

# Think About Your Families Health

TO

**Things TCE can do for you!** (from EPA)(this is some bad stuff)

**4.2. Genetic Toxicity** = In genetics, genotoxicity describes the property of chemical agents that damages the genetic information within a cell causing mutations, which may lead to cancer or other problems. The alteration can have direct or indirect effects on the DNA: the induction of mutations, mistimed event activation, and direct DNA damage leading to mutation. This DNA damage can be passed on to your off spring.

**4.3. Central Nervous System (CNS) Toxicity** = The critical neurological effects are nerve conduction changes, sensory effects, cognitive deficits, changes in psychomotor function, and changes in mood and sleep behaviors.

**4.7.4.4.3.1. Mutagenicity** = is a physical or chemical agent that changes the genetic material, usually DNA, of an organism and thus increases the frequency of mutations.

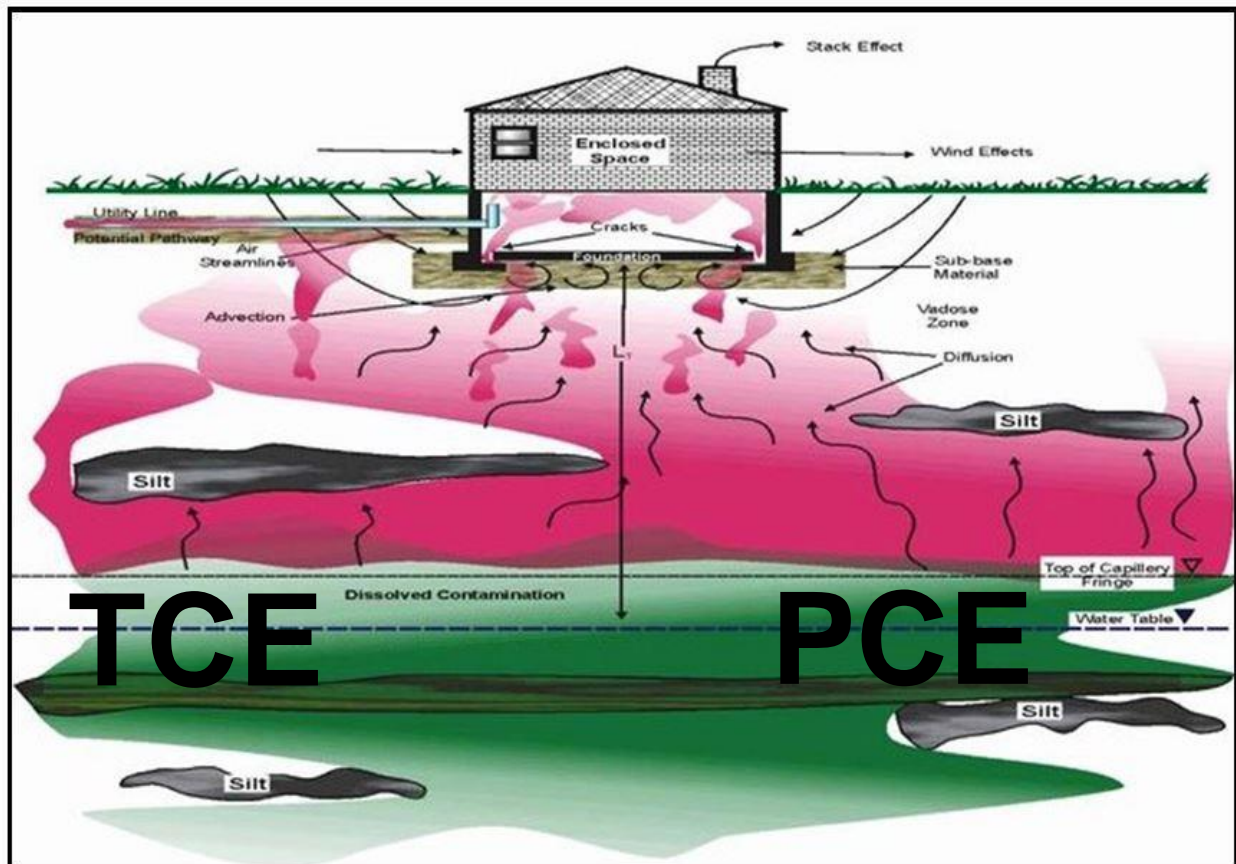
**4.7.4.4.3.2. Cytotoxicity** = is the quality of being toxic to cells.

