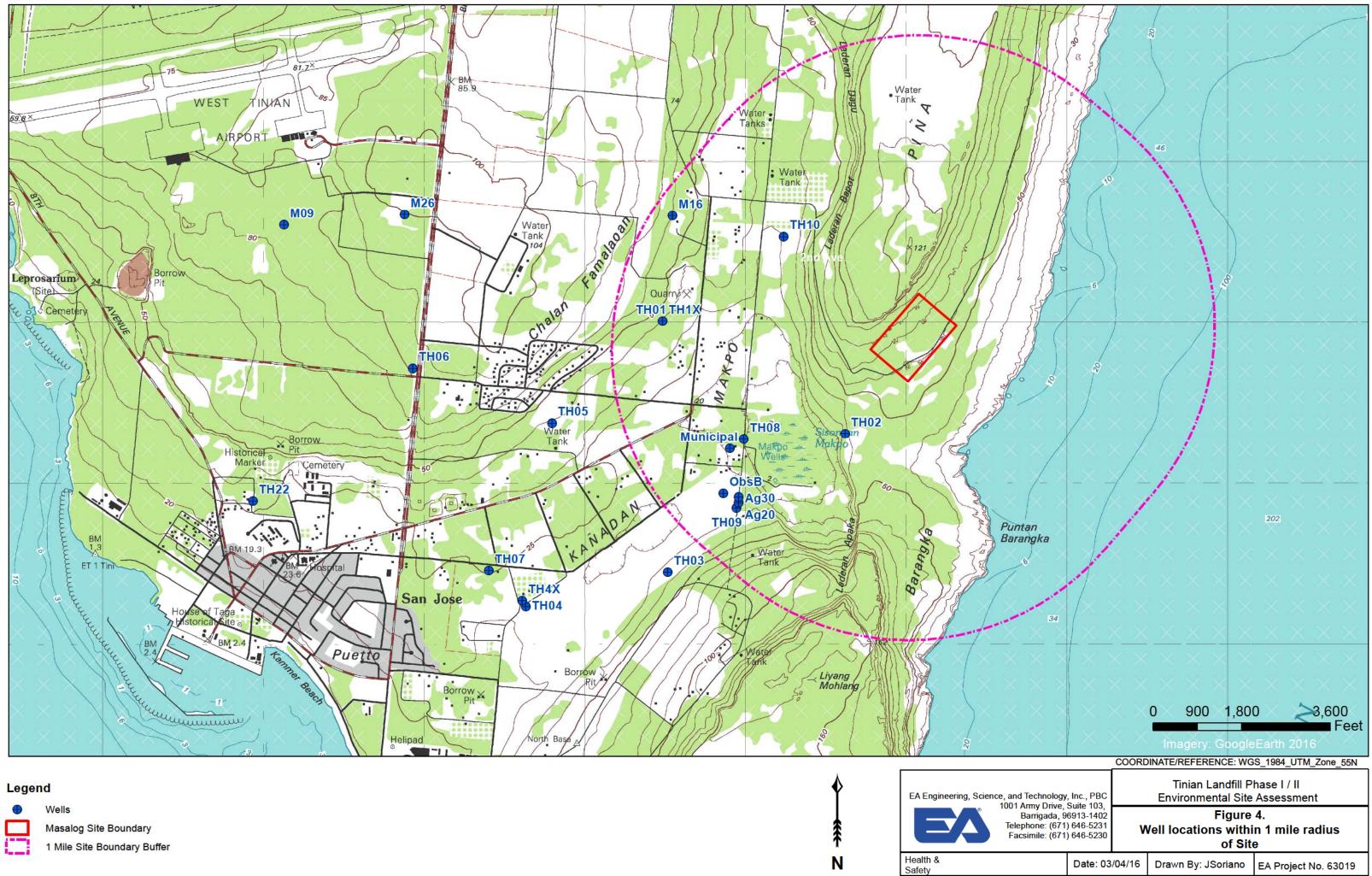
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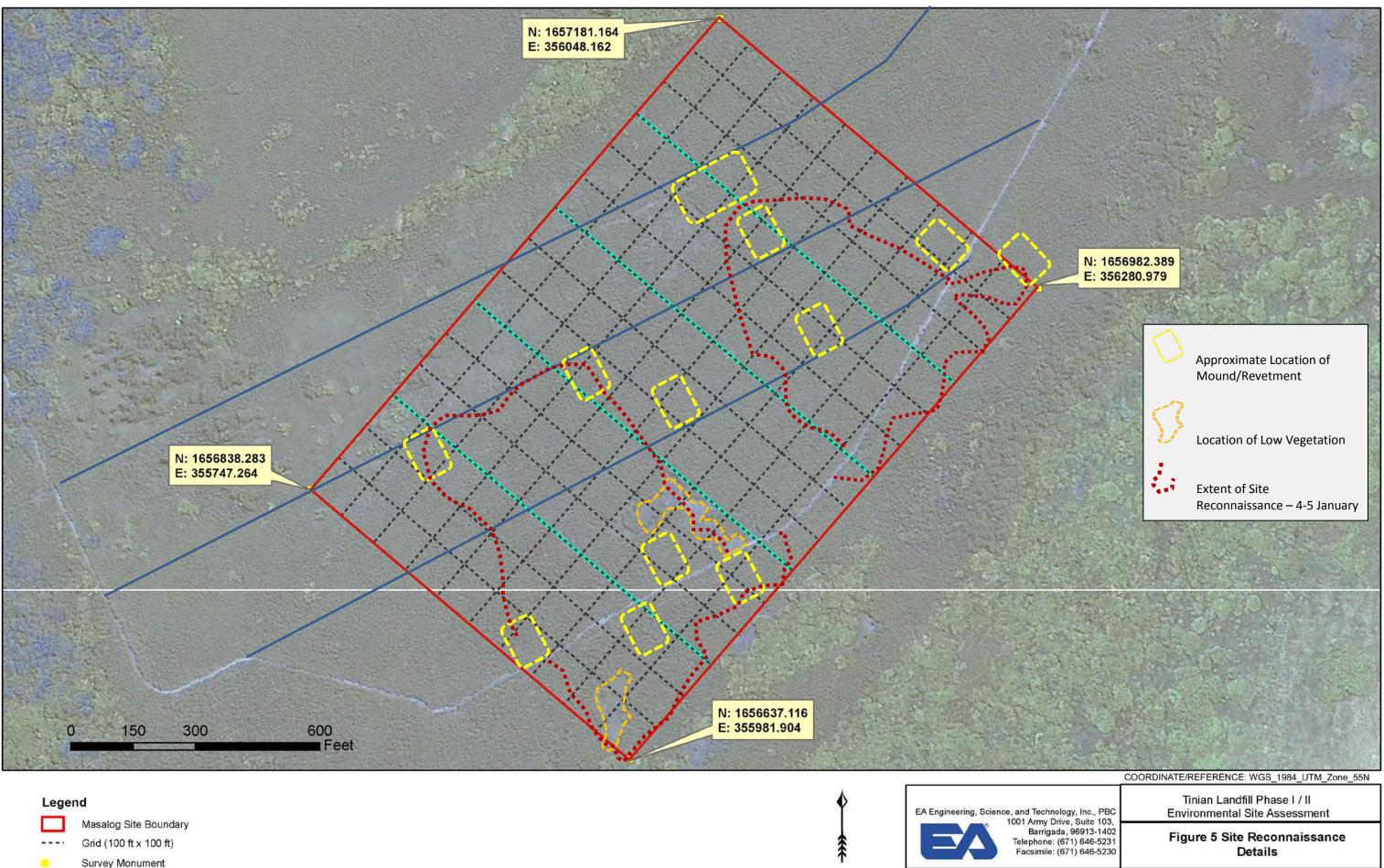
COORDINATE/REFERENCE: WGS\_1984\_UTM\_Zone\_55N

Tinian Landfill Phase I / II Environmental Site Assessment Figure 2 General Location





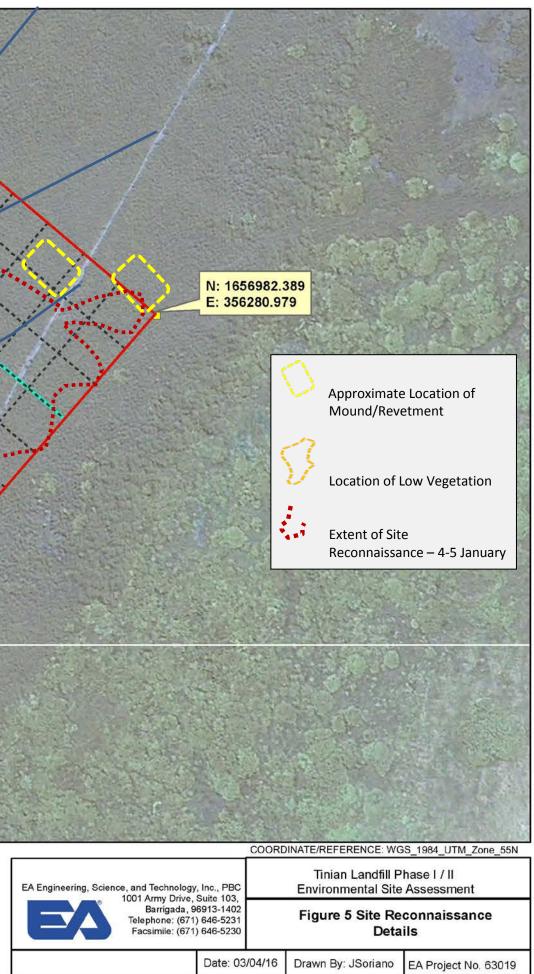




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Survey Monument

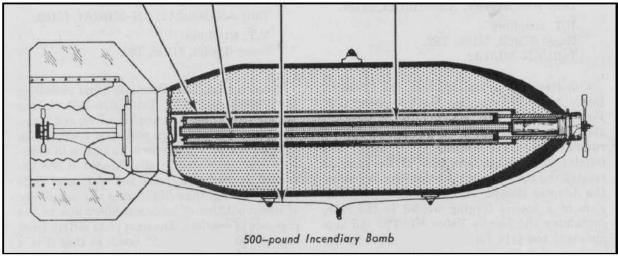


Appendix B

Photograph Log



US 500 LB Incendiary Bomb

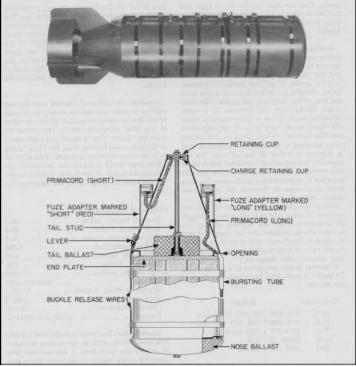


500 LB Incendiary Bomb Diagram

Photo 1. 500 LB MEC Found On Site (AMPRO, LLC November 2008)



US Incendiary Bomb Cluster Adapter with Incendiary Bomblets



Incendiary Bomb Cluster Adapter Components

Photo 2. Incendiary Bomblet MEC Found On Site (AMPRO, LLC November 2008)



Photo 3. Looking west on access road from near the east end of the site (6 March 2015)



Photo 4. Looking west on access road from near the east end of the site (4 January 2016)



Photo 5. Looking west into the site from the road near the central area of the site (6 March 2015)



Photo 6. Earth berm (approximately 8 ft. high) adjacent to the road in the western section of the site (6 March 2015)



Photo 7. Concrete in ground structure (approximately 10 ft. x 10 ft.) adjacent to the road in the central area of the site (6 March 2015)



Photo 8. Site vegetation near the east end looking from the road (6 March 2015)



Photo 9. Elongated earth berm adjacent to the road (6 March 2015)



Photo 10. Site vegetation near the east end looking from the road (6 March 2015)



Photo 11. Low vegetation area south of road near the southern control survey marker (5 January 2016)



Photo 12. Munitions-relate metallic debris (5 January 2016)



Photo 13. Heavy equipment-relate metallic debris (5 January 2016)



Photo 14. Southern corner survey control marker (5 January 2016)

Phase I Environmental Site Assessment Report Masalog Ammunition Depot, Pina, Tinian

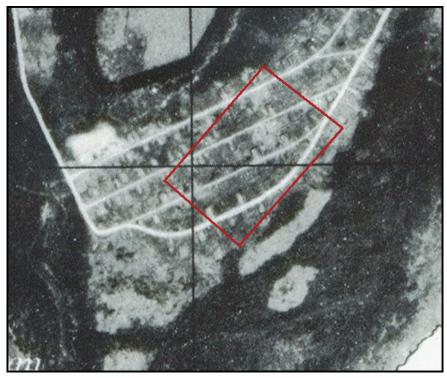
# Appendix C

## **Historical Research Documentation**

- C.1 Aerial Photographs
- C.2 Historical Maps

Appendix C.1

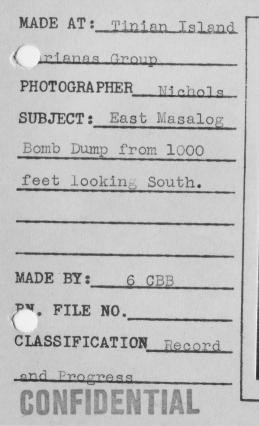
**Aerial Photographs** 



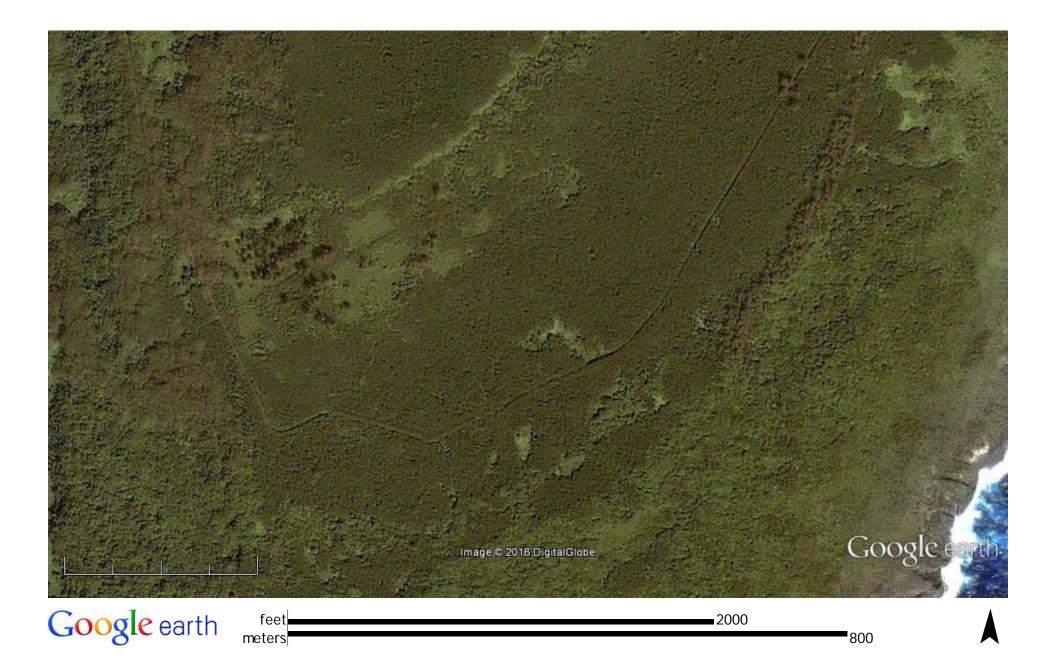
## 6TH NAVAL CONSTRUCTION BRIGADE

DATE 6/18/45 NO. 6 CBB E10-34

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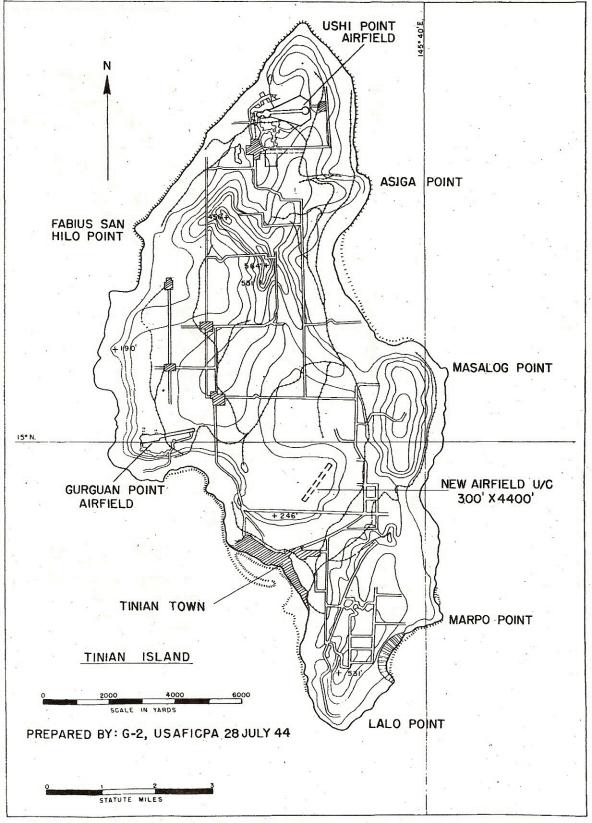


