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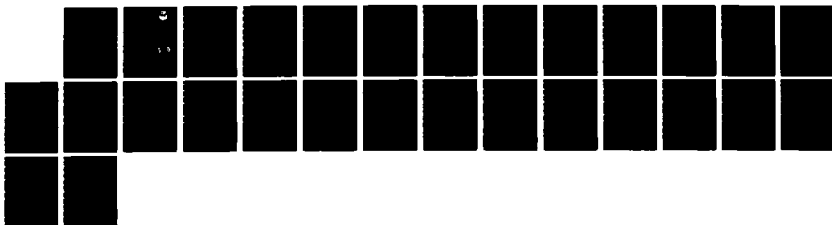
QUALITY ASSURANCE FOR WATER SAMPLING(U) AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH LAB BROOKS AFB TX
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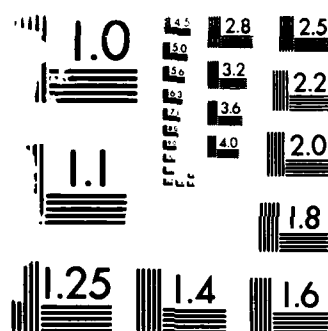
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USAFOEHL REPORT

86-015SO253BSA



QUALITY ASSURANCE FOR WATER SAMPLING

THOMAS C. THOMAS, M.S.

RAY I. NAKASONE, Capt, USAF

February 1986

Final Report

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USAF Occupational and Environmental Health Laboratory
Aerospace Medical Division (AFSC)
Brooks Air Force Base, Texas 78235-5501

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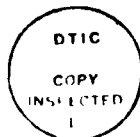
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INTRODUCTION

Due to the increase in litigation involving environmental samples there has been increased concern for the validity and quality of the samples. Proper sampling will result in an accurate characterization of the type of problem existing in the field site at that particular point in time. Improper sampling will result in inaccurate assessment of the problems or possible problems in the field.

It is imperative, therefore, that sampling be conducted so that the samples collected are representative of the situation existing at the sampling site at the time. This means sample results are precise and accurate. To insure that representative samples are collected, sampling programs must be carefully planned and the USAFOEHL Recommended Sampling Procedures should be followed.

The purpose of this report is to insure that the collection of samples is representative and free from error (accurate) and that they result in meaningful (precise) data.

SAMPLE ACQUISITION

Collection

Groundwater samples can be contaminated by material and/or equipment used to install the well. It is recommended that before sampling, purging of well(s) should be accomplished until the physical parameters (conductivity, temperature, and pH) are constant. Problems with this procedure appear when the well(s) do not produce an appreciable amount of water. Bailing of these well(s) for two to three well volumes is also recommended. When sampling surface waters, care must be taken to avoid collection of bottom sediment, large organisms, or any free floating matter. This could definitely impact the sample validity. Consult the USAFOEHL Recommended Sampling Procedures before attempting to collect any samples. Equipment used for sampling should also be considered as a source of contamination. It is easy to cross contaminate samples from one site to another. All sampling equipment must be rinsed with distilled water between sampling. It is a good idea to follow this by a rinse of the water to be sampled. After use, all sampling equipment should be scrubbed with a nonresidue detergent, rinsed with distilled water and dried.

Containers

In almost all instances, plastic or glass containers will be used. (See Appendix A to obtain the recommended container.) There are several types of plastic containers: linear polyethylene (LPE), polypropylene, polyvinyl chloride (PVC), and Teflon.^R Usually, LPE offers the best combination of low cost and chemical resistance. Plastic containers are normally used when possible because of durability during shipment. Glass containers are resistant to all chemicals but cannot be used for certain types of tests. Glass containers cannot be used for strong alkalis and hydrofluoric acids and are more fragile during shipment. Glass containers must be used for all organic chemical analyses. Special containers are used for volatiles and must be baked at 350 to 400 degrees centigrade for 12 to 24 hours to remove any organic contaminants.

Used solvent or other chemical containers should never be used as sample containers, no matter how well they are cleaned. It is almost impossible to remove trace levels of organic compounds. Even new containers should be rinsed with distilled or deionized water followed by a rinse of the water to be sampled. Lids or inserts should be Teflon or similar type material.