**4.8. Reproductive and Developmental Toxicity** = pure evil for our kids

**6.1.3.4. Immunological Effects** = A relationship between systemic autoimmune diseases, such as scleroderma.

**6.1.4. Carcinogenicity** = Cancer Causing.

Do-it-Yourself Test Kits are available for Vapor Intrusion



Vapor Intrusion of TCE & PCE Contamination Into Indoor Living Space

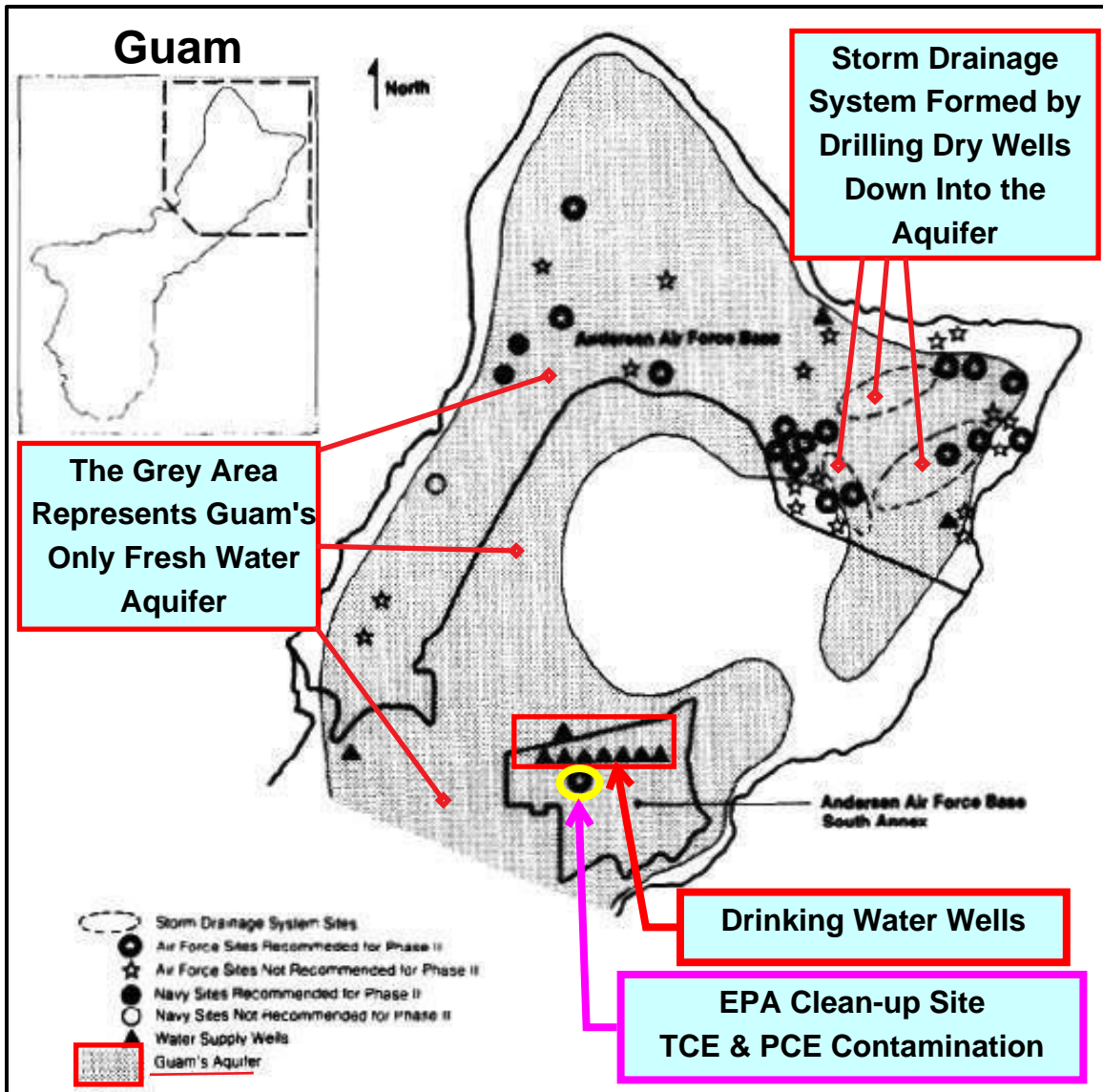


Table 2.1: RCRA Violations Found in Four Inspections, by Installation

Installation	Number of violations				Total
	1985		1986		
	First	Second	First	GAO requested	
Anderson Air Force Base	4	11	1	7	23
Guam Naval Complex Generators:					
Ship Repair Facility	5	0	2	6	13
Public Works Center	5	2	3	6	16
Naval Air Station, Agana	8	5	1		14
Naval Magazine	0	0	1		1
Naval Station	0	0	0		0
DRMO	6	0	0	6	12
<b>Total</b>	<b>28</b>	<b>18</b>	<b>8</b>	<b>25</b>	<b>79</b>



# National Priorities List (NPL)

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## NPL Site Narrative for Andersen Air Force Base

### ANDERSEN AIR FORCE BASE Yigo, Guam

Federal Register Notice: [October 14, 1992](#)

**Conditions at Proposal (February 7, 1992):** Andersen Air Force Base (AAFB) is located in Yigo on the northern end of the island of Guam. The main base and annexes of AAFB occupy approximately 20,000 acres. Navy and Air Force installations occupy most of the northern half of the island. Approximately 34,000 people live within 4 miles of the site in the Cities of Dededo, Tamuning, and Yigo. The population living, working, and attending school on AAFB currently includes 3,400 military personnel, 600 civilians, and 4,000 dependents. The land occupied by AAFB provides habitat for four species designated as endangered by the U.S. Fish and Wildlife Service.