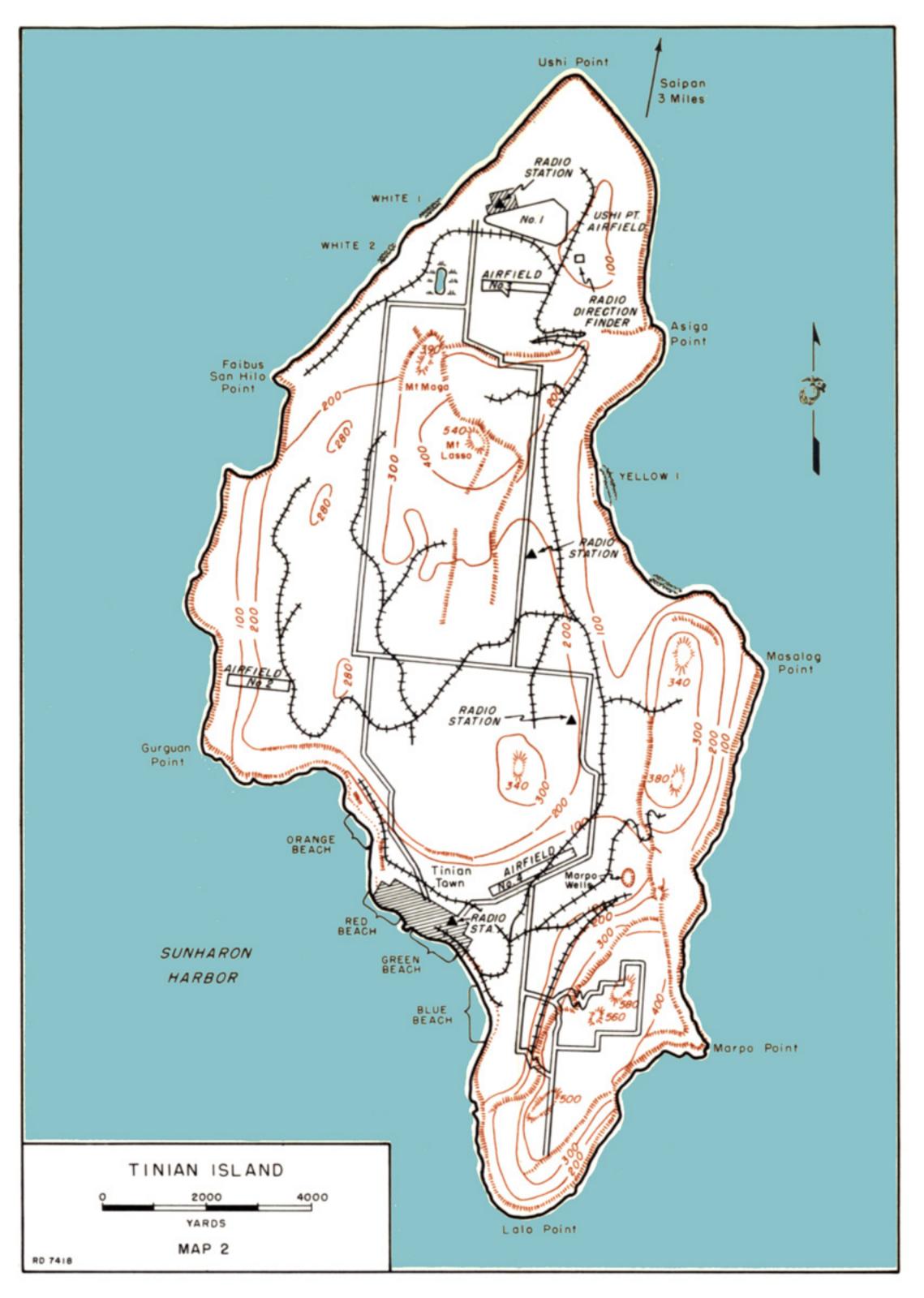


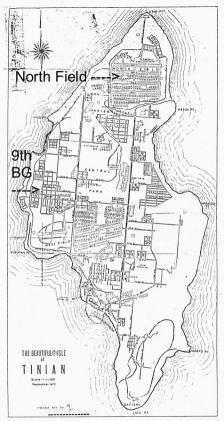


Appendix C.2

**Historical Maps** 









# Appendix D

**Regulatory Records Documentation** 



EA Engineering, Science, and Technology, Inc., PBC

1001 Army Drive, Suite 103 Barrigada, Guam 96913 Telephone: 671-646-5231 Fax: 671-646-5230 www.eaest.com

4 January 2016

Frank Rabauliman Division of Environmental Quality P.O. Box 501304 C.K., Saipan, MP 96950-1304

Re: File Review Request under FOIA

To Mr. Rabauliman:

EA Engineering, Science, and Technology, Inc., PBC (EA) is an environmental consulting firm submitting a Freedom of Information Act (FOIA) request on behalf of our Saipan client CNMI DPL, under the Brownfields Program. As part of the assessment, I am submitting a request for information pertaining to:

- State Recycling Directory (SWRCY) list
- State Brownfields list
- Federal Brownfields list
- State National Pollutant Discharge Emissions System (NPDES) Wastewater Permitting list
- State Permitting and Facility Information (AIRS) list
- State Historical Underground Storage Tank (UST) list
- State Historical Leaking Underground Storage Tank (LUST) list
- State Aboveground Storage Tank (AST) list
- State Drycleaners list
- State Historical Cleaners list
- State Lead Inspection list

#### Specific Site of Interest:

Masalog Ammunition Depot, Pina, Tinian, CNMI See Figures 1 and 2

Please use DPL Brownfields on all written correspondence or responses forwarded to our offices in reference to this request. Please respond within ten (10) business days of this request. Any written responses should be sent to the following address:



Robert Shambach P.G. EA Engineering, Science, and Technology, Inc., PBC 1001 Army Drive, Suite 103 Barrigada, Guam 96913

Please contact myself as soon as possible at 671-646-5231 ext. 505 or by email at bshambach@eaest.com with any or with information regarding available files.

That Shulal

Robert Shambach Guam Operations Manager

Attachments: Figures 1 and 2



1001 Army Drive, Suite 103 Barrigada, Guam 96913 Telephone: 671-646-5231 Fax: 671-646-5230 www.eaest.com

January 26, 2016

US EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (415) 972-3040

*Via Facsimile: 671-646-5230* Re: File Review Request under FOIA

To Whom This May Concern:

EA is an environmental consulting firm submitting a Freedom of Information Act (FOIA) request on behalf of our Saipan client CNMI DPL, under the Brownfields Program. As part of the assessment, I am submitting a request for information pertaining to:

- Federal Department of Defense (DOD) list
- Federal Formerly Used Defense Sites (FUDS) list
- Federal Brownfields list
- Federal Superfund (CERCLA) Consent Decrees (CONSENT) list
- Federal Record of Decision (ROD) list
- Federal Uranium Mill Tailings Site (UMTRA) list
- Federal Open Dump Inventory (ODI) list
- Federal Toxic Chemical Release Inventory System (TRIS) list
- Federal Toxic Substances Control Act (TSCA) list
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)/TSCA Tracking System (FTTS) list
- Federal FFTS Inspections and Enforcements list
- Federal Historical FFTS
- Federal Section 7 Tracking System (SSTS) list
- Federal CERCLA Lien Information
- Federal Polychlorinated Biphenyl Activity Database (PADS) list
- Federal Radiation Information (RADINFO) list
- Federal Clandestine Drug Labs (CDL) list
- Federal Integrated Compliance Information System (ICIS) list
- Federal Land Use Control Information System (LUCIS) list

- Federal Department of Transportation, Office of Pipeline Safety (DOT OPS) Incident and Accident Data list
- Federal Material Licensing Tracking System (MLTS) list
- Federal Mines Master Index File (MINES) list
- Federal Facility Index System (FINDS) list
- Federal RCRA Administrative Action Tracking System (RAATS) list
- Federal Biennial Reporting System (BRS) list
- Federal National Priorities List (NPL) list
- Federal Proposed NPL list
- Federal Delisted NPL list
- Federal NPL Liens list
- Federal Comprehensive Environmental Response, Cleanup, and Liability Information System (CERCLIS) list
- Federal CERCLIS-No Further Remedial Action Planned (NFRAP) list
- Federal Resource Conservation and Conservation Act (RCRA) Corrective Action Sites (CORRACTS) list
- Federal RCRA non-CORRACTS TSD list
- Federal RCRA-generator list
- Federal Emergency Response Notification System (ERNS) list
- Federal Institutional Controls list
- Federal Engineering Controls list
- State Recycling Directory (SWRCY) list
- State Brownfields list
- State National Pollutant Discharge Emissions System (NPDES) Wastewater Permitting list
- State Permitting and Facility Information (AIRS) list
- State Historical UST list
- State Historical LUST list
- State Aboveground Storage Tank (AST) list
- State Drycleaners list
- State Historical Cleaners list
- State Lead Inspection list
- State Hazardous Waste Sites (SHWS) list
- State Solid Waste Facilities/Landfills (SWF/LF) list
- State Oil Control Program Cases (OCPCASES) list
- State Underground Storage Tank (UST) list
- State Leaking Underground Storage Tank (LUST) list

- State Voluntary Cleanup Program (VCP) list
- Institutional Control list
- Indian Reservation list
- Indian LUST list
- Indian UST list

Specific Site of Interest:

Masalog Ammunition Depot, Pina, Tinian, CNMI See Figures 1 and 2

Please use DPL Brownfields on all written correspondence or responses forwarded to our offices in reference to this request. Please respond within ten (10) business days of this request. Any written responses should be sent to the following address:

Robert Shambach P.G. EA Engineering, Science, and Technology, Inc., PBC 1001 Army Drive, Suite 103 Barrigada, Guam 96913

Please contact myself as soon as possible at 671-646-5231 ext. 505 or by email at bshambach@eaest.com with any or with information regarding available files.

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Robert Shambach Guam Operations Manager

Attachments: Figures 1 and 2

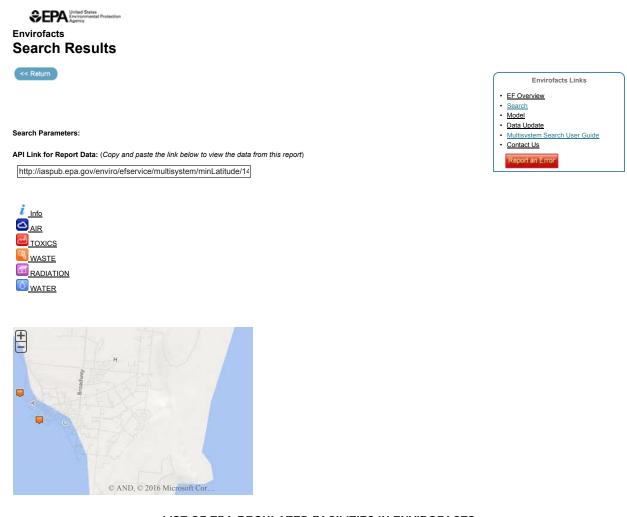
## Phase 1 ESA

Communication Record Form

Client	CNMI DPL
Location	Masalog Ammunition Depot, Pina, Tinian
Site Owner	
Site Legal Description	
Date	February 18, 2016
Time	5:36 pm
Person(s) Contacted	Stephen Southern
Contact Phone Number(s)	415-972-3215
Person(s) Making Contact	Jennifer Trainor

### Notes:

Mr. Southern called regarding the USEPA FOIA request. He stated that after a brief search of EPAs databases he found only one report, a Phase I ESA dated July 2014, completed by Allied Environmental.



### LIST OF EPA-REGULATED FACILITIES IN ENVIROFACTS

FACILITY INFORMATION						AFS	ACRES		BR	CERCLIS
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Total Number of Facilities Retrieved: 2

Appendix E

**Supporting Documentation** 



### PROPERTY OWNER/USER PRE-SURVEY QUESTIONNAIRE: PHASE I ENVIRONMENTAL SITE ASSESSMENT

EA has been retained to conduct a Phase I Environmental Site Assessment (ESA) of the following property. The Phase I ESA will involve site observations, interviews, and a review of available documentation. To ensure the success of the assessment, and in accordance with the Scope of Work for this assessment, we request that you complete this questionnaire and return it by e-mail (bshambach@eaest.com) or fax at 671-646-5230to Mr. Bob Shambach within one business day of receipt.

			Date: Feb. 22, 2016
Name of person completing questionnaire:	Rachel M. Roque DPL Brownfields Grant – Program/Project Director	Company:	Department of Public Lands (DPL) – Property Owner
Length of association with property:	January 1, 1976	Phone Number:	670-234-3751/2
Property Name/Address	Tinian, Commonwealth of the	e Northern Mariana Isla	ands
Please check appropriate box(es):	Property Owner: XX	Use	

**Directions:** Please answer all questions to the best of your knowledge and in good faith. Mark the column corresponding to the appropriate response ("Y" = Yes; "N" = No; "U/NR" = Unknown). Additional details necessary to explain any yes or unknown responses should be provided in the "Comments" column.

	QUESTION		ESP	ONSE	COMMENTS
		Y	N	U/NR	
1	Are you aware of any pending, threatened, or past litigation relevant to hazardous substances of petroleum products in, on or from the property?		Х		
2	Are you aware of any pending, threatened, or past administrative proceedings relevant to hazardous substances or petroleum products in, on or from the property?			Х	
3	Are you aware of any notices from any governmental entity regarding any possible violation of environmental laws or possible liability relating to hazardous substances or petroleum products?			Х	
4	Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, state or local law?		Х		
5	Are you aware of any Activity and Use Limitations (AULs), such as engineering controls, land use restrictions or institutional controls that are in place at the site and/or have been filed or recorded in a registry under federal, tribal, state or local law?		X		
6	Do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business.		Х		
7	Does the purchase price being paid for this property reasonably reflect fair market value of the property? If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property?			Х	



### PROPERTY OWNER/USER PRE-SURVEY QUESTIONNAIRE: PHASE I ENVIRONMENTAL SITE ASSESSMENT MASALOG AMMUNITION DEPOT, PINA – TINIAN, CNMI

	QUESTION		RESPONSE			COMMENTS
			Y	N	U/NR	
8 Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional identify conditions indicative of releases or threatened releases? For example,		X				
	8A	Do you know the past uses of the property?	Х			I am not aware of all past uses, only that it was used during WWII that it was used for ordnance storage with revetments.
	8B	Do you know of specific chemicals that are present or once were present at the property?			Х	
8C Do you know of spills or other chemical releases that have taken place at the property?				Х		
	8D	Do you know of any environmental cleanups that have taken place at the property?		Х		
9	9 Based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?				Х	I have not been to the site physically. I only know that it and the adjacent sites were ammunition storage areas.

In addition to the above, are you aware of any of the following documents? If so, please provide copies to our Environmental Professional on the date of the on-site assessment:

1 - Environmental site assessment reports (i.e., Phase I, Phase II, tank testing results, radon, lead paint, or asbestos testing, etc.); Unknown for examples mentioned. UXO Survey conducted in 2008 (copy provided to EA Engineering, Science, and Technology.

2 - Environmental compliance audit reports; Unknown

3 - Environmental permits (for example, solid waste disposal permits, hazardous waste disposal permits, wastewater permits, NPDES permits, underground injection permits); Unknown

- 4 Registrations for underground storage tanks (USTs) and aboveground storage tanks (ASTs); No
- 5 Material safety data sheets; No
- 6 Community right-to-know plan; Unknown

7 - Safety plans; preparedness and prevention plans; spill prevention, countermeasure, and control plans; etc; No

8 - Reports regarding hydrogeological conditions on the property and surrounding area; Unknown

9 - Notices or other correspondence from any governmental agency relating to past or current violations of environmental laws with respect to the property or relating to environmental liens encumbering the property; Unknown

- 10 Hazardous waste generator notices or reports; No
- 11 Geotechnical studies; Unknown
- 12 Risk assessments; Unknown
- 13 Recorded Activity and Use Limitations (AULs) Unknown

Date: 1/5/2016 @ 3:2	5 pm EA Project No.: 63019.01
Communications with:	Historic Preservation Office; Gilbert Borja/Mike Lizama
Telephone No:	670-433-0220/0914
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach stopped by the Tinian Historic Preservation Office to speak with Gilbert Borja or Mike Lizama, but the HPO was closed due to administrative reasons. The POCs were not able to be reached for the remainder of the day. Should follow up with the HPO with a phone call from Guam. -------END------

Date: 1/6/2016 @103	0am EA Project No.: 63019.01
Communications with:	Tim Lang (TRL Consultants)
Telephone No:	670-287-6403
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach met with Tim Lang at his office on Beach Road. The purpose of the meeting was to provide an update to him and his client, CNMI Department of Public Lands (DPL), about Phase I progress and field visit at the site. Shambach explained about the just completed 2-day site reconnaissance and observations of the site. Shambach requested an update from Tim on the status of the Section 7 & Section 106 permit request to be completed by USEPA project manager, Noemi Emerick-Ford. Tim said that USEPA will submit the request for consultation with the federal agencies, but at this time he didn't know if it was completed or not. Shambach requested a copy of the 2014 Phase I ESA of the Masalog Ammunition Depot performed by APEC. An electronic copy of the report was provided. Review of schedule was completed and meeting ended at 1200pm.

Date: 1/4/2016 @ 830	Dam EA Project No.: 63019.01
Communications with:	Ray Cing, Tinian DPL
Telephone No:	670-285-0550; 670-433-9245
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach met with Ray Cing, point-of-contact at the Tinian DPL office. Shambach introduced himself and described what EA Engineering would be doing for the next 2 days. Ray was familiar with the site but really has nothing to do with the management of the site, that would be Rachel Roque in the Saipan office. Shambach asked for any site information or knowledge he or his staff may know about the site. He had nothing more than what we already have as he passes all information to the Saipan office and Rachel.