Sampling

Each sample container should be labeled with a gummed label or tag wired to the sample container immediately after sampling. The tag or label must contain the following information:

Date and Time of Collection
Sample Source
Base
Preservation Used
Base Sample Number
Collector's Name

Always collect the amounts recommended in the USAFOEHL Recommended Sampling Procedures. Submission of a smaller sample may negate the proper QA/QC procedures and prohibit the analyses requested to a smaller portion of the requested tests.

Preservation and Recommended Holding Times

Preservation serves to maintain the physical and chemical integrity of the sample(s) from the time of collection to the time of analysis. Preservation methods usually involve pH control, refrigeration and/or chemical addition. (See Appendix A for recommended preservation methods for individual analysis.)

Only analytical reagent grade chemicals should be used for preservation. Technical grades may be contaminated with some compounds of interest, causing erroneous results. If in doubt, treat an equal volume of distilled water in an identical manner and submit with the samples. Make sure that the volumes are equal and the amounts of preservative added are identical. Preservatives are normally added to the sample immediately after collection.

Analyses with holding times less than 48 hours must be performed on site or at a nearby laboratory (see Appendix A for holding times). Analysis should be started as soon as possible after collection to protect against any possible alteration of the chemicals of interest. If carrying a long distance to a laboratory or work area, all samples must be iced to four degrees centigrade or 40 degrees Fahrenheit.

SHIPMENT OF SAMPLES TO A LABORATORY

All samples must be shipped according to Department of Transportation (DOT) standards. Groundwater and wastewater samples are not considered hazardous materials and can be shipped via normal mail, overnight express, or priority air freight as required. The fastest means of transportation should be used to give

the Laboratory adequate time to analyze the sample before the recommended holding time expires. If necessary, the chain-of-custody procedures should be followed and submitted with the shipment to the Laboratory.

For samples that require chilling as a preservative, ship them with an adequate amount of refrigeration material to last the duration of the shipment. It is suggested that plastic prefrozen gel blocks be used instead of ice (either dry or regular ice). They cool better, last longer and eliminate the problem of residual water from melting ice. Dry ice tends to freeze the sample and should not be used unless it is specifically required that the sample be frozen. When shipping refrigerated containers, adhere to the following procedures:

1. DO NOT USE DRY ICE as it will freeze the samples and may cause breakage.
2. Pack the samples so that the frozen blocks do not come into contact with the sample containers. This may be accomplished by utilizing a double-walled shipping container. Direct contact for prolonged periods may cause breakage, or the condensation may cause the labels to peel off or smear.
3. To ensure continuity in sample preservation, samples should be shipped during the first part of the week. Do not ship routine samples after Tuesday or priority samples after Thursday. It is preferred and highly recommended that chilled samples be shipped via air priority express mail or overnight delivery.

Table 1. CHILLING OF SAMPLES DURING SHIPMENT

Container Size	Pounds of Pre-Frozen Blocks	Hours Maintained Between 35°F - 55°F
Small	3.5	111
Medium	7.5	116
Large	18.0	122
Extra Large	21.0	120

NOTE: All containers should be precooled to 40°F before packing.

FIELD ANALYSIS EQUIPMENT

Due to short holding times, parameters such as Biological Oxygen Demand (BOD), chlorine, color, Dissolved Oxygen (DO), pH, temperature, iodine, nitrate, nitrite, orthophosphate, fecal coliforms and other tests with holding times less than two days should be tested on site. The apparatus and equipment used for these tests should meet the following quality control requirements.

Glassware

All graduated glassware or plasticware for measurement of sample volumes should have a tolerance of 2.5% or better. Pipettes delivering volumes of 10 milliliters (ml) or less should be accurate within a 2.5% tolerance. When cleaning glassware, all washing should be followed by a final rinse with distilled water or deionized water.

Pure Water

Distilled water and/or deionized water that is used should be checked at least weekly to insure that the conductivity is less than 2.0 micromhos per centimeter, at 25°C.

Reagents

Some reagents and standardized solutions alter slowly because of chemical or biological changes. Some need to be refrigerated to extend