AAFB has been operational since the 1940s. Its major mission is support for Strategic Air Command operations. Sources of hazardous substances at AAFB include unlined landfills, drum storage and disposal areas, chemical storage areas, fire training areas, waste storage areas, a laundry, and industrial and flight line operations. Substances known to be involved in AAFB's operations include: solvents such as trichloroethene (TCE) and paint thinners; dry cleaning fluids and laundry products; fuels such as JP-4 and gasoline; pesticides; antifreeze; aircraft cleaning compounds; and PCBs.

AAFB is located in a karst limestone terrain. Inadequately contained sources of hazardous substances are located in sinkholes that provide a direct route for contamination to reach ground water. The Northern Guam Lens, which underlies the site, has been designated a Sole Source Aquifer under the Safe Drinking Water Act. This designation is based upon two criteria: 1) the aquifer supplies drinking water to 50 percent or more of the area's population and 2) if contaminated, the aquifer would present a significant risk to public health.

Air Force analyses indicate the presence of lead, chromium, TCE, toluene, and tetrachloroethene in ground water beneath the site. However, not all of these materials can be attributed to AAFB operations, and background levels have not been determined for the metals, which occur naturally. An estimated 40,200 people obtain drinking water from wells within 4 miles of the site.

**Status (October 1992):** EPA, the Guam environmental agency, and the Air Force are negotiating a Federal Facilities Agreement under CERCLA Section 120 to cover future activities at the site.

For more information about the hazardous substances identified in this narrative summary, including general information regarding the effects of exposure to these substances on human health, please see the Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs. ATSDR ToxFAQs can be found on the Internet at <http://www.atsdr.cdc.gov/toxfaq.html> or by telephone at 1-888-42-ATSDR or 1-888-422-8737.