-----END-----

Date: 1/6/2016	EA Project No.: 63019.01
Communications with:	John Scott (AMPRO); Marshall Brown (AMPRO)
Telephone No:	671-789-7228
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach met with John Scott and Marshall Brown for breakfast at Shirley's Restaurant in Garapan, Saipan @ 730am. Since John's company, AMPRO, completed the 2008 UXO survey at the Masalog site it was good to have more insight to items found at the site and to get his perspective on site conditions. The 2008 field investigation and report was performed under contract to DPL. John provided electronic copies of historical maps, text, and figures from the 2008 report. He also mentioned that another good resource would be the Phase I ESA that APEC completed for the whole Masalog Ammunition Depot under contract to the CNMI Department of Environmental Quality (now BECQ). Point-of-contact for that report would be Ray Masga at BECQ. He also recommended that we contact the Historic Preservation Office on Tinian. During the field visit, the Tinian Police Department were the ones to respond to UXO/MEC concerns and at that time Ray Pangelinan was the director. Ray was the person that would do any reporting and recording of responses. Another good resource of information is Sam McPheters. His office is located on Middle Road (Saipan) above the Lizama Law Offices). John agreed to copy the 2008 files to a thumb drive. Some of the files may be MEC maps and response paperwork from the Tinian XRT (MEC response teams) -----END-----

Date: 1/5/2016 @ 21	5 pm EA Project No.: 63019.01
Communications with:	Mr. Ignacio P. Kiyoshi (Tinian DFEMS Director)
Telephone No:	670-433-7385
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach met with briefly with Mr. Kiyoshi to ensure that he received the FOIA dropped off at the office on 4 January 2016. He confirmed that he received the request and will process it in a timely manner. Shambach explained to him what type of information is being requested and why we need it. Also there was some discussion on the background of the Masalog site and if any know responses were made by the fire department. To his knowledge no responses were ever performed. Mr. Kiyoshi will send the FOIA response via email within the next 10 days.

-----END-----

Date: 1/5/2016 @ 1:2	5 pm EA Project No.: 63019.01
Communications with:	Department of Public Safety (DPS); Kerry Borja (Police Officer
	I)
Telephone No:	670-423-9222; (mobile) 670-783-5379
Communication by:	Meeting; Robert Shambach (EA Engineering)

Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach stopped by the Department of Public Safety and Department of Fire and Emergency Management Services to inform the agencies that we were completed with our site reconnaissance. Mr. Borja leads any UXO/MEC responses on Tinian. The director of DPS is now Juan E. Santos (670-783-8083). Shambach to follow up with FOIA for DPS. Kerry said that about 1 or 2 years ago the Marines came on island and went out to the site and did an MEC/UXO survey of the area. He didn't have much else information about what the Marines did but said that they were in uniform and he suggested that we speak with the former Police Director, Mr. Ray Pangelinan, who now works for the company Bridge Capital Investments, building the Tinian Ocean View Resort and Casino down at the Tinian Port. Ray's contact number is 670-783-0407. Ray is currently off island.

-----END------

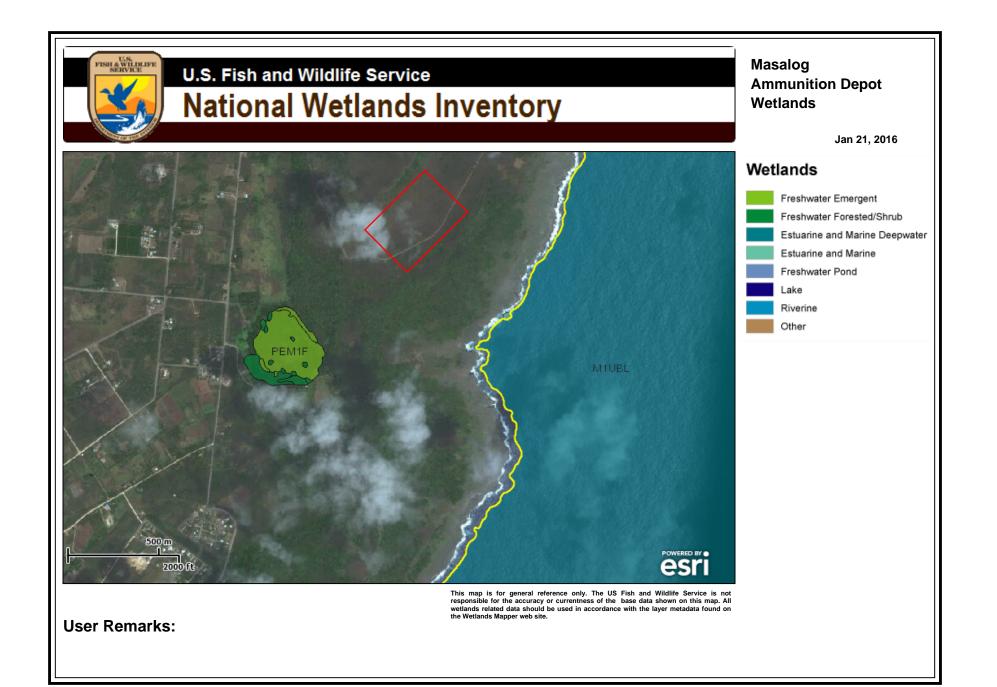
Date: 1/5/2016 @ 4:0	0 pm EA Project No.: 63019.01
Communications with:	Don Farrell (Historian)
Telephone No:	670-433-3082
Communication by:	Meeting; Robert Shambach (EA Engineering)

### Re: MASALOG AMMUNITION DEPOT, PINA TINIAN

Summary of Communication:

Robert Shambach scheduled a meeting with Don Farrell for 4pm at JC Café in San Jose, Tinian. Unfortunately, Don was unable to meet due to other obligations. Shambach needed to leave on a flight to Saipan at 530pm and was not able to reschedule the meeting. Via email, Don was able to provide some historical documentation about the use of the area as an ammunition depot.

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## Revised Final Statewide Management Action Plan (SMAP)

for

## Defense Environmental Restoration Program Formerly Used Defense Sites (DERP-FUDS) Within the Commonwealth of the Northern Mariana Islands

27 June 2007 (Final)

Contract No. DACA83-00-D-0012 Task Order No. 0073

Prepared for: U.S. Army Corps of Engineers Honolulu Engineer District Program and Project Management Division Bldg 230 Fort Shafter, Hawaii 96858-5440

> Executed by: U.S. Army Corps of Engineers Pacific Ocean Division Military Integration Division Building 525 Fort Shafter, Hawaii 96858-5440

### REVISED FINAL MANAGEMENT ACTION PLAN FOR DEFENSE ENVIRONMENTAL RESTORATION PROGRAM FOMERLY USED DEFENSE SITES (DERP-FUDS) WITHIN THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

### EXECUTIVE SUMMARY

This Management Action Plan (MAP) is an initiative emerging from representatives of the Commonwealth of the Northern Mariana Islands (CNMI) Government, CNMI Division of Environmental Quality (DEQ), the U.S. Environmental Protection Agency (EPA), the Department of Army (DA), and the U.S. Army Corps of Engineers (USACE). The MAP is intended to be a document for managing CNMI's Formerly Used Defense Sites (FUDS) environmental restoration program and to involve regulators in the development of life-cycle plans for the investigation and cleanup of all FUDS properties within the CNMI. This MAP is intended to identify FUDS cleanup activities in the CNMI, projected schedules, and project funding requirements. Included in this MAP is information for each FUDS property, such as location, historical costs, future costs, past progress, current status, future activities, project teams, and other budgetary information.

This MAP has been prepared by the U.S. Army Corps of Engineers, Honolulu Engineer District (POH) in coordination with DEQ and EPA Region IX, and is intended to be a "living" document that will be revised periodically by the CNMI MAP team. It is envisioned that the team— consisting of representatives from DEQ, EPA Region IX, and POH—will meet periodically to review, update, and revise this document.

Acknowledgement of the information presented herein—as evidenced by the affixed signatures below—represents the participating agencies involved in the management action plan for FUDS properties in the CNMI.

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Auchan W. Tykanla

Hudson W. Kekaula FUDS Program Manager U.S. Army Corps of Engineers, Pacific Ocean Division

Ray Masga

Date: 27 June 2007

Date 21 June 200

Site Assessment and Remediation Program Manager Commonwealth of the Northern Mariana Islands, Division of Environmental Quality

attleen 9 Shimmin

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Kathleen Shimmin FUDS Program Manager U.S. Environmental Protection Agency, Region IX

Date: 27 June 2007

### TABLE 5-2

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### LIST OF FUDS PROPERTIES WITHIN THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

	Site No.	Site Name	Region	Island	FUDS Eligible
	H09CN0000	Carolinas	Carolinas Heights	Tinian	No
	H09CN0001	Naftan Bomb Storage	Naftan	Saipan	Yes
pr <	H09CN0002	Isley Field	I Fadang	Saipan	Yes
1	H09CN0007	Marpi Point Field	Banaderu	Saipan	Yes
	H09CN0008	Camp Calhoun	Garapan	Saipan	CE
	H09CN0009	Japanese Defense Complex	Ginalangan	Rota	Yes
	H09CN0010	Dandan Asphalt Drum Dump Site	Dandan	Saipan	Yes
	H09CN0011	Far East Broadcasting Company	Marpi	Saipan	Yes
	H09CN0012	Tai Gomat Asphalt Drum Dump Site	Tai Gomat	Saipan	Yes
	H09CN0013	Tinian Asphalt Drum Dump Site	Puntan Diapblo	Tinian	CE
	H09CN0014	Edoni Site	I Agag	Saipan	Yes
	H09CN0020	Latte Stone Site	Carolinas Kastiyu	Tinian	No
	H09CN0030	Quartermaster Station	Chalan Pupula	Saipan	Yes
	H09CN0040	Kagman Caves	Kagman	Saipan	Yes
	H09CN0050	Tanapag Village PCB Contamination	Tanapag	Saipan	Yes
	H09CN0060	Ordnance Plan	Marpi	Saipan	Yes
	H09CN0070	Naftan Ordnance Disposal	Naftan	Saipan	Yes
	H09CN0080	Kagman Airfield	Kagman	Saipan	Yes
	H09CN0090	Rota Site 1	Songsong Village	Rota	Yes
	H09CN0100	North Field	Marpi	Saipan	Yes
	H09CN0110	Kobler Airfield	Koblerville	Saipan	Yes
	H09CN0120	Hospital Dump Site	Talufofo	Saipan	Yes
	H09CN0130	Garapan Fuel Pipeline	Garapan	Saipan	Yes
	H09CN0394	American Memorial Park	Garapan	Saipan	Yes

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	Site No.	Site Name	Region	Island	FUDS Eligible
	H09CN0395	Kobler Naval Supply Center	Chalan Piao, Fina Sisu	Saipan	Yes
	H09CN0396	Cape Obian Depot	Agingan	Saipan	Yes
	H09CN0398	Tanapag Fuel Farm	Tanapag	Saipan	Yes
	H09CN0399	Pagan Island	Pagan	Pagan	No
	H09CN0400	Goat Island	Aguijan	Aguijan	Yes
	H09CN0401	Island of Rota	Songsong	Rota	Yes
	H09CN0402	Chalan Kanoa Elementary School	Chalan Kanoa	Saipan	Yes
Ń	H09CN0403	Surplus Area – West Field	West Field	Tinian	CE®
rear here	H09CN0404	As Lito Tank Farm	As Lito	Saipan	No

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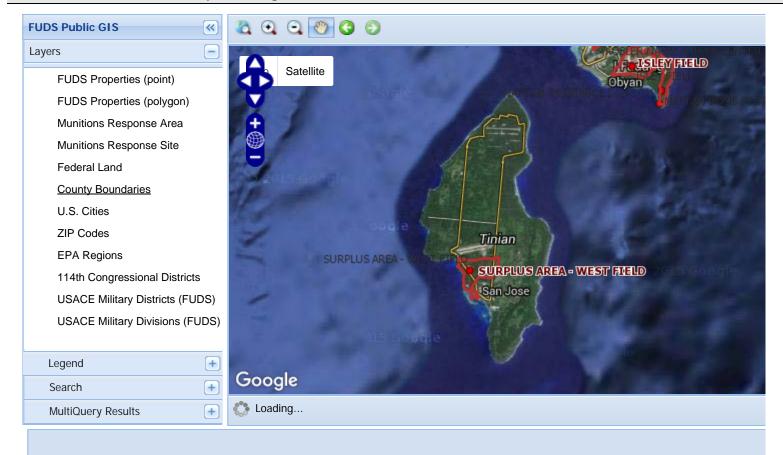


Formerly Used Defense Sites Geographic Information System

Introduction / Help



#### FUDS Public GIS - 2013 Annual Report to Congress



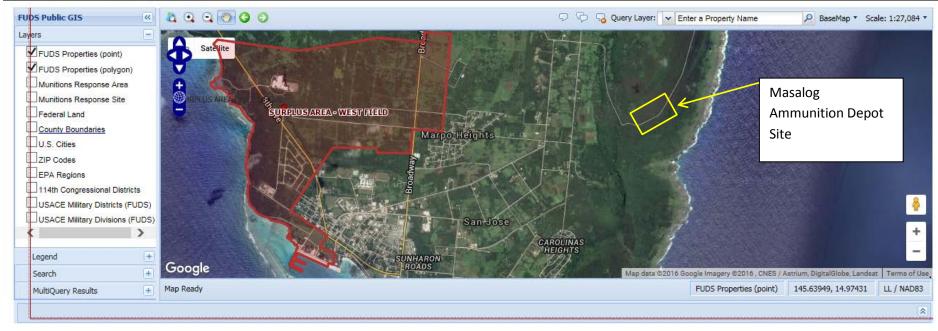
DISCLAIMER - This data represents the results of data collection/processing for a specific U.S. Army Corps of Engineers (USACE) activity and is in no way to be considered comprehensive or to be used in any legal or official capacity as presented on this site. While the USACE has made a reasonable effort to ensure the accuracy of the maps and associated data, it should be explicitly noted that USACE makes no warranty, representation or guaranty, either expressed or implied, as to the content, sequence, accuracy, timeliness or completeness of any of the data provided herein. The USACE, its officers, agents, employees, or servants shall assume no liability of any nature for any errors, omissions, or inaccuracies in the information provided regardless of how caused. The USACE, its officers, agents, employees or servants shall assume no liability for any decisions made or actions taken or not taken by the user of the maps and associated data in reliance upon any information or data furnished here. By using these maps and associated data the user does so entirely at their own risk and explicitly acknowledges that he/she is aware of and agrees to be bound by this disclaimer and agrees not to present any claim or demand of any nature against the USACE, its officers, agents, employees or servants in any forum whatsoever for any damages of any nature whatsoever that may result from or may be caused in any way by the use of the maps and associated data. For additional information on Formerly Used Defense Sites please contact the USACE mays of the target o



#### Formerly Used Defense Sites Geographic Information System



FUDS Public GIS - 2013 Annual Report to Congress





## **All Hazard Management Professionals**

# UNEXPLODED ORDNANCE SURVEY PROPOSED TINIAN LANDFILL SITE TINIAN, CNMI

Prepared For CNMI Department of Public Lands

AMPRO LLC SPS 741, Box 10006 Phone (670) 483-7227 E-mail: amprouxo@hotmail.com www.amprouxo.com

### **OVERVIEW**

The proposed site for the relocation of the public landfill on Tinian is located on a site which was used during World War II as an Army Air Corp ordnance storage facility in support of the North field B29 flight operations. Consequently, a high potential exists for the site to have unexploded ordnance (UXO) remaining in the area as result of these activities.

### **SCOPE OF WORK**

AMPRO LLC provided the following services in support of this project.

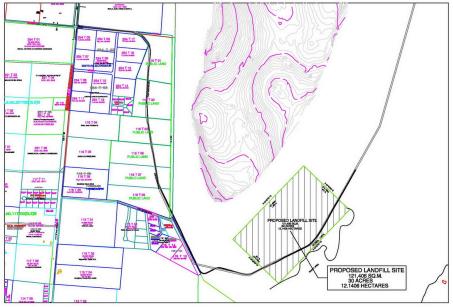
Field Investigation and Survey for Unexploded Ordnance (UXO)

A systematic surface search of the proposed site was made by a three man UXO Survey team. The area was gridded following the former service roads and the site surveyed following the layout of the existing revetments.

Ordnance related contacts were manually excavated and analyzed as to component structure and explosive content. Records were kept and pictures taken of location, type, quantity and general condition of UXO items found.

### SITE DESCRIPTION

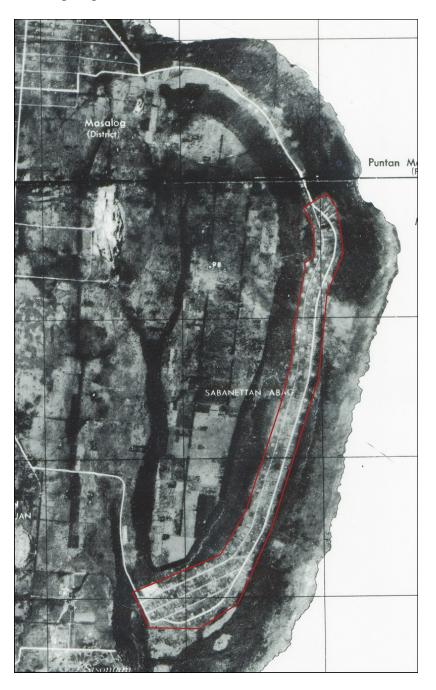
The proposed landfill site covers the southeastern area along the Masalog ridge access road in the east central section of Tinian.



Proposed Landfill Site – Masalog Area Tinian

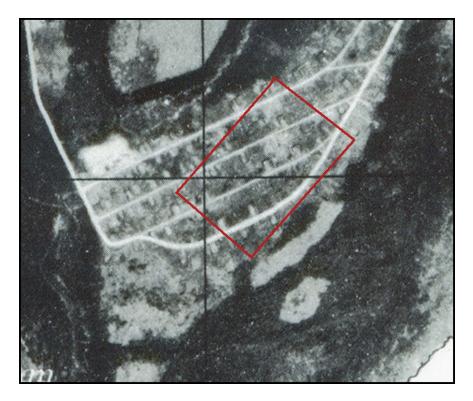
### HISTORY

This area was used by the US Army Air Corps as an ammunition dump to support air dropped ordnance storage facilities in support of North Field B29 operations during World War II. The Masalog ammunition dump consisted of a large number of earth berm revetments located along both sides of the Masalog ridge access road.



**Tinian Masalog Ridge Area Showing Army Ammunition Dump Location** 

The proposed landfill site is located on the lower portion of the former ammunition depot. The site is divided by the Masolog ridge road and consists of numerous World War II era ordnance storage revetments and four revetment access roadways. Most of the former roadbeds and abandoned revetments still exist but have been taken over by the jungle.



Proposed Landfill Site Showing WWII Ordnance Storage Areas

### UXO SURVEY RESULTS

A significant number of US ordnance and components was located within the search area for the survey. Ordnance items found included 500 pound incendiary bombs, 10 pound incendiary bomblets, fragmentation bombs, incendiary cluster adapters and components and other miscellaneous ordnance components.

Based on the ordnance items encountered and surveyed, we conclude the area was used for primarily incendiary type US air dropped ordnance. Several of the revetments showed what appear to be detonation holes within and immediately outside the revetment structures. We interpret these signs as evidence of attempts to dispose of the ordnance by "blowing it in place" which was a standard method of disposal used at the end of World War II. This information is supported by discussions with the Tinian Historic Preservation Office and interviews with Don Farrell, a local Tinian historian.

Photos of UXO types found during the survey are included in Appendix A to this report.

### CONCLUSIONS

Based on the results of the survey and the historical information, we <u>conclude this site is</u> <u>contaminated with unexploded ordnance</u> which will be encountered during the construction phase.

### RECOMMENDATIONS

1. <u>Monitoring for the presence of UXO during the Clearing and Grubbing phase of site preparation.</u> Clearing and grubbing needs to be accomplished to remove any obstructing vegetation and rubble piles prior to any UXO Clearance to depth and/or Geophysical Survey. Monitoring consists of a UXO Technician observing during excavation as it occurs to watch for, and remove, UXO as it is encountered.

2. <u>DO NOT BURN any rubble piles as any UXO within may detonate upon exposure to heat and flame.</u>

3. A <u>UXO Clearance be initiated upon completion of the Clearing and Grubbing construction</u> <u>phase of this project</u>. Removal of the overburden vegetation and rock piles will allow full access to the site for the effective conduct of an initial phase of a UXO Clearance. No work should be undertaken in the site until this area has been swept and cleared of UXO due to the confirmed presence of explosive items.

November 26, 2008 Date

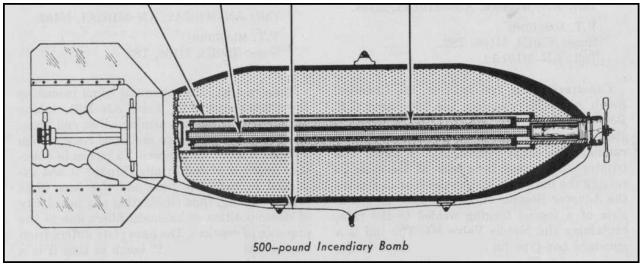
John L Scatt

John L. Scott President, AMPRO

## **APPENDIX A – UXO SURVEY RESULTS**



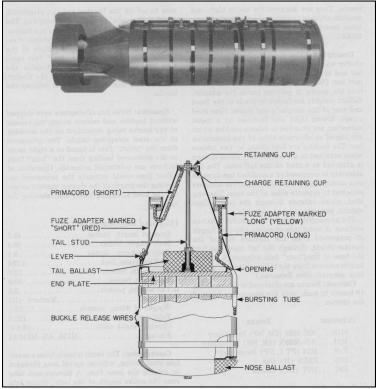
US 500 LB Incendiary Bomb



500 LB Incendiary Bomb Diagram



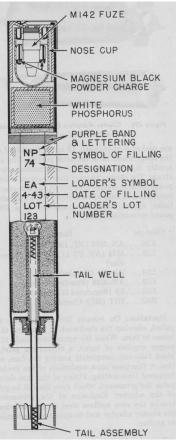
US Incendiary Bomb Cluster Adapter with Incendiary Bomblets



**Incendiary Bomb Cluster Adapter Components** 



**US Incendiary Bomblets** 



**Incendiary Bomblet Components** 

# CNMI-DEQ Public Record (/)

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### Pina Plateau, Tinian





The Pina Plateau is approximately 600 acres, immediately adjacent to a former US military ordnance storage depot known as the Masalog Ridge Area, on the island of Tinian. Due to its close proximity to the Masalog Ridge area, and as a result of the airstrikes of Tinian during WWII, there is a likely potential of UXOs within the Pina Plateau area as have been found elsewhere on the island.

The island of Tinian held strategic importance to all (U.S and Japanese military) involved with the events of WWII. After the taking of Saipan by the US forces, Tinian was the next logical island to invade to claim the Marianas. On July, 1944 the naval forces bombarded the island and artillery was fired across the strait from Saipan. The battle of Tinian led to almost daily aerial bombardment of the island from U.S. warships and planes.

The potential UXO contamination at the Pina Plateau occurred during and after World War II, prior to the landowner acquiring the property. The property was returned from the Trust Territory government when the CNMI government was created in 1976. The property is currently owned by the Department of Public Lands (DPL), which is in charge of managing public properties in the CNMI and is under the Executive Branch of the CNMI government.

With the likely potential of unexploded ordnance (UXO) and other WWII vintage explosive components at the Pina Plateau area, the area presents a likely significant health and physical hazards to general public. Additionally, the Pina Plateau is one of the few largest public land available on Tinian for economic development projects, which is also outside of the two-thirds of the US military controlled area.

Summary (Phase I ESA, Performed and Completed by Allied Pacific Environmental Consulting

The Commonwealth of the Northern Marianas Islands (CNMI), Bureau of Environmental and Coastal Quality (BECQ), retained Allied Pacific Environmental Consulting (APEC), to conduct a Phase I Environmental Site Assessment (ESA) of the Pina Plateau on the island of Tinian, MP. This investigation was conducted in general accordance with the American Society for Testing and Materials (ASTM) *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, Standard E 1527-13.* Work carried out during this ESA included reconnaissance of the subject and adjoining properties, interviews and review of historical records and regulatory databases in an effort to identify evidence of environmental conditions which may include, but are not limited to, the presence of hazardous materials, petroleum products or soil vapor impacts that may affect the environmental quality of the property.

The approximately 600 acre site is owned by the Department of Public Lands (DPL). The site is located approximately 1.5 miles northeast of San Jose Village and approximately 1.5 miles east of the Tinian Airport Runway. the property consist of an elongated oval shaped plateau, which is approximately 2 miles long (north to south) and approximately 0.5 wide ( east to west). (ft) about mean sea level. at the time of this ESA, the property is undeveloped and heavily vegetated

Category: Brownfields Coordinates: -

 Island: Tinian

 Village:

 Response Status: EPA Eligibility Determination Checklist approved on 3/31/15; Phase I ESA: Completed (12/28/15)

 Land Use Restrictions:

 Institutional control: None

 Responsible Party: Unknown

 Enforcement Authority: Non-Enforcement Project

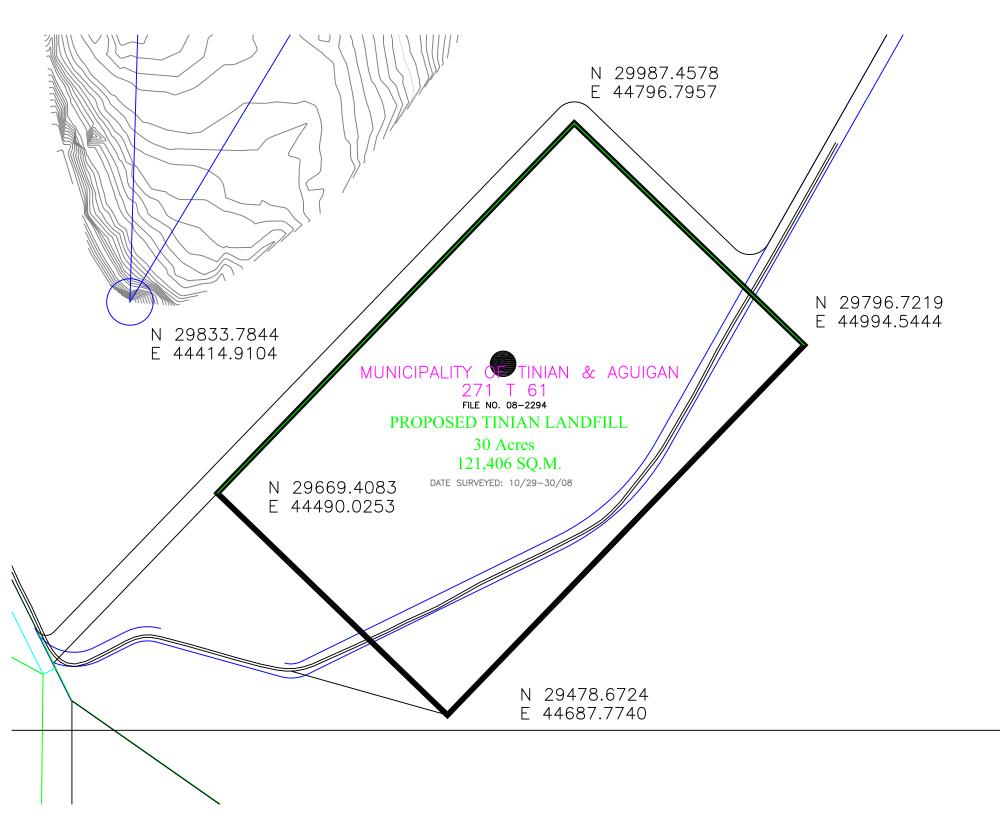
 Project Lead: DEQ (http://www.deqsar.org/agency\_dtl.asp?agencyID=9)

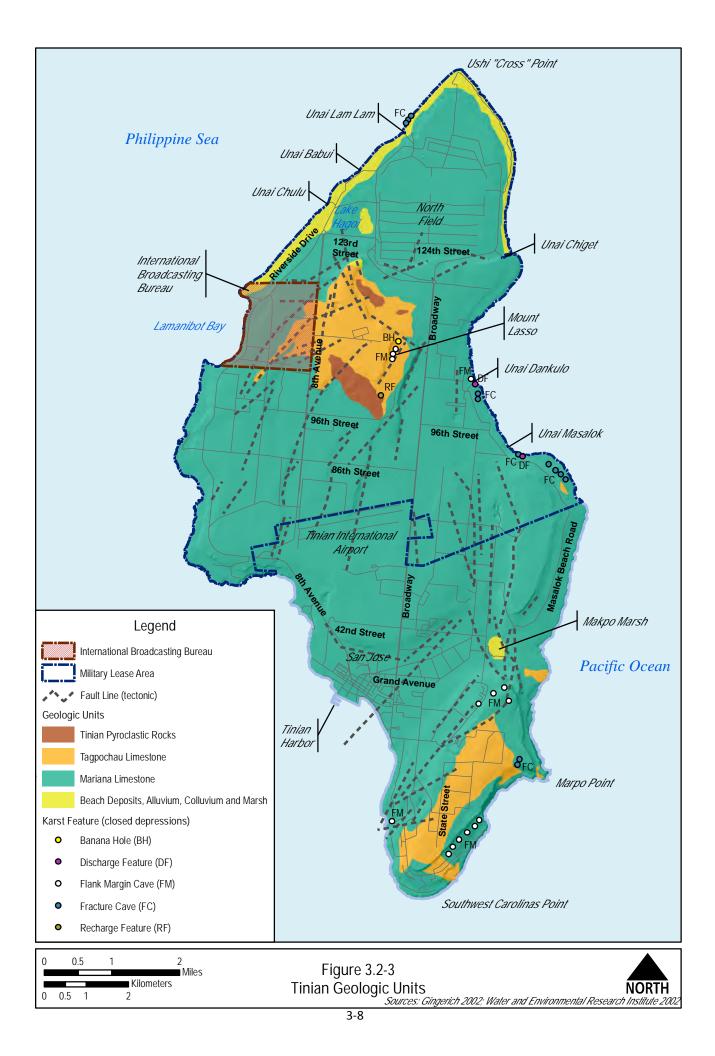
 Property Status: Public Land

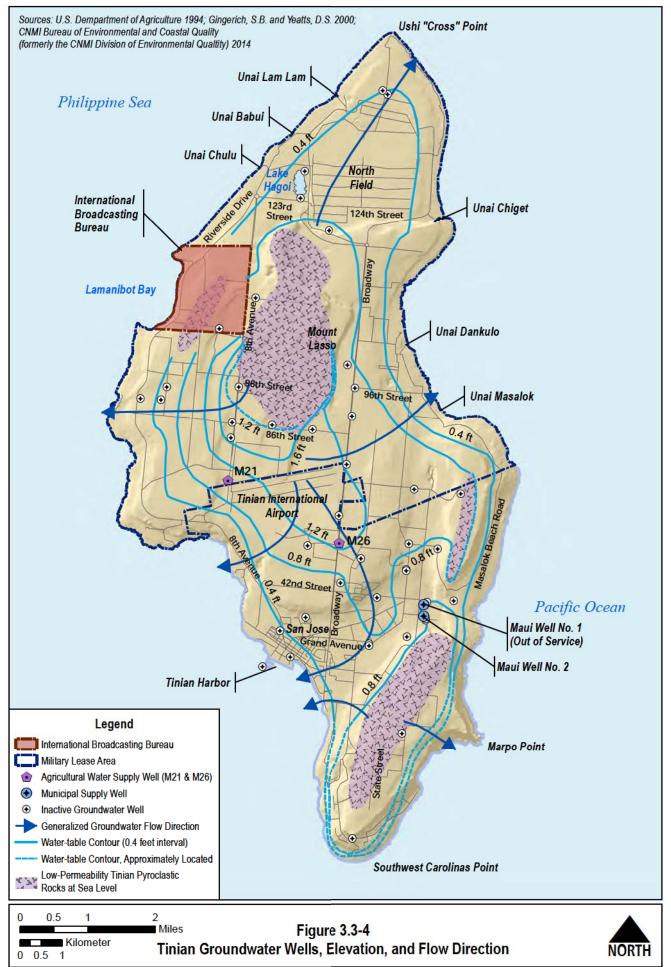
 Date Entered into Public Record: April 5/15/14

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# FIELD OPERATIONS REPORT

# MUNITIONS AND EXPLOSIVES OF CONCERN ANOMALY INVESTAGATION SUPPORT

Masalog Ammunition depot, Pena Tinian Lot 271 (Masalog Ammunition Depot Project) Prepared for: EA Engineering, Science, Technology, Inc. PBC

1001 Army drive Suite 103

Barrigda GU, 96913

Unitek Environmental Guam, Inc. PO Box 24607 Barrigada, GU 96921 (671) 565-3151

05 Jan 2016

### FIELD OPERATIONS REPORT

### PROJECT: Masalog Ammunition Depot Pena Tinian lot 271 T 61

### **SUMMARY**:

This report summarizes field work for Munitions and Explosives of Concern Anomaly Investigation Operations for Masalog Ammunition Depot Pena Tinian Lot 271 T61.

### PERIOD OF SUPPORT: Jan 04-05, 2016

### SITE / LOCATION: Masalog Ammunition Depot Pena Tinian Lot 271 T 61

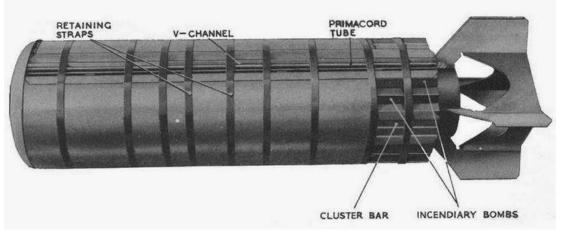
### SCOPE OF WORK TASK

MEC Anomaly Investigation services to check objects of concern at Masalog Ammunition Depot site. Plan is to have UEG provide (1) UXO Technicians to check the object exposed on the surface while conducting a site walk thru If item is an explosive hazard at that location, Proper notification procedures will be implemented by on site UXO technician.

### **FIELD OPERATIONS:**

Day 1 (Jan. 04, 2016) Mobilized to Masalog Ammunition Depot Pena Tinian to conduct Anomaly Investigation services for EA Engineering, Science, Technology Inc. Masalog Ammunition depot project. Arrived on site at 0900 for a site brief. Moved to area of concern and conducted a walk thru of portions of the site. Items located were on or near the surface. Most items were Munitions debris/various bomb components. The Items were not an explosive hazard but it was an old parts of incendiary bombs. Other metals were located throughout the site.

Day 2 (Jan 05 2016) Mobilized to Masalog Ammunition depot Pena Tinian to conduct Anomaly Investigation services for EA Engineering, Science, Technology, Inc. Masalog Ammunition depot project. Arrived on site at 0900 for a site brief. Moved to area of concern and conducted a walk thru of portions of the site. Items located were on or near the surface. Most items were Munitions debris/various bomb components. The Items were not an explosive hazard but it was an old parts of incendiary bombs. Other metals were located throughout the site.