**We used TCE every day to clean parts and paint brushes. We had two 55 gal. drums of it on our shops bench stock inventory. We found out years later TCE was in our drinking water also.**

**Herbicides fall under the category of "Pesticides"**

**My job was working on fuel systems of all kinds on and off base. We were exposed to all kinds of fuel but mostly JP-4. The exposure included skin contact and breathing the fumes, daily.**

**There are 39 EPA Super-fund Clean-up Sites on and off of Andersen Air force Base**

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<http://www.epa.gov/superfund/sites/npl/nar1340.htm>  
[Print As-Is](#)

- Final Spring 2007 Groundwater Monitoring Report for Andersen AFB, Guam (EA, 2007b)
- Final Fall 2007 Groundwater Monitoring Report for Andersen AFB, Guam (EA, 2008a)
- Final Spring 2008 Groundwater Monitoring Report for Andersen AFB, Guam (EA, 2008b)
- ➔ • Final FFS to Support a ROD Amendment with a TI Waiver for the MARBO Annex Operable Unit, Andersen AFB, Guam (EA, 2008c).

➔ Based on the results of the investigations completed for MARBO Annex groundwater, the USN has concluded that Natural Attenuation with Wellhead Treatment is a failed remedy and that specific fundamental changes are needed for the original groundwater remedy.

### 2.2.2 Occurrence, Fate, and Distribution of Groundwater Contamination

A complete description of the nature and extent of contamination in MARBO Annex groundwater is presented in the 2008 Focused Feasibility Study (FFS) (EA, 2008c).

Since the LTGM Program was initiated in 1995, 26 groundwater sampling events have been conducted at the MARBO Annex. Based on the results of the OU 2 Remedial Investigation and the LTGM Program, two potential contaminants of concern were identified: TCE and PCE (ICF, 1997; EA, 2008b). These contaminants of concern have historically been detected in deep groundwater samples collected from two monitoring wells, IRP-31 and IRP-29, at concentrations above their respective MCLs (5 µg/L, each). The historic distribution of TCE and PCE concentrations in groundwater exceeding the MCL are depicted on Figure 2-1.

➔ The dissolved-phase TCE and PCE have been identified as being two immobile, geographically distinct plumes; therefore, a common source for contaminants is not plausible. The estimated volumes of TCE- and PCE-contaminated groundwater are 340 million gallons and 280 million gallons, respectively<sup>2</sup>. ➔ Though a significant number of potential sources have been investigated at IRP sites, no surface or subsurface sources for the TCE and PCE have been identified. Also, the fact that the shallow freshwater lens has shown a consistent decline in TCE and PCE concentrations over the past 15 years is indicative that there is not continued contaminant sourcing from the vadose zone (EA, 2008c).

TCE and PCE have either been non-detect or detected at concentrations below the MCL in all shallow monitoring wells, except IRP-14. In groundwater samples collected from IRP-14 PCE concentrations have decreased linearly over the past 11 years to concentrations below the

<sup>2</sup> The estimated volumes of TCE- and PCE-contaminated groundwater were calculated by multiplying the plume volumes by the soil porosity using the following assumptions:

➔ PCE Plume: Length = 2,500 feet  
Width = 1,000 feet  
Height = 50 feet  
Porosity = 30% (ICF, 1997)

➔ TCE Plume: Length = 3,000 feet  
Width = 1,000 feet  
Height = 50 feet  
Porosity = 30% (ICF, 1997)

## 2.2 Air Force Marbo Groundwater Impacted by TCE and PCE

The groundwater table beneath the Andersen Air Force Base MARBO Annex ranges from approximately 281 to 400 feet below ground surface. There are water production wells within the MARBO Annex area. This water is blended with water from other production wells and is distributed to various villages. As a consequence of past Air Force activities at MARBO Annex, the groundwater beneath the Annex area has been impacted by trichloroethylene (TCE) in the northern portion and tetrachloroethene (PCE) in the vicinity of the former MARBO Laundry facility. This contamination was first detected in MARBO groundwater when appropriate groundwater sampling and analysis was initiated some 30 years ago. As a result, Andersen Air Force Base has been identified as the responsible party for the groundwater contamination and has since implemented some actions to address the situation.