Incendiary bomb (Numerous MDAS components of this device found on site)



Masalog Ammunition Depot Pena Tinian Lot 271 T61 Site

## **ANOMALY INVESTIGATION RESULTS**

The project site is where excavation will take place. Lack of World War II cultural debris on the surface would suggest large amounts of material are buried beneath the jungle surface to include UXO items in this area. MEC Anomaly Investigation services are complete. Unitek recommends providing on site UXO Tech support for future surveys and full MEC Clearance for Future excavations on this site.

## MEC PROGRAM MANAGER'S SIGNATURE

Signature /

Tony Brinkley MEC Program Manager Unitek Environmental Guam Office: 565-3151 Cell: 888-1973 Email: mec1@unitekguam.com

# CNMI-DEQ Public Record (/)

HOME (/) SITE(S) TIME LINE (/SITES-TIME-LINE.HTML) SITES (/S LATEST NEWS (/LATEST-NEWS.HTML)

SITES (/SITES.HTML)

### Masalog Ridge Area Site, Tinian



The size of the area of interest is about 292 acres, which is part of a largest ordnance storage depot located in what is known as the Masalog Ridge Area, Tinian. The US Military used the site immediately following the capture of the Mariana Islands in World War II to stage ordnance for aircraft, especially B-29 Bombers for the invasion of Japan. The ordnance storage area was extensive, consisting of over a hundred open revetments with unknown number of ordnance scattered throughout the area.

The UXO contamination occurred after World War II, during the Trust Territory of the Pacific Islands government (which was administered by the US government), prior to the Landowner acquiring the property. The property was returned from the Trust Territory government when the CNMI government was created in 1976. The property is currently owned by the Department of Public Lands (DPL), which is in charge of managing public properties in the CNMI and is under the Executive Branch of the CNMI government.

These unexploded ordnance (UXO) and potentially other WWII vintage explosive components present a significant health hazards to general public. The site has remained idled and undeveloped since after its use as an ordnance storage depot.

DEQ SAR branch had completed and submitted EPA Eligibility Determination Checklist on July 28, 2013 and was approved by U.S. Environmental Protection Agency on August 16, 2013 as a Brownfields site; Request for Proposal announcement is being advertised, last day of advertisement is September 10, 2013. The Scope of Work is available on or after August 27, 2013 at the DEQ office or electronically by e-mail request to raymasga@deq.gov.mp (mailto:raymasga@deq.gov.mp). A Pre-Proposal meeting is scheduled for September 13, 2013 at 1:00 p.m., local time in the 2nd floor DEQ conference room (Rm. 205). Awaiting for Phase I ESA, upon award.

#### Executive Summary (Phase I Report)

CNMI BECQ retained Allied Pacific Environmental Consulting (APEC) to conduct a Phase I Environmental Site Assessment (ESA) of Tract 42-1 Public Lands plots Chalan Lau Lau, Saipan, CNMI. This investigation was conducted in general accordance with the American Society for Testing and Materials

#### Masalog Ridge Area Site, Tinian - CNMI-DEQ Public Record

(ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, Standard E 1527-05. Work carried out during the ESA included reconnaissance of the subject and adjoining properties, interviews, and review of historical records and regulatory databases in an effort to identify evidence of the environmental conditions that may impact the property.

The 292 acre MAsalog property is owned by the Department of Public Lands (DPL), compromised of Lots Tract 41-3. The site is located approximately two miles northeast of San Jose Village and approximately two miles of the Tinian Airport runway. The property is a narrow strip of land in which curves along the shoreline on the east of and along the Pina plateau. The lands slopes generally southward from an elevation of approximately 350-360ft. above sea level to sea level at the top of the plateau to approximately 180 feet above sea level on the eastern border of the property. The majority of the coastline is comprised of cliffs approximately 30ft. high. There are two sandy sections of beach. At this time, the property is undeveloped and heavily vegetated.

Category: Brownfields Coordinates: N-14° 59' 46.939" ; E- 145° 39' 57.690" Island: Tinian Village: Masalog Point Response Status: November 26, 2008, AMPRO LLC condu

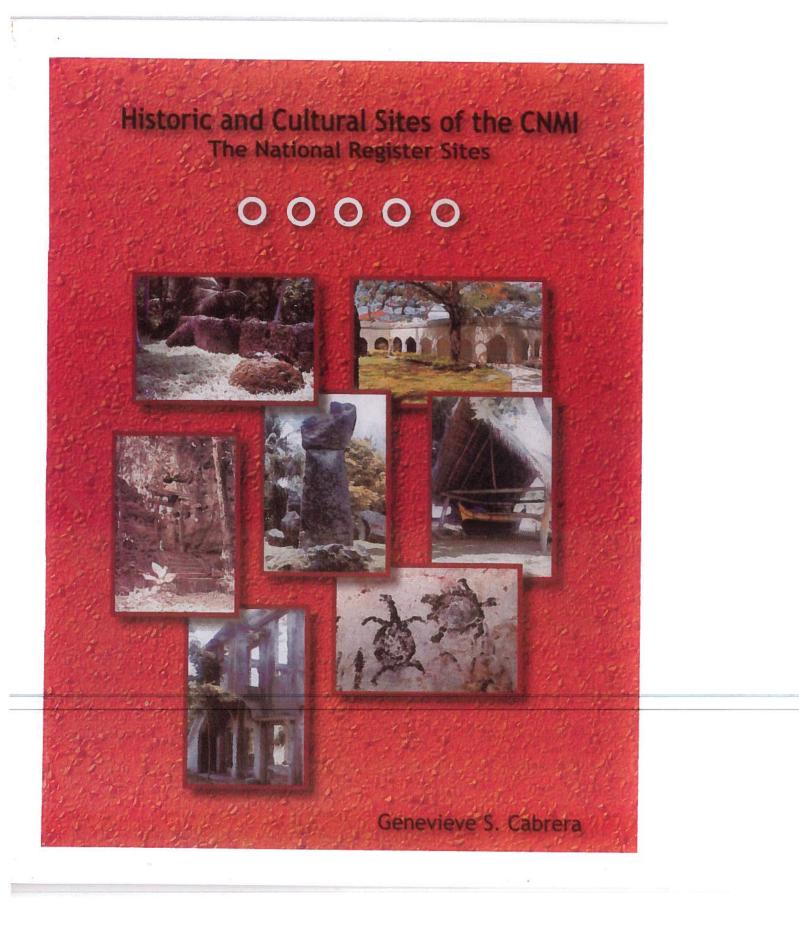
**Response Status:** November 26, 2008, AMPRO LLC conducted an Unexploded Ordnance Survey for the Department of Public Lands to help identify potential site to relocate the public landfill facility. The proposed site happened to be an area used during World War II as an Army Air Corp ordnance storage facility in support of the North field B29 flight operations.

; Phase I ESA completed on July 2014;, Phase II ESA in 2015

Institutional control: None Responsible Party: Undetermined Enforcement Authority: DEQ Project Lead: DEQ Property Status: Public Lands Date Entered into Public Record: August 19,2013

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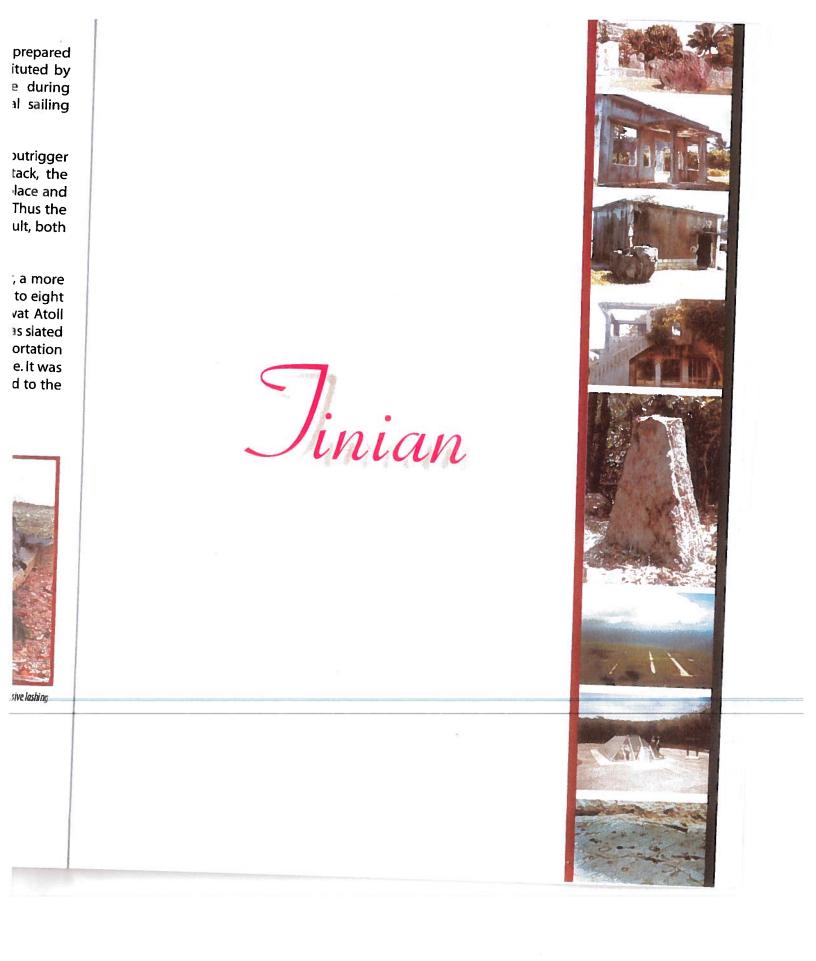
# Historic and Cultural Sites of the CNMI The National Register Sites

**Genevieve S. Cabrera** 

## **CNMI Division of Historic Preservation**

Saipan, CNMI 2005

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## **House of Taga Latte Site**

The archaeological remains of the House of Taga are situated within the village of San Jose on the island of Tinian. Once boasting an impressive twelve-stone latte set, the House of Taga is now relegated to a lone upright pillar and its accompanying fragmented hemispherical capstone, which was impacted by shelling from U.S. naval ships during the World War II invasion of Tinian 24 July 1944.

The House of Taga was one of eighteen latte sets erected on Tinian's southwestern shore. According to Chamorro oral tradition, it was the home of Chief Taga, one of the more renown ancient Chamorro chiefs made famous in lore because of his extraordinary strength, stature, and demeanor.

It is recounted that Taga was a large and robust man standing ten feet in height at the very least. After having defeated the chief of Rota, he married a



House of Taga Latte Site circa 1997

Rotanese woman and with whom he had a daughter. He began quarrying latte pillars and capstones at As Niebes on Rota intending to build a home. He abandoned these efforts and moved to Tinian where he once again challenged and overcame the island's principal chief. It was on Tinian that he and his wife had a son. However, he was later to kill his son out of fear of the boy's brute strength after having witnessed him uproot a coconut tree while chasing down a crab. His wife fell ill and died shortly after this incident. It is said that his daughter, fearing for her life, fled to the hills of southern Tinian. It is also told that he buried the remains of his daughter, which were covered in rice flour, in an artificial cavity in one of the latte capstones. One of the fallen capstones at the site exhibits this particular feature.

The latte pillars at this site each measure about 12 feet in height and weigh approximately 13 to 15 tons. The capstones stand at an average four and a half feet and weigh about 12 tons. The latte cover a 12 foot wide by 57 foot long rectangular area making the House of Taga the largest and most complete erect Latte Period residence. All of the latte pillars and capstones at this site were quarried from coral limestone bedrock situated along the water's edge approximately a mile away from the ancient village site. How they were removed from the quarry pits and transported to where they stand today remains unknown.



## **NKK Administration Building**



Located on the former main road of San Jose township on Tinian, the NKK (Nan'yo Kohatsu Kabushiki Kaisha or South Sea Development Company) Administrative Office is a single-storey rectangular frame structure, measuring 32 by 47 feet. The building's shell, measuring 14.5 feet tall, still stands. The building has narrow awnings over each of the windows, as well as narrow eaves. A steel-reinforced concrete beam runs the centerline of the building, and would have once supported a wooden-framed and possibly clay-tiled roof. The main entrance is located in the center of its southern

façade. A smaller service entrance is located at the northern corner of the west wall, which would have provided for ready communication between the administrative office and the adjacent NKK laboratory (see NKK Laboratory entry). The main entrance exhibits an impressive porch, supported by two double columns with a fascia elaborately ornamented with cast concrete moulding. Iron fittings of down pipes remain.



Left: View of NKK Administration Building's western facade with the NKK Laboratory in the background

Right: Detail of the decorative motif that adorns the roof of the building's main entrance



The building served as the administrative headquarters of the Tinian operations of the NKK, which was largely responsible for the development of the sugar industry in the Northern Marianas. Unlike the many examples of heavily-constructed military buildings, this building with its many and large window openings exudes an openness and airiness characteristic of Japanese houses. It is additionally reflective, in its quality of work, of civilian structures erected at a time of economic prosperity.



Angle view (from southastern elevation) of NKK Administration Building's eastern and southern facades with the northwestern doorway clearly visible Opp NKK had othe dam



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## **NKK Ice Storage Building**

Opposite the House of Taga ruins (see House of Taga entry) in Tinian's San Jose Village stands the NKK Ice Storage Building. It is a single storey structure measuring approximately 14 by 20 feet. It had its original entry in the western portion of the north wall, which is still preserved. The only other original opening is located in the west wall. This facade sustained World War II bombardment Jamage. Additional war damage is evident throughout the structure.



The building is a good extant example of Japanese non-military architecture. The outside of the building was roughed cement-rendered. A bottom section within the exterior walls shows a wainscot, offset by a recess from the roughed cement render. The wainscot is comprised of smoothed render, ruled off in a fashion so as to imitate three layers of masonry. The eaves of the flat-roofed building are protruding, with a cantilevered canopy over the northwestern entrance providing protection from rain.

its operations in the Marianas, the NKK focussed on sugar production and its derivatives. It raintained two mills on Saipan, with Chalan Kanoa being the main sugar refinery, one mill on Rota, nd two mills on Tinian. Not unlike the main operations on Saipan, the NKK industrial complex on nian also included facilities for alcohol production as well as those for the associated transportation frastructure (i.e. the light gauge railway system). The ice making plant supported the fishing peration based in San Jose harbour, which supplied the local and regional markets. The ice storage uilding was part of the overall ice plant operations.

e humble Nan'yo Kohatsu Kabushiki Kaisha Ice Storage Building is important not only because it presents a good example of Japanese commercial architecture in Micronesia, but also because it one of the few remaining buildings that are associated with commercial activities other than the iquitous sugar industry.



Left: West wall of the ice storage building showing wainscot and the structure's only other original opening

Right: WWII damage to building's roof and interior



## **NKK Laboratory**

The NKK Laboratory building is one of the few two-storey concrete structures remaining from the Japanese period. Both floors of the 19.3 by 30 foot structure were single rooms. Access to the first floor was through a door in the southeastern facade, while the top floor (constructed of suspended steel-reinforced concrete), could be accessed via an external staircase running up the same facade as shown in the photo below.



The building once possessed large windows on all four sides. The window openings on the northeastern and southeastern facades are still extant showing a concrete ledge about two feet above the ground. It is possible that the opening below was covered with a louver construction of some sort to allow air to circulate, while the top part would have had standard windows. The wide window on the southwestern side, next to the base of the staircase, has a protruding ledge, giving it the semblance of a counter. The building was most certainly modified on the northwestern wall where the

former windows were removed and the space opened up to an appurtenant wooden workshop. This occurred after the war when the building was used as a private residence (the traces of the roofline are still visible).

The workmanship exhibited in this and other civilian buildings throughout Japanese Mandated Micronesia is of high quality. The concrete staircase has a concrete banister with regular openings. A low-relief decorative motif comprised of curving vine-like features interspersed between what appear to be breadfruit can still be seen adjacent to the staircase. Only a handful of extant Japanese period buildings show decorative architectural features.







Detail of decorative motif

View of the north wall

## **Tachognya Latte Site**



Situated outside of San Jose Village on the island of Tinian, the Tachognya Latte Site is comprised of fourteen latte sets, twelve of which are aligned in two rows parallel to the beach, while the remaining two lie inland and are oriented perpendicular to the shoreline and the other latte sets. The individual latte sets range from six to fourteen stone columns and capstones.

Associated with several of the latte are small midden mounds containing shell, fish remains, pottery and other artifacts, as well as concentrations of ash. They represent

the refuse heaps of the houses that once stood at the site. Archaeological excavations and the analysis of cultural material date the site to circa 1,000 A.D.



Left: Shell and pottery sherds are a lew of the artifacts that make up the site's surface scatter

Right: A basalt mortor or lusong situated near one of the latte sets



Located on gently sloping ground, the site allowed its occupants access to marine staples in shallow coral reef areas as well as deeper off-shore waters. A half-a-mile wide coastal plain provided fertile land for agricultural production as well. The latte site is the most extensive and well-preserved latte complex on Tinian. Yet it is clear that the site was much larger at one time and that the inland portions of the site were destroyed in the 1920s when the general vicinity was cleared for sugar cane cultivation.



A notable feature exhibited by the latte pillars at the Tachognya Site is the extremely geometric or planar manner in which the stones were quarried and finished. Only the neighboring latte pillars at the Taga Latte Stone Site in San Jose Village and those at the As Niebes Latte Stone Quarry on the island of Rota show this same diagnostic. Most of the other noted latte stone sites have pillars that possess an apparently flattened side abutting its more curvilinear opposite.

## North Field Historic District



Tinian's North Field ca. December 1944

Operation Forager, which was the code name for the United States military campaign in the Mariana Islands, called for the establishment of expansive airfields from which B-29 Superfortress bombers could carry out missions against the Japanese home islands. In October 1944, Isely Field on Saipan began servicing a little over 100 B-29's and by December, bombing missions against Japan were being carried out. Meanwhile, three miles across the channel on Tinian, around-the-clock construction was underway at North Field. Early the following year, North Field boasted an expansive military air base and the largest airport in the world with planes taking off every 45 seconds. It is also from North Field

that the atomic bomb missions to Hiroshima and Nagasaki were flown in August 1945.



North Field ca. July 2003

Today, many of North Field's historical features are still readily visible and unless prohibited by notice of the U.S. Navy, which occupies Tinian's northern sector, are equally accessible. Two of the four original runways, however, stand covered over by encroaching vegetation. Only the northern-most runway, originally referenced as Runway 1 during World War II, is operational.

The atomic bomb pits were excavated in June 2004 in preparation for the 60th Anniversary Commemoration of the Battle of Saipan and Tinian activities and ceremonies. In order to protect the pits and allow visitors to view the

interior, a plexiglass cover was designed to fit over each one. During the course of the excavation, it was determined that the references to the pits were erroneously reversed. Bomb Pit #1 is really Bomb Pit #2 and vice versa. Both A-Bombs were lowered into pit #1 (the pit situated at the western end of the B-29 hardstand), then hydraulically lifted into the bomb bay of the respective bomber. Enola Gay carried Little Boy 6 August 1945 bound for Hiroshima. Bock's Car carried Fat Man to Nagasaki 9 August 1945.



Left and Right: Bomb Pits 1 and 2 as they appeared before the onset of excavation activities, 3 June 2004





- Left: A-Bomb Pit #1 (formerly #2) after excavation activities
- Right: A-Bomb Pit #2 (formerly #1) after excavation activities



The other historical features within North Field include extant remnants of Japanese period buildings that functioned as part of the Ushi Point Airfield. One such building is the air operations building and the nearby air raid shelters. Another is the airfield administration building, which exhibits the scars of the battle that raged between Japanese and American forces 24 July through 1 August 1944.



Left: Japanese air operations buildings

Right: Japanese air raid shelters



The U.S. troops that took part in the invasion of Tinian set foot on the island at the designated beach heads known as White 1 and White 2. In local terms, these stretches of beach are known as Unai Babui and Unai Chulu, respectively. A Japanese pillbox is situated at Unai Chulu along with an interpretive plaque that explains the significance of the site.







White Beach 1 (Unai Babui

White Beach 2 (Unai Chulu)

Japanese pillbox at Unai Chulu

North Field is one of the two National Historic Landmark (NHL) designations within the Northern Mariana Islands .Visitors that come to this part of Tinian's northern sector garner, for the most part, a sense of the island's historical significance specific to that imprinted by World War II. The remnant features are reminiscent of the conflict and the tremendous price that humanity imposed upon

itself to attain peace.



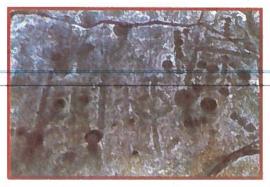
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### Unai Dangkulo Petroglyph Site



The majority of the archaeological data concerning the ancient Chamorro people centers on settlement sites exhibiting latte sets, midden deposits, and/or burials. Rock art is also a source from which archaeological data is extracted. Pictographs (images painted on the rock surface) and petroglyphs (images pecked into the rock surface) are the primary types of rock art. In the Marianas, pictographs occur more frequently than do petroglyphs and they are predominantly found within caves. To date, the Unai Dankulo Petroglyph Site on Tinian is the only known rock art site that is situated outside of a cave environment.

These petroglyphs are pecked into a flat rock outcrop on the stretch of beach. The effort required to carve these into the rock surface would have been substantial, given the nature of the tools available at the time. They comprise approximately 50 individual images found in an area of about 260 square feet (24 sqm). Many of these are anthropomorphic, representing human beings as stick figures, often without heads. There are also a number of circular cup-like depressions, smaller rectilinear

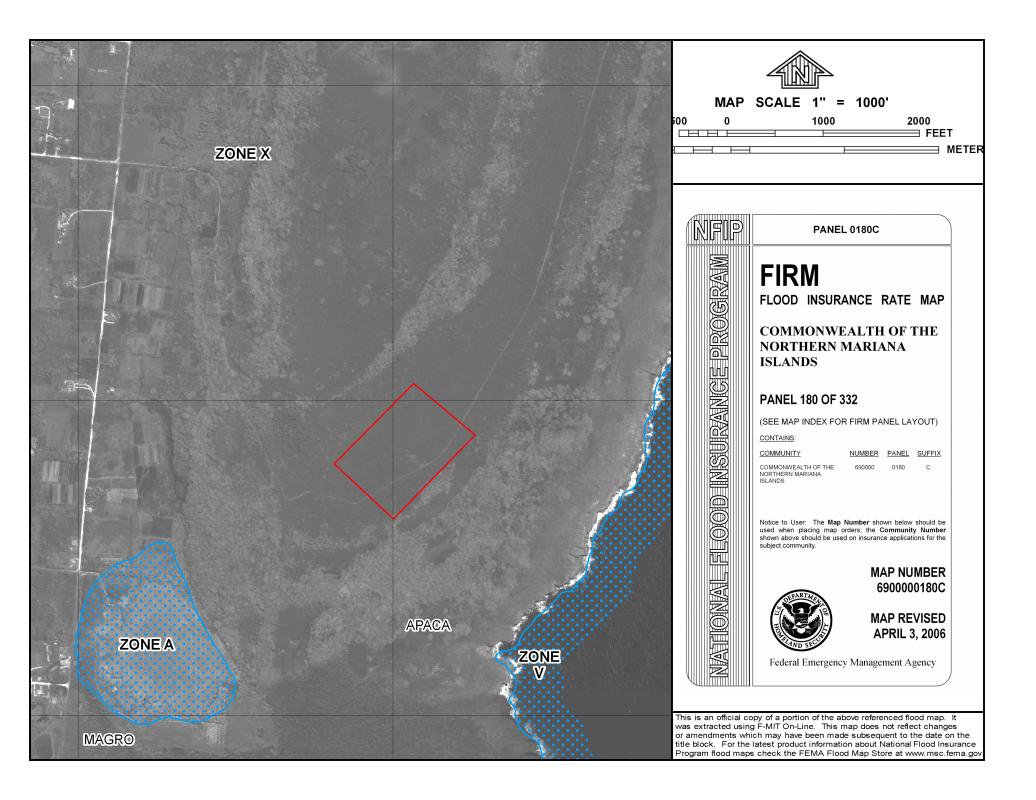


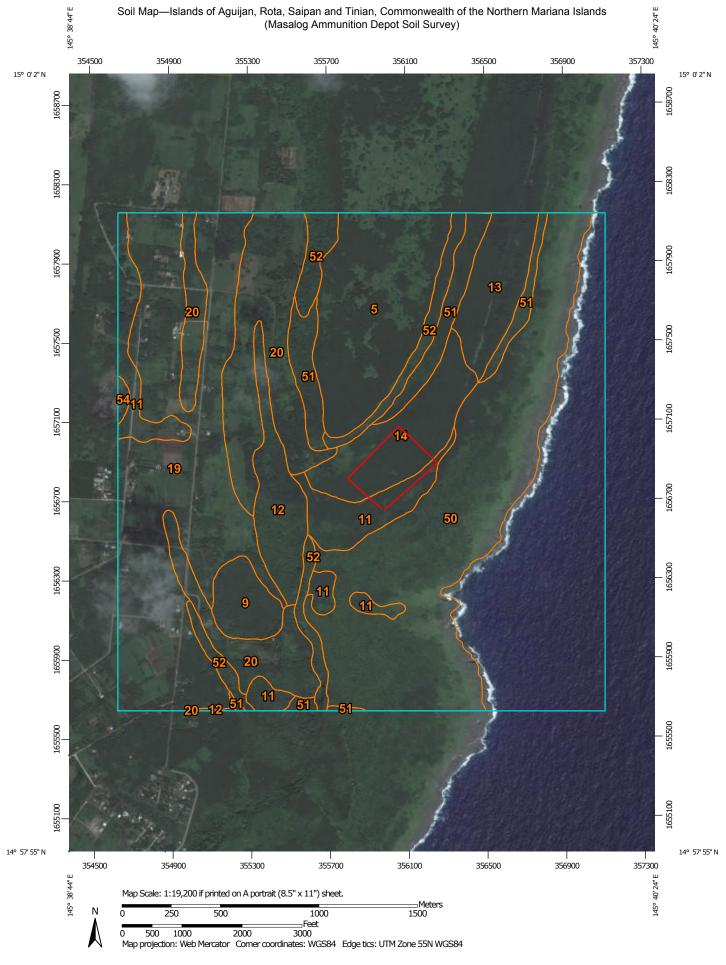
forms of unknown association and origin, as well as two particular examples that may represent turtles. The petroglyphs are obscured from view because they lay buried in approximately two feet of sand. Wave action caused by typhoons wash sand up over the petroglyphs as well as clear the sand away. The latter was the case in 1998 when Typhoon Keith tore through the Northern Mariana Islands. It was at this time that the petroglyphs were discovered.

On the narrow coastal terrace above the beach, which

in turn allows access to the beach, the remains of a latte period village have been found. Noted in this find were a total of sixteen latte sets as well as associated artifact surface scatter and what appears to to be a latte quarry site. It is possible that the petroglyphs and the latte village were culturally linked.

Next to nothing is known about the iconography of the petroglyphs. The fact that many of the anthropomorphic figures at the Unai Dankulo Petroglyph Site are depicted without the head, as is the case with many painted images within the pictograph sites, has given rise to the speculation that they may be associated with ancestor worship. In ancient Chamorro culture, the skulls of the deceased were separated from the body after decomposition and used, in one way or another, to communicate with the manganiti or ancestor spirits.





Web Soil Survey National Cooperative Soil Survey

MAP LEGEND		MAP INFORMATION		
Area of Interest (AOI)         Area of Interest (AOI)         Soils         Soil Map Unit Polygons         Soil Map Unit Lines         Soil Map Unit Points	<ul> <li>Spoil Area</li> <li>Stony Spot</li> <li>Very Stony Spot</li> <li>Wet Spot</li> <li>Other</li> <li>Special Line Features</li> </ul>	The soil surveys that comprise your AOI were mapped at 1:10,00 Please rely on the bar scale on each map sheet for map measurements. Source of Map: Natural Resources Conservation Service Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov Coordinate System: Web Mercator (EPSG:3857) Maps from the Web Soil Survey are based on the Web Mercator		
Special Point Features         Image: Optimized state         Image: Optized state         Image: Optimized stat	Water Features Streams and Canals Transportation HII Rails	projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accura calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as the version date(s) listed below.		
Gravel Pit Gravelly Spot	<ul> <li>Interstate Highways</li> <li>US Routes</li> <li>Major Roads</li> <li>Local Roads</li> </ul>	Soil Survey Area: Islands of Aguijan, Rota, Saipan and Tinian, Commonwealth of the Northern Mariana Islands Survey Area Data: Version 9, Sep 25, 2014 Soil map units are labeled (as space allows) for map scales 1:50,00		
<ul> <li>Lava Flow</li> <li>Marsh or swamp</li> <li>Mine or Quarry</li> </ul>	Background Aerial Photography	or larger. Date(s) aerial images were photographed: Data not available. The orthophoto or other base map on which the soil lines were		
<ul> <li>Miscellaneous Water</li> <li>Perennial Water</li> <li>Rock Outcrop</li> </ul>		compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shift of map unit boundaries may be evident.		
<ul> <li>Saline Spot</li> <li>Sandy Spot</li> <li>Severely Eroded Spot</li> </ul>				
<ul> <li>Sinkhole</li> <li>Slide or Slip</li> <li>Sodic Spot</li> </ul>				

## Map Unit Legend

Islands of Aguijan, Rota, Saipan and Tinian, Commonwealth of the Northern Mariana Islands (PB645)				
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	
5	Banaderu clay loam, 3 to 5 percent slopes	134.1	8.7%	
9	Chacha clay, drained, 0 to 5 percent slopes	27.3	1.8%	
11	Chinen clay loam, 5 to 15 percent slopes	81.5	5.3%	
12	Chinen clay loam, 15 to 30 percent slopes	48.7	3.2%	
13	Chinen very gravelly sandy loam, 0 to 5 percent slopes	50.3	3.3%	
14	Chinen very gravelly sandy loam, 5 to 15 percent slopes	67.8	4.4%	
19	Dandan-Chinen complex, 0 to 5 percent slopes	292.1	18.9%	
20	Dandan-Chinen complex, 5 to 15 percent slopes	170.1	11.0%	
50	Takpochao-Rock outcrop complex, 3 to 15 percent slopes	299.1	19.4%	
51	Takpochao-Rock outcrop complex, 15 to 30 percent slopes	59.0	3.8%	
52	Takpochao-Rock outcrop complex, 30 to 60 percent slopes	54.9	3.6%	
54	Quarry	2.5	0.2%	
Subtotals for Soil Survey Area		1,287.6	83.5%	
Totals for Area of Interest		1,542.8	100.0%	

Appendix F

Resumes

## Robert P. Shambach, P.G. Project Manager/Geologist

Mr. Shambach is a registered Professional Geologist with more than 21 years of experience working on environmental projects for the public sector and government agencies throughout the United States, Saipan, and Guam. He served as the Guam Operations Profit Center Manager from 2010 to 2013, and has managed a variety of indefinite delivery/indefinite quantity projects under contracts for federal and local government, as well as industrial clients.

Mr. Shambach currently serves as the Guam office manager. His experience also includes multi-year basic ordering agreements, which he is responsible for overall schedule and budget compliance, and technical performance of EA personnel working from EA's Guam office.

Working in EA's Pacific Business Unit, Mr. Shambach's project responsibilities include operations management and supervision of site investigations with extensive experience at sites containing unexploded ordnance and munitions and explosives of concern. Over the past 16 years, he has developed experience with petroleum-contaminated site investigations, mitigation, and monitored natural attenuation evaluation. Mr. Shambach has a strong background in geology, including groundwater monitoring well installation and testing, air injection and monitoring wells, groundwater and soil sampling, geophysical surveys, soil gas surveys, air quality monitoring,

### Qualifications

#### Education

B.S.; Bloomsburg University; Geology; 1994

B.S.; Bloomsburg University; Earth Space Science; 1994

#### **Registrations/Certifications**

Professional Geologist—PA (No. PG004866) Certified Manager of Integrated Solid Waste Management Systems (exp. 5/7/17)

Construction Quality Mangement for Contractors (USACE)

#### **Specialized Training**

OSHA 40-Hour Hazardous Waste Health and Safety Training; 1994

OSHA 8-Hour Hazardous Waste Health and Safety Training Recertification; 2013

OSHA 8-Hour Hazardous Waste Advisory and Supervision Training EA Project Manager Training; 2013

CPR and First Aid Training; February 2013

#### **Professional Affiliations/Appointments**

Guam Chamber of Commerce National Groundwater Association Society of American Military Engineers, Member Board of Directors American Water Works Association Recycling Association of Guam, Officer Dededo Soccer Club, U-10 Youth Coach

asbestos building inspection and sampling, and report writing. His field experience also encompasses environmental sampling throughout the eastern and central United States at former U.S. Naval, Army, and Air Force bases as well as commercial and industrial facilities. For the past 8 years, he has been active in conducting marketing meetings, personnel interviews, and client presentations.

### **Professional Experience**

*Management*—Responsible for project and personnel management, including managing 5-10 employees, providing staff allocations, scheduling, utilization, and general office management. Profit center management responsibilities include client contact, sales and marketing, work schedule projections, resource allocation, report generation, and budget tracking. Interacts with the client for purposes of maintaining client relations, obtaining new work orders, providing project updates, scheduling field activities, obtaining site-specific information, and change order/invoice preparation. Additionally, project management responsibilities include management of various types of projects worth in excess of \$1.5 million annually, with office annual revenue of more than \$2.5 million.

**Project/Operations Manager**—Managed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation/feasibility study (RI/FS) and Resource Conservation and Recovery Act (RCRA) projects exceeding \$1 million at remote locations throughout Guam and Saipan. Successfully managed over 40 Installation Restoration Program (IRP) site investigations, monitored natural attenuation projects, RCRA site investigations and closures, and preliminary assessment/site investigation projects for 33 sites. Completed several styles of reports including No Further Response Action Planned, Engineering Evaluation/Cost Assessment, RI/FS Reports, RCRA Closure Reports, monitored natural attenuation reports, plume delineation reports, and Comprehensive Contaminant Assessment reports. Regular interface with regulatory agencies for project updates and decision-making is common.



**Remedial Investigation/Feasibility Studies**—Managed RIs at over 40 National Priorities List sites performed under CERCLA and Air Force Center for Engineering and the Environment IRP guidance. These projects involved site reconnaissance, geophysical surveys, site personnel interviews, real property record searches, historical records review, report preparation, project proposals, project cost estimating, terrestrial and marine environment investigations, monitoring well drilling, and required media analyses of soil and groundwater samples. The investigations addressed numerous chemicals of concern in various media and evaluated exposures to assess human health and ecological risk.

*Environmental Assessments*—Performed investigative activities that have included site reconnaissance, site personnel interviews, real estate searches, historical records review, report preparation project proposal, and project cost estimating. Performed work on Phase I and Phase II environmental baseline surveys under the IRP at former U.S. Air Force properties scheduled for real estate transactions in the Pacific Region. Also performed Solid Waste Management Unit Release Assessments at 76 sites with responsibilities ranging from scheduling, field management, work plan development, cost estimation sample collection, and site evaluation. Initiated cost saving measures at a site on Guam using portable auger and prepacked wells screens instead of using a subcontracted hollow-stem auger and traditional well. Received Guam U.S. Environmental Protection Agency (EPA) concurrence to proceed with prepacked well installations at the site.