In November of 2009, the United States Air Force (USAF) updated the original selected remedy, *Natural Attenuation with Wellhead Treatment*, for MARBO Annex Groundwater at AAFB, by amending certain aspects of the June 1998 MARBO Annex OU Record of Decision. The amended selected remedy is *Long-Term Groundwater Monitoring with Contingency for Wellhead Treatment*.

Since the implementation of 1998 selected remedy, semi-annual groundwater sampling and analysis has shown that natural attenuation has not been effective in reducing TCE and PCE concentrations in the deep portions of the freshwater aquifer. Therefore, the USAF concluded that specific fundamental changes are needed to modify the MARBO Annex Groundwater remedy of *Natural Attenuation with Wellhead Treatment* selected in the 1998 ROD.<sup>4</sup>

### *Navy Environmental Restoration Program*

#### 2.3. Tiyan – former NAS Agana

Groundwater beneath Tiyan has been investigated since 1986 under the DOD, IRP. Groundwater contamination beneath Tiyan has been detected in the form of TCE and PCE. One production well (NAS-1) exists on the former base and a water sample collected in January 1991 exceeded the MCL for TCE. Subsequent groundwater sampling of monitoring wells under the BRAC has shown the presence of an extensive area of contamination of PCE and TCE.

In July 1993, the (Base Realignment and Closure) BRAC Commission recommended closure of Naval Air Station (NAS) Agana. The installation was closed on March 31, 1995.

All cleanup work on BRAC sites is complete and the sites are in long-term management (Action conducted after cleanup to monitor effectiveness of the remedy and ensure site restrictions remain in place). All former NAS Agana property has been transferred,

<sup>4</sup> November 2009 AMENDMENT: Proposed Plan MARBO Annex Groundwater, MARBO Annex Operable Unit, AAFB, Guam


except for the Agana Power Plant.

Contamination in NAS-1 is currently being remediated through wellhead treatment through activated carbon filtration.

#### **2.4 Construction Battalion Landfill – IRP Long-term Management Site**

In 1998, a soil and synthetic liner system was completed. The site is now in long-term management. A five year review is planned for 2012. Annual reviews and landfill cover maintenance are ongoing.<sup>5</sup>

#### **3.0 Ground Water Conditions in the Vicinity of the Orote “Landfill”**



The Orote “Landfill” was an uncontrolled Navy dump throughout its operational history. Contaminants initially detected in soil and buried waste at the facility include PCBs, dioxins (including 2,3,7,8 TCDD) and furans, polychlorinated aliphatic hydrocarbons, volatile organic compounds (including TCE, PCE, TCA, DCA, and BTEX), metals, and pesticides. These same contaminants have also been detected in groundwater in monitoring wells in and around the dump, coastal fresh water springs and marine waters, and marine sediments and organisms (including fish).

In 2001 the beach area immediately adjacent to the dump was cleaned up of metallic debris, a sea wall was constructed to minimize further erosion of contaminated soil and buried waste, and an impermeable cap was constructed over the dump in an attempt to isolate contaminated waste from the groundwater and marine water beneath and adjacent to the dump.

Subsequent sampling of groundwater, spring and marine waters, and off-shore biota indicate that the contaminants persist in the local environment. A study of the effects of storm-induced waves, tides, and heavy rains on the water table in the vicinity of the capped dump has demonstrated that groundwater rises into buried waste and probably remobilizes contaminants thought to have been isolated from the groundwater and marine environment by the cap and seawall. It was also determined that storms cause temporary reversals of the water table and groundwater flow direction, thus continuing to disperse contaminants away from the dump through the groundwater pathway.

The site is now in long-term management. Fish sampling data evaluation is ongoing. Cap and seawall maintenance is ongoing. Groundwater monitoring is planned.