*Solid Waste Management Unit Investigations*—Managed the field effort of over 30 solid waste management unit sites. These projects involved surface and subsurface investigations, and required analyses of soil, wastewater, and sludge samples.

*Environmental Compliance*—Conducted biannual stormwater sampling in support of Air Force compliance with permitted underground injection wells. Performed sampling and participated in completing work plan, quality assurance project plan, compliance report, identifying non-compliant wells and recommending remedial and procedural adjustments to maintain compliance status. Managed the re-engineering of stormwater runoff at a covered percolation basin to eliminate the need for permitting of injection control wells.

Asbestos Hazard Emergency Response Act Asbestos Building Inspector—Performed inspections and sampling of more than 50 buildings throughout several military installations in the Pacific Region. Completed an Asbestos Survey Reinspection Report for updating the installation database.

*Shallow Groundwater Monitoring Well Installation and Sampling*—Managed the completion of groundwater monitoring wells (10-100 ft deep), well development, and conducted groundwater sampling. Evaluated groundwater and soil conditions for potential environmental concerns at commercial and industrial facilities throughout the northeastern United States. Responsibilities included well installation, groundwater and soil quality, and determination of hydrogeologic conditions in glacial till aquifers. Installed shallow groundwater wells in South Dakota, throughout the eastern United States, and Guam. Methods of sampling included utilization of low flow peristaltic pumps, variable speed pumps, and hand bailers.

*Deep Groundwater Monitoring Well Installation and Sampling*—Installed deep groundwater monitoring wells and open boreholes (300-700 ft deep) in the Northern Guam Lens portion of the island of Guam. Conducted field geologic and geophysical logging of boreholes and exhibited proficiency in describing coralline limestone geology in northern Guam. Monitoring wells averaged 500 ft deep and were generally drilled to basal and parabasal freshwater aquifers. Has experience in supervision of drilling contractors using air rotary and dual-wall reverse air rotary drilling methodology and provided oversight for containment of drilling fluids and cuttings from borings. Collected groundwater samples from monitoring wells located on Guam using low-flow Bennett piston pumps.

*Air Injection and Monitoring Well Installation*–Managed the completion of air injection and monitoring wells for in situ remediation of an abandoned underground storage tank containing fuels and solvents. The wells were completed in porous limestone bedrock to a depth of 300 ft below the surface. Three 1.5-in.-diameter threaded pipes were placed in each of the boreholes based on concentrations of volatile organic compounds. Also installed a biosparge system to assess applicability at a petroleum-impacted site in southern Guam.



*Geophysical Investigations*—Performed electromagnetic geophysical investigations at more than 20 RI sites in a variety of geologic conditions throughout the eastern United States and Guam. Some of the geophysical surveys were performed to identify areas of unexploded ordnance and munitions and explosives of concern.

*Field Task Management*—Field managed several CERCLA RI/FS and RCRA projects throughout the eastern United States and Guam. Managed several site investigations and provided oversight to subcontractors during investigation of CERCLA and RCRA sites. Successfully managed IRP site investigations in five operable units from start to final report phase. Completed several styles of reports including No Further Remedial Action Planned, Engineering Evaluation/Cost Assessment, RI/FS Reports, Comprehensive Contaminant Assessments, and Site Closure Reports.

### **EA Project Experience**

*Guam Commercial Port Modernization Program, Environmental Investigation; U.S. Department of Transportation Maritime Administration; Guam; Project Manager*—Project manager for an environmental assessment in support of the design for the modernization of the essential Jose D. Leon Guerrero Port facility per a \$400 million Indefinite Delivery/Indefinite Quantity contract. Investigative activities included performing soil borings and test pits for the collection of subsurface soil and groundwater to assess the volume of potentially impacted soils in areas scheduled for subsurface construction at the port. A hazardous material survey, installation of pump test wells and piezometers, and abandonment of wells was also included with the project. Calculations of estimated volumes and costs to remediate and dispose of impacted material was included in the assessment report. *Project Date: August – December 2013* 

Project Value – \$195,360; Contract Type – IDIQ; EA Project No. – 1477909; EA Project Manager – Robert Shambach

*Guam Waterworks Authority Program; Brown & Caldwell; Guam; Program Manager*—Manages teams to conduct essential Guam Water Works Authority projects stipulated by a Court Order. Responsibilities include team and stakeholder coordination, technical oversight for wastewater and potable water planning, modeling, design, and construction projects.

Project Date: 2012–2013 Project Value – \$500,000; Contract Type – IDIQ; EA Project No. – 14953; EA Project Manager – Robert Shambach

*Tumon Bay Stormwater Flow Study; Stanley Consultants; Guam; Project Manager*—Project objective is to collect stormwater flow and infiltration basin levels during the 2013 rainy season in support of a hydraulic model for future management assessment of stormwater flow in Tumon's tourist district. Level loggers and rain gauges were installed at several locations within the Tumon watershed and are downloaded weekly and sent to the client. During storm events field staff record observations of flow patterns and flooding within Tumon's tourist district. *Project Date: August 2013 – Present* 

Project Value – \$27,752; Contract Type – LS; EA Project No. – 6273801; EA Project Manager – Robert Shambach

Layon Landfill Water Quality Monitoring; Gershman, Brickner & Bratton, Inc.; Inarajan, Guam; Project Manager—Project Manager for Guam's Layon Landfill compliance water quality monitoring. Included two rounds of detection monitoring by sampling of groundwater and surface water, quarterly landfill gas monitoring and reporting, sub-drain tank monitoring, and stormwater sample collection. Detection monitoring reports were completed and submitted within 90 days of sampling event.

Project Date: October 2012 – October 2013

Project Value – \$153,443; Contract Type – LS; EA Project No. – 6239208; EA Project Manager – Robert Shambach



Dededo Solid Waste Transfer Station; Gershman, Brickner & Bratton, Inc.; Dededo, Guam; Senior Geologist– Phase II environmental site assessment at the Dededo Solid Waste Transfer Station and former recycling/processing

facility. Field activities included conducting a detailed site inventory of surface debris, Global Positioning System survey, surface and subsurface soil sampling, and waste characterization of soil and waste oil. Reporting of the waste volume and recommendations for removal and disposal were included. Land area will be remediated and a new waste transfer station built.

Project Date: April 2013 – Present Project Value – \$123,914; Contract Type – LS; EA Project No. – 623920; EA Project Manager – Jaquay Soriano

*Inarajan Wastewater Quality Monitoring; Gershman, Brickner & Bratton, Inc.; Inarajan, Guam; Senior Geologist*—Water quality monitoring of wastewater treatment facility to assess the impact of leachate generated at the new solid waste municipal landfill on the nearby wastewater treatment plant and marine water environment. Project involved influent, effluent, leachate, and marine water quality monitoring and reporting. Samples were collected on a weekly basis and reported quarterly to the client.

Project Date: February 2010 – October 2013

Project Value – \$866,727; Contract Type – LS; EA Project No. – 6239203; EA Project Manager – Brian Thomas

Agat Transfer Station and Santa Ana Dump Site; Gershman, Brickner & Bratton, Inc.; Agat, Guam; Senior Geologist—Phase II environmental site assessment at the Agat Transfer Station and former Santa Ana dump site. Field activities included conducting a detailed site inventory of surface debris, Global Positioning System survey, surface and subsurface soil sampling, waste characterization, and cultural resources survey. Provided input and review of data quality objectives, review of field data, and meetings with client.

Project Date: November 2012 – Present

Project Value – \$223,378; Contract Type – LS; EA Project No. – 6239209; EA Project Manager – Brian Thomas

Soil Removal and Remediation at Site 75C and Site 77; EATC Joint Venture (U.S. Navy); Andersen Air Force Base, Yigo, Guam; Senior Geologist—Performed field activities to include surface and subsurface soil sampling, Global Positioning System survey, excavation of soils containing contaminants of concern, and treatment using triple super phosphate RCRA hazardous soils to stabilize the leachability of constituents for disposal at the base consolidation unit. Several areas were also screened for munitions and explosives of concern.

**Project Date:** September 2011 – Present

Project Value – \$344,976; Contract Type – LS; EA Project No. – 6243805; EA Project Manager – Scott Moncrief

Moffatt & Nichol Engineers; P-566 Emergent Repair Facility, Hazardous Materials Survey; U.S. Naval Facilities Command Pacific Naval Base Guam, Agat, Guam; Environmental Technician/Scientist/Project Manager — Project Manager for the hazardous materials assessment of materials at a submarine warfare emergent repair facility to determine if hazardous items need to be included in design criteria. All painted items were screened for lead-based paint using an x-ray fluorescence detector. Materials were also assessed for polychlorinated biphenyls containing oils, asbestos-containing materials, and other potentially hazardous materials. All surveys were described and results included in a Hazardous Materials Report.

#### **Project Date:** June 2013 – Present

Project Value – \$18,203; Contract Type – FFP; EA Project No. – 6236511; EA Project Manager – Robert Shambach

Moffatt & Nichol Engineers; P-518/P-519 X-Ray Wharf Hazardous Materials Survey; U.S. Naval Facilities Command Pacific Naval Base Guam, Agat, Guam; Environmental Technician/Scientist/Project Manager— Project Manager for the hazardous materials assessment of materials at X-Ray wharf to determine if hazardous items need to be included in design criteria. All painted items were screened for lead-based paint using an x-ray fluorescence detector. Materials were also assessed for polychlorinated biphenyls containing oils, asbestoscontaining materials, and other potentially hazardous materials. All surveys were described and results included in a Hazardous Materials Report.

Project Date: October 2012 – December 2013

Project Value – \$17,891; Contract Type – FFP; EA Project No. – 6236508; EA Project Manager – Robert Shambach



**P&S Construction; Building 901 (Andersen Air Force Base South); Andersen Air Force Base, Guam; Senior Environmental Technician**—Conducted site visits to visually identify any potentially hazardous materials or substances that were used or releases in conjunction with building materials, lighting, paints, fixtures, road and utilities improvements, coolant fluids in electrical components and past site releases. Provided oversight to subcontractors during x-ray fluorescence surveys to identify lead-based paint used at Building 901. **Project Date: July–October 2012** 

Project Value – \$6,470; Contract Type – LS; EA Project No. – 6263001; EA Project Manager – Bob Shambach

*Geus-Manell Watershed Restoration; National Oceanic Atmospheric Administration; Merizo, Guam; Senior Geologist*—Design and implementation of erosion control in two watersheds on southern Guam. Site survey of areas void of vegetation along stream banks and riparian areas. Pilot project to design low cost best management practices to reduce sediment load and improve water quality into the streams and onto coral reefs. Project involved installation of the best management practices and vegetation buffer strips.

Project Date: October 2012 – December 2013

Project Value – \$84,500; Contract Type – LS; EA Project No. – 6266201; EA Project Manager – Jaquay Soriano

Biological Monitoring Program and Detection Monitoring Plan at the Victor, X-Ray, Delta, and Echo Wharves, Apra Harbor, Piti, Guam; Reliable Builders (U.S. Navy); Environmental Technician/Scientist/Project Manager—Performed biological monitoring, sediment monitoring, fabrication and installation of sediment sampling devices. Survey transect lines were installed in 3 locations for monitoring during 8 months of maintenance dredging at Victor, X-Ray, and Delta/Echo wharves on Naval Base Guam. Sediment samples were collected and photo/video documentation was performed prior to commencement of maintenance dredging, during dredging and post dredge activities. Sediment samples were dried and weighed to compare sediment load over the period of the maintenance dredge activity. A dredge material management plan was also developed to characterize the dredged materials for compliance and final disposal placement and beneficial reuse options.

Project Date: April 2012 – June 2013

Project Value – \$114,363; Contract Type – LS; EA Project No. – 6258902; EA Project Manager – Jaquay Soriano

*Guam Coral Reef Monitoring Database Development; Guam Bureau of Statistics and Plans; Guam; Senior Geologist*—Assisted project manager with client relations and project kickoff. Project included compilation of Guam coral reef monitoring and terrestrial datasets collected by various government agencies, organizations, and the University of Guam and prepared the data for migration to a relational database. Characterized datasets for the following parameters: water quality, benthic habitats, and associated biological communities. Datasets were formatted and imported into the Guam Coastal Management Program database.

Project Date: October 2012 – June 2013

Project Value – \$34,800; Contract Type – LS; EA Project No. – 6261901; EA Project Manager – Jaquay Soriano

Naval Magazine Area Guam, Remedial Investigation and Surface Clearance; Guam Naval Base, Project

*Manager*—Directly responsible for ensuring that the correct process was adhered to by all personnel during tree planting surface clearance operations following the Navy's Explosives Safety Submission. Responsible for day-to-day project health and safety matters, including oversight and interface for onsite subcontractors. Implemented and conducted safety meetings, visitor orientations, inspections, training, audits, and self-assessments, as required by the project work plan. Maintained written safety and equipment logs/records.

Project Date: September 2012 – October 2013

Project Value – \$144,927; Contract Type – Lump Sum; EA Project No. – 6251401; Project Manager – Robert Shambach

Layon Landfill Water Quality Monitoring; Gershman, Brickner & Bratton, Inc.; Inarajan, Guam; Project Engineer—Project Manager for the new Layon Landfill water quality monitoring, such as data collection oversight, sampler programming, calibration and troubleshooting.

Project Date: October 2011 – October 2012

Project Value – \$200,231; Contract Type – LS; EA Project No. – 6239205; EA Project Manager – Robert Shambach



*Dissolved Gas Analysis; Guam Power Authority; Various Locations, Guam; Project Manager*—Provided technical oversight of contract and field operations of technical staff and support to the Project Manager. Project involved collection of transformer oil for dissolved gas analysis. Results indicated if the transformers are operating efficiently or if they are at risk for failure. Project involved monitoring of over 30 transformers owned by Guam Power Authority T&D division.

Project Date: June 2010 – December 2012 Project Value – \$41,000; Contract Type – LS; EA Project No. – 6232503; EA Project Manager – Tressie Word

*Power Plant 1 and 2 Site Investigation, Commonwealth Utilities Commission, Saipan, Commonwealth of the Northern Mariana Islands; Project Manager*—Managed the site investigation and EA field staff to ensure adherence to the work plan. Investigation included installation of 20 borings and shallow wells, collection of soil samples and groundwater samples, product recovery, and report preparation.

Project Date: June 2010 – May 2011

Project Value – \$419,500; Contract Type – LS; EA Project No. – 6232503; EA Project Manager – R. Shambach

*Gershman, Brinker, and Bratton; Inarajan, Guam; Senior Geologist*—Conducted a dye trace study at the Inarajan Wastewater Treatment Plant. The purpose of the study is to characterize water infiltration and percolation conditions beneath the facility and to identify seeps along the shore line. Field activities included mixing approximately 20,000 gallons of potable water with a food-grade, non-toxic and biodegradable dye and discharging the dye to a percolation bed located at the treatment plant. An additional 20,000 gallons of potable water were used to flush the dye through the subsurface. The nearshore marine waters in the vicinity of the sewage treatment plant were observed for the emergence of dye around the clock for 5 consecutive days until dye was observed in the seeps along the shoreline below the treatment plant.

Project Date: 2010-2011

Project Value – \$166,149; Contract Type – LS; EA Project No. – 6239202; EA Project Manager – Brian Thomas

Landfill Gas Monitoring Point Installation, Inarajan, Guam; Gershman, Brinker and Bratton; Senior Geologist/Project Manager—Project manager for installation of the first three perimeter landfill gas wells around Cells 1 and 2 at the new Layon Landfill. This included oversight of drillers while performing well installation and monitoring using an air quality meter. Also responsible for the reporting and analysis of analytical data. Project Date: January–October 2011

Project Value – \$24,844; Contract Type – Lump Sum; EA Project No. – 6239204; EA Project Manager – Robert Shambach

*EATC Joint Venture B-2 Crash Site Andersen Air Force Base Yigo, Guam; U.S. Air Force Center for Engineering and the Environment; Senior Geologist*—Responsible for reviewing field data and reporting of daily operation of vapor extraction unit. Provided information to client and tracked property usage and operation and maintenance of equipment.

Project Date: June 2011 – April 2013 Project Value –\$539,156; Contract Type – LS; EA Project No. – 6243802; EA Project Manager - Scott Moncrief

**PCR-Groundwater; Andersen Air Force Base, Yigo, Guam; Senior Geologist**—Provides technical support and Geologic resources for the long-term groundwater monitoring program for MARBO Annex, Northwest Field, and Main Base Operable Units at Andersen Air Force Base, Guam.

Project Date: October 2010 – Present

Project Value – \$226,515; Contract Type – LS; EA Project – 6245101; EA Project Manager – Brian Thomas

Leaking Underground Storage Tank Phases 1 and 2, Division of Environmental Quality; Commonwealth of the Northern Mariana Islands; Environmental Professional—Provided technical assistance for Division of Environmental Quality Leaking Underground Storage Tank Phases 1 and 2 Program in Saipan and Rota for the Division of Environmental Quality. Responsibilities included technical support for numerous Phase I and Phase II site remediation projects.

Project Date: September 2010 – June 2011 Project Value – \$19,707; Contract Type – FFP; EA Project – 6248202; EA Project Manager – Tressie Word



Integrated Contingency Plan for Andersen Air Force Base, Guam, DZSP-21 (Navy BOS Contractor); Guam, Project Manager—Project Manager for the Integrated Contingency Plan for Andersen Air Force Base. The intent of the Integrated Contingency Plan was to incorporate the major aspects of various environmental preparedness plans into a single useable plan in order to provide guidance in environmentally hazardous situations that may arise at Andersen Air Force Base. The Integrated Contingency Plan addressed the prevention, identification, response, and mitigation of petroleum products and hazardous materials that are stored at Andersen Air Force Base. The emergency preparedness and response procedures outlined in the Integrated Contingency Plan were designed to minimize the impacts of releases to human health, the surrounding environment, and the facility itself. The intent was to consolidate multiple plans that had been previously prepared, and incorporate newly generated required response plans to comply with various regulations into one functional emergency response plan, aiding emergency response trainers to better prepare Andersen Air Force Base personnel for potential future incidents. Worked closely with the EA Loveton office engineering and compliance departments to ensure a thorough report was submitted.

Project Date: December 2010 – December 2011 Project Value – \$59, 684; Contract Type – FFP; EA Project No. – 6248901; EA Project Manager – Robert Shambach

New Production Well Site Evaluation, Guam Waterworks Authority, Guam; Winzler & Kelly; Project

*Manager/Senior Geologist*—Project Manager and Senior Geologist for the development of a technical memorandum for the placement of three new production wells. Compiled available information including relevant geotechnical formation, well logs, and property ownership for three new water production wells on Northern Guam. Worked closely with the University of Guam WERI to gather available hydrogeological information, including logs and other data from wells in the vicinity. The data were then entered into a Geographic Information System database to assess the most feasible location for 700 gpm production wells on northern Guam. Conducted field investigations of each proposed well site and estimate groundwater yield, and identify available utilities, land availability, existing waterlines and pressure zone considerations. An evaluation of the chloride histories of the wells and adjacent wells, especially upgradient wells was performed and presented in a matrix format. EA supported completion of test borings and pump tests at each of the test borings.

Project Date: April 2011 – August 2013

Project Value – \$57,000; Contract Type – FFP; EA Project No. – 6253201; EA Project Manager – Robert Shambach

*Geologic Oversight of Geotechnical Borings – Kilo Wharf, Naval Base, Guam; TOA Corporation; Project Manager/Senior Geologist*—Project Manager and onsite Senior Geologist for the geotechnical assessment of subsurface materials during test borings at a wharf expansion project to determine if materials are competent and follows design criteria. Borings were completed to 130 ft below ground surface using a hollow-stem auger and split spoon SPT test. All borings were logged and reported with photo logs.

Project Date: May 2009 – June 2010

Project Value – \$14,000; Contract Type – FFP; EA Project No. – 6232601; EA Project Manager – Robert Shambach

*Hazardous Materials Survey, Apra Harbor Wharves (Tango, Uniform, Victor); Naval Base, Guam; Moffatt & Nichol Engineers; Project Manager*—Project Manager for the hazardous materials assessment of materials at the wharves to determine if hazardous items need to be included in design criteria. All painted items were screened for lead-based paint using an x-ray fluorescence detector. Materials were also assessed for polychlorinated biphenyls containing oils, asbestos-containing materials, and other potentially hazardous materials. All surveys were described and results included in a Hazardous Materials Report.

Project Date: June 2009 – June 2010

Project Value – \$100,000; Contract Type – FFP; EA Project No. – 6232601; EA Project Manager – Robert Shambach



*GBB-Layon Landfill Baseline Groundwater Monitoring Program, Inarajan, Guam; Gershman, Brinker and Bratton; Senior Geologist/Project Manager*—Project manager for finalizing of the Site-Specific Groundwater Monitoring Plan that included groundwater monitoring well installation, development and monitoring using dedicated sampling pumps and abandonment of some wells, collecting stream surface water samples; water level transducer installation and monitoring, installation and monitoring of rain gauge system. Also responsible for the reporting and analysis of analytical data.

Project Date: November 2009 – March 2011

Project Value – \$895,429; Contract Type – Lump Sum; EA Project No. – 6239201; EA Project Manager – Robert Shambach

URS Corporation- Shell Guam Phase II-Shell Terminal and Pipeline; URS Corporation; Agat, Guam; Project Manager—Project Manager for work involving the collection of soil samples using hand augers and split spoon sampling equipment, packing and shipping of samples at a petroleum storage facility. The work also included installation of groundwater monitoring wells, well development and sampling using hand bailers and low flow peristaltic pumps. Product recovery and volume tracking in designated monitoring wells throughout the terminal complex.

Project Date: 2010

Project Value - \$74,522; Contract Type - T&M; EA Project - 1467901; EA Project Manager - Robert Shambach

Brownfields Phase I Environmental Site Assessment, Saipan, Commonwealth of the Northern Mariana Islands; Department of Environmental Quality; Project Manager/Responsible Professional—Activities included performance of Phase I environmental site assessment in accordance with American Society for Testing and Materials E 1527-05 (Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process) at two sites and consisted of a review of current and historic activities and conditions at the properties and adjacent properties, including a non-intrusive visual inspection of the subject sites; review of local, state, and federal regulatory database records; review of available historic records; and a survey of adjacent land uses. Concluded the Phase I environmental site assessment with a final report for each of the sites. Project Date: August 2009 – May 2010

Project Value – \$10,043; Contract Type – Lump Sum; EA Project No. – 6236001; EA Project Manager – Robert Shambach

Remedial Investigation/Feasibility Study and Proposed Plan/Record of Decisions for 54 Sites, Installation Restoration Program, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Geologist—Onsite field task manager for one RI/FS IRP site following CERCLA process under Air Force Center for Engineering and the Environment and Federal regulations. During the investigation, provided senior support for activities conducted that included installation of one deep monitoring well to 550 ft using air rotary drilling equipment, groundwater sampling from deep wells, soil sample collection, down-hole video of borings and underground injection control wells

Project Date: April 2009 – September 2013

Project Value – \$747000; Contract Type – Lump Sum, EA Project No. – 1456008; EA Project Manager – Scott Moncrief

Long-Term Groundwater Monitoring; Andersen Air Force Base, Yigo, Guam; Air Force Center for Engineering and the Environment (Subcontract to CAPE Environmental Management); Senior Geologist—Provided Senior Technical Review and support of the Long-Term Groundwater Monitoring Program for MARBO Annex, Northwest Field, and Main Base Operable Units at Andersen Air Force Base, Guam. Responsibilities included ensuring that all aspects of the sampling of approximately 50 groundwater monitoring, open borehole, and production wells were in compliance with the work plan and sampling and analysis plan documents. Attended remedial program meeting updates and weekly meetings with the Air Force client.

Project Date: 2010 – April 2011

Project Value – \$305,226; Contract Type – Lump Sum; EA Project – 6232101; EA Project Manager – Chip Brown



Preliminary Assessments/Site Investigations for 10 IRP Sites, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Project Manager—Project manager for a \$1.5 million preliminary assessment/site investigation to determine if chemicals of potential concern are present at 10 sites (18 subsites) following CERCLA process. Management of sites that included subcontractor oversight, subcontractor procurement, development of work plans, sampling and analysis plans, standard operating procedures, and preliminary assessment/site investigation reports.

Project Date: March 2006 – May 2008

Project Value – \$2,445,000; Contract Type – CPM; EA Project No. – 2970014; EA Project Manager – Robert Shambach

*Old Seaman's Club D-Line Release Assessment; Shell Guam, Inc.; Project Manager*—Project Manager for the assessment of groundwater after the release of petroleum from a distribution line leak. Used an excavator to complete test pits for the assessment and collection of groundwater grab samples. *Project Date: December 2005 – 2007 Project Value – \$24,900; Contract Type – CPM; EA Project No. – 1433904; EA Project Manager –* 

Project Value – \$24,900; Contract Type – CPM; EA Project No. – 1433904; EA Project Manager – Robert Shambach

*Petroleum Plume Delineation – Shell Guam Agat Terminal; Shell Guam, Inc.; Project Manager*—Project Manager for the delineation and lateral extent of petroleum constituents in shallow groundwater at three plumes. Used cone penetrometer, prepacked well screens, portable hydraulic auger, and low-flow pump technology to complete the project with minimal budget. Project included a pilot study for use of biosparging technology to add oxygen to an anaerobic media.

Project Date: November 2005 – January 2009 Project Value – \$150,000; Contract Type – CPM; EA Project No. – 1433907; EA Project Manager – Robert Shambach

*RCRA investigations under a Voluntary Corrective Action Plan, Agat, Guam; Shell Guam, Inc.; Geologist*— Field task manager for conducting drilling and report writing for several Solid Waste Management Unit sites following the RCRA process. Provided site support and oversight of subcontractors, collected boring samples during the investigation. Supported author for Corrective Action Completed Clean Closure Report for several sites on Guam.

Project Date: May 2002 – 2004 Project Value – \$26,500; Contract Type – CPM; EA Project No. – 1379701; EA Project Manager – Toraj Ghofrani

**Product Recovery and Monitored Natural Attenuation Sampling and Performance Evaluation, Agat, Guam; Shell Guam, Inc.; Project Manager**—Project Manager for Product Recovery and monitored natural attenuation at several areas of concern in southern Guam. Biannually sampling for monitored natural attenuation parameters since May 2002. Performed monitoring well/recovery well drilling oversight, sampling, report writing and performance evaluations throughout the site. Data were also evaluated to EPA and American Society for Testing and Materials guidance for monitored natural attenuation evaluations. BIOSCREEN modeling was also performed for several plumes at the site.

Project Date: May 2002 – 2009 Project Value – \$50,000 annually; Contract Type – CPM; EA Project No. – 1337306; EA Project Manager – Robert Shambach

RCRA Solid Waste Management Unit Investigations, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Task Manager/Site Geologist—Field task manager for several solid waste management units sites throughout Andersen Air Force Base. Conducted site investigations that include surface and subsurface soil sample collection, boring completion for site characterization. The investigations involved permits; surface and subsurface soil sampling, oversight of subcontractors, and reporting of results in a summary document. *Project Date: July 2001 – 2008* 

Project Value – \$816,000; Contract Type – CPM; EA Project Nos. – 1379706, 07, 08; EA Project Manager – Robert Shambach



*IRP, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Geologist*—Field task manager for several RI/FS IRP sites following CERCLA process under Air Force Center for Engineering and the Environment and Federal regulations. Successfully managed six IRP site investigations in five operable units from start to final report phase. During the investigation, conducted multiple activities that included installation of deep monitoring wells to 700 ft using reverse air rotary drilling equipment, groundwater sampling from deep wells, soil gas probe installation and sample collection, soil sample collection, unexploded ordnance avoidance, and electromagnetic geophysical surveys. Provided site task-managing support for several IRP sites including oversight of a minimum of two subcontractors. Writing experience included several styles of reports including No Further Remedial Action Plans, Site Characterization Summary Reports, Engineering Evaluation/Cost Analysis, and RI/FS reports.

### Project Date: March 1996 – 2008

Project Value – \$250,000; Contract Type – CPM; EA Project No. – 2970014, EA Project Manager – Robert Shambach

*Petroleum Storage Tank Leak Assessment; Shell Guam, Inc.; Project Manager*—Project Manager for initial assessment to determine if a petroleum storage tank leaded. Used portable hydraulic auger technology to complete shallow borings to groundwater to determine if release occurred. The project was completed within 50 percent of the proposed budget.

Project Date: February 2007

Project Value – \$9,000; Contract Type – CPM; EA Project No. – 1433909; EA Project Manager – Robert Shambach

*Preliminary Assessments/Site Investigations for 23 IRP Sites, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Project Manager*—Project manager for a \$2.4 million preliminary assessment/site investigation following CERCLA process under AFCE Air Force Center for Engineering and the Environment and Federal regulations. Provided site management support for sites including oversight of subcontractors, procurement of subcontractors, and development of work plans, sampling and analysis plans, standard operating procedures, and RI/FS reports.

Project Date: March 2004 – January 2007

Project Value – \$1,500,000; Contract Type – CPM; EA Project No. – 2970037; EA Project Manager – Toraj Ghofrani

Brownfields Site Survey, Saipan, Commonwealth of the Northern Mariana Islands; Department of Environmental Quality (Team Partner - Duenas & Associates); Task Manager/Site Geologist—Task management activities included site preparation and logistics, review of survey procedures and forms, survey results, photos, forms, interviews, and draft report. Concluded the investigation with a Brownfields Site Survey and Inventory for the Island of Saipan report.

Project Date: October 2005 – September 2006 Project Value – \$22,600; Contract Type – CPM; EA Project No. – 6206401; EA Project Manager – Robert Shambach

*Edoni Borrow Pit, Edoni, Saipan, Commonwealth of the Northern Mariana Islands; U.S. Army Corps of Engineers; Project Manager/Site Geologist*—Delivery order manager for RI site in Saipan, Commonwealth of the Northern Mariana Islands. Task management activities included site preparation and logistics, obtaining appropriate permitting, subcontractor oversight, site investigations that included detailed site inventory, test excavations, surface soil and subsurface soil sampling. Concluded the project by summarizing data and coauthoring an RI report. *Project Date: February 2004* 

Project Value - \$256,000; Contract Type - LS; EA Project No. - 6133401; EA Project Manager - Warren Hall



Asbestos Building Survey, Andersen Air Force Base, Guam; Air Force Center for Engineering and the *Environment; Asbestos Hazard Emergency Response Act Building Inspector*—Performed inspections and sampling of more than 50 buildings throughout two military installations. Completed an Asbestos Survey Reinspection Report for updating the installation database and to provide the client with recommendations for future facility use.

Project Date: May–September 2002 Project Value – \$15,000; Contract Type – CPM; EA Project No. – 1379715; EA Project Manager – Chip Brown

*IRP Site 15/Landfill 20 Engineering Evaluation/Cost Analysis, Andersen Air Force Base, Guam; Air Force Center for Engineering and the Environment; Task Manager/Site Geologist*—Delivery order manager for CERCLA IRP Site 15/Landfill 20. Task management activities included site preparation and logistics, obtaining appropriate permitting, subcontractor oversight, site investigations that included detailed site inventory, surface soil and subsurface soil sampling. Concluded the investigation by authoring an Engineering Evaluation/Cost Analysis report.

Project Date: March–July 2001

Defense Environmental Restoration Program Formerly Used Defense Sites; U.S. Army Corps of Engineers-Baltimore District; Geologist—Preliminary site assessment of Defense Environmental Restoration Program Formerly Used Defense Sites, conducted interviews of current landowners and local community members, and compiled information into documentation in a cost effective time period. Project Date: February 1996

#### Fort Drum Military Installation, Watertown, New York; U.S. Army Corps of Engineers; Geologist-

Environmental media sampling including collecting surface soil and subsurface soil samples during monitoring well and piezometer installations at multiple petroleum-containing underground storage tank sites. Conducted surface water and sediment sampling, unexploded ordnance avoidance, electromagnetic geophysical surveys, analytical data reporting, and assisted in compilation of a Comprehensive Contaminant Assessment Report for the U.S. Army Corps of Engineers. Conducted several pump tests for a granular activated carbon system to regulate appropriate flow velocities for wells used during remedial treatment process. Performed operations and maintenance on a light non-aqueous phase liquid skimmer system at two former underground storage tank sites. *Project Date: April 1995 – January 1996* 

*Camp Simms Military Reservation FSI, Washington D.C.; U.S. Army Corps of Engineers; Geologist*—Field team leader for investigations consisting of surface and subsurface soil sampling of former military target practice backstop locations, surface water and sediment sampling, groundwater monitoring well installation, unexploded ordnance avoidance, groundwater sampling, and a location survey. Assisted in compilation of a Focused FS Report. All fieldwork conducted during this project was performed with the support of armed security guards due to the high crime location of the sites.

Project Date: Spring 1995

Andrews Air Force Base, Maryland; U.S. Army Corps of Engineers; Geologist—Conducted redevelopment of several shallow aquifer sparge wells and performed a 36-hour aquifer test at a petroleum-contaminated fire fighting training area for implementation of an air sparge treatment system. Project Date: Spring 1995

Philadelphia Naval Shipyard, Philadelphia, Pennsylvania; Naval Facilities Engineering Command, Northern Division; Geologist—Completed logging and installation of shallow groundwater monitoring wells, collected soil samples, assisted in active whole air soil gas surveys using a mobile gas chromatography/mass spectrometry, and conducted electromagnetic geophysical surveys. Project Date: December 1994 – February 1995

Aquifer Pump Tests, Mather Air Force Base, Sacramento, California; U.S. Army Corps of Engineers; Technician—Assisted in performance of extended pump tests at solvent-contaminated sites. Project Date: October 1994



Remedial Investigation/Feasibility Study Field Investigations, Ellsworth Air Force Base, Rapid City, South Dakota; U.S. Army Command/Air Combat Command; Environmental Technician—Assisted in the installation and construction of shallow groundwater monitoring wells, collection of soil samples from boreholes, and conducted air quality monitoring during RI/FS field activities. Project Date: 1994

### **Employment History**

Employer—EA Engineering, Science, and Technology, Inc., PBC
Dates of Employment—June 1994 – Present
Title—Guam Office Manager/Senior Geologist (July 2013 – Present)
Guam Operations/Profit Center Manager (October 2008 – June 2013)
Project Manager/Geologist III (September 2005 – October 2008)
Geologist II (January 1997 – September 2005)
Geologist I (January 1995 – January 1997)
Environmental Technician II (June 1994 – January 1995)

### List of Technical Skills and Specializations

- Administrative duties
- Business development
- Conduct management of Government furnished equipment
- Investigations and removal actions with remote site logistics
- Investigations involving remote site logistics
- Management of teaming partners and subcontractors
- Monitored natural attenuation evaluation and reporting
- Performance of geophysical surveys and interpretation of data
- RI/FS at CERCLA and RCRA sites
- Technical document preparation and production