#### **4.0 Other CERCLA Sites**

There are several CERCLA sites located in the Southern Guam hydrogeologic province not over the NGL: the Ordot Landfill and numerous sites belonging to the Navy.

##### **4.1 Ordot Dump**

The Ordot Dump is listed on the NPL, but no groundwater contamination resulting from

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<sup>5</sup> Fact Sheet 1: Navy’s Guam Environmental Restoration Program – Site Status Update , November 2009

activities at the site has been documented. However, leachate impacts to the Lonfit River have been documented resulting in the impairment and 303(d) listing of this waterbody. It is suspected that the Lonfit River is hydraulically connected with the southern-most extension of the NGL; therefore, impacts to the NGL from Ordot leachate are possible.

#### **4.2 Navy's Guam Environmental Restoration Program**

The Environmental Restoration Program is organized into three programs based on the site type and location. Appendix I. provides Fact Sheet 1 dated November 2009. This document describes the status categories of the environmental cleanup sites on Guam by program.

#### **D. Summary of Ground Water Quality**

The overall ground water quality of the NGL is good, however, it is significantly vulnerable to contaminants, including chloride contamination induced from over pumping of water supply wells. These threats increase the NGL's contamination potential.

During the last quarter of 2005 Guam EPA under the lead of its Safe Drinking Water Program, investigated requirements of "Ground Water Under the Direct Influence of Surface Water" because of the contamination of several GWA ground water wells and possibly U.S. Navy wells. Staff suspected that these wells were potentially influenced by surface water or raw sewage from leaking sewer pumps or sewer pipes. The Agency has formulated draft guidance to determine the source, if the groundwater is under the influence of surface water.




The preservation of the Northern Guam Lens Aquifer is a priority because of its designation as Guam's Sole Source Aquifer and because of the magnitude of incidences observed in which the levels of pollutants (Bacteria, Nutrients, Chlorides, and Toxic Contaminants) exceeded Guam Water Quality Standards. The Agency will facilitate assessment, planning, or pollution control activities necessary to improve water quality such that it complies with local standards. The degree of public interest in or concern about the water body is extremely high.

#### **E. Summary of Groundwater-Surface Water Interactions**

Guam EPA has a growing awareness of ground water-surface water interactions and their contribution to water quality problems.

Another aspect of groundwater is spring discharge along the coast in the inter- and sub-tidal zones. These springs comprise the discharge of the NGL aquifer. A completed study has characterized the chemistry of discharge from selected springs into Tumon Bay. The study consisted of sampling eight Tumon Bay springs during four discrete

sampling events. Total discharge estimated for the seven springs is 17 million gallons per day.

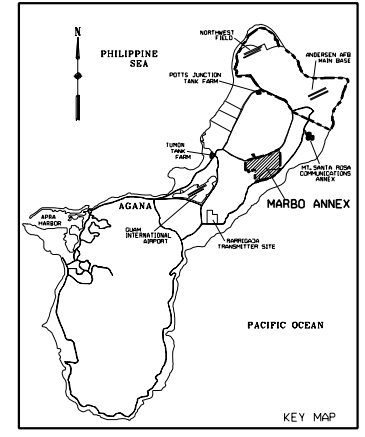
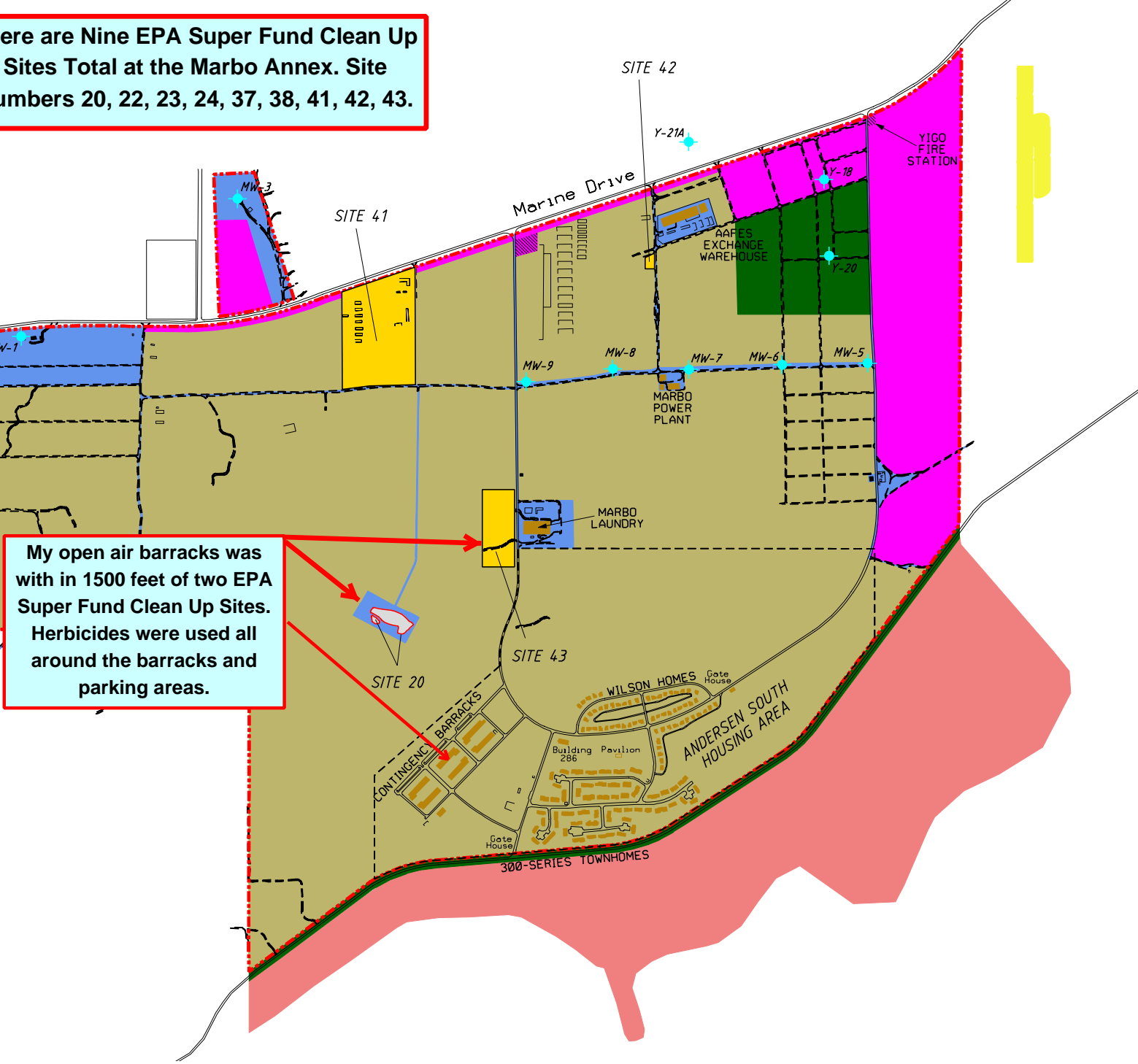
 The two-year study consisted of four sample rounds (of eight springs along the Bay) during both the wet and dry seasons. Chemicals detected above Guam EPA water quality standards included Tetrachloroethene, Trichloroethylene, Aluminum, Antimony, Arsenic, Magnesium, Chloride, Sulfate, Oil & Grease, Total Coliform and Fecal Coliform.  Pesticides Dieldrin, Alpha-Chlordane, and Gama Chlordane were also detected in spring discharge; however no Guam EPA water quality standards currently exist for these  compounds. The study was funded with Clean Water Action Plan money through the Watershed Planning Committee.

Guam EPA intends to use the results of the spring discharge study and information from the recent Northern Watershed Bacteria TMDL to prioritize and mitigate documented impacts on Tumon Bay and other northern beaches.



There are Nine EPA Super Fund Clean Up Sites Total at the Marbo Annex. Site numbers 20, 22, 23, 24, 37, 38, 41, 42, 43.

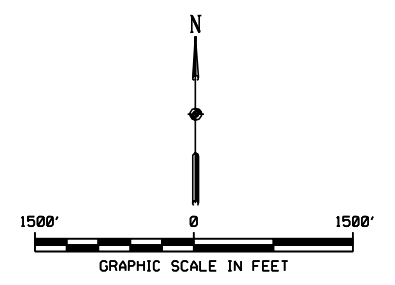
My open air barracks was within 1500 feet of two EPA Super Fund Clean Up Sites. Herbicides were used all around the barracks and parking areas.



**LEGEND:**

- [Red dashed line] EXISTING AIR FORCE PROPERTY LINE
- [Solid black line] EXISTING ROADS
- [Dashed black line] EXISTING UNIMPROVED ROADS
- [Thin grey rectangle] FORMER BUILDING OR PAD
- [Olive rectangle] EXISTING BUILDING NOT INCLUDED IN THE FIRST FIVE-YEAR REVIEW OF THE MARBO ANNEX OPERABLE UNIT RECORD OF DECISION.
- [Blue rectangle] 224 ACRE AREA - AIR FORCE RETAINED PROPERTY
- [Olive rectangle] 1569 ACRE AREA - STILL PROPOSED FOR EXCESS
- [Green rectangle] 81 ACRE AREA - GOVERNMENT OF GUAM
- [Red rectangle] 395 ACRE AREA - CONVEYED TO GOVERNMENT OF GUAM IN 2000
- [Pink rectangle] 231 ACRE AREA - UNDERWOOD PROPOSAL
- [Purple hatched rectangle] 6 ACRE AREA - GOVERNMENT OF GUAM FIRE AND POLICE STATION
- [Blue diamond] MW-9 PRODUCTION WELL

SOURCE: ANDERSEN AFB REAL PROPERTY



9  
Figure 2-3.  
MARBO Annex Operable Unit  
Land Use



Many Service members use industrial solvents in regular military tasks such as cleaning, degreasing, paint stripping, and thinning oil-based paints. Too much exposure to some industrial solvents can cause short-term and long-term health effects.

## Health effects of exposure to solvents

Exposure to solvents may impact your health depending on the specific chemicals, level of concentration, length of exposure, and how it enters the body.

- Inhaled vapors: These may irritate the eyes, cause drowsiness, difficulty with breathing and if severe, neurological damage
- Direct eye contact: This may cause burning and tearing and if severe, visual problems.
- Skin contact: This may cause skin dryness, irritation, rashes or chemical burns.
- **Ingested: Although rare, this can cause serious illness.**



## Specific solvents

For information on specific solvents, the Agency for Toxic Substances and Disease Registry (ATSDR) provides the following fact sheets:

- [Benzene](#) (55 KB, PDF) (and other aromatic hydrocarbons)
- [Perchlorate](#) (66 KB, PDF)
- [Perfluorooctane sulfonate](#) (135 KB, PDF) (and other perfluorinated surfactants)
- [Tetrachloroethylene \(PCE or PERC\)](#) (145 KB, PDF)
- [Trichloroethylene \(TCE\)](#) (76 KB, PDF) (and other chlorinated hydrocarbons)
- [Vinyl chloride](#) (59 KB, PDF), **which can form when TCE and PCE are broken down**

## Health concerns?

If you are concerned about exposure to industrial solvents during military service, talk to your health care provider or local [VA Environmental Health Coordinator](#). Veterans not enrolled in the VA health care system, [find out if you qualify for VA health care](#).

## VA benefits

Veterans may be eligible for VA [disability compensation benefits](#) and [health care benefits](#) for health problems associated with exposure to industrial solvents during military service. Veterans' dependents and survivors also may be eligible for benefits. Read [Federal Benefits for Veterans, Dependents and Survivors](#) to learn more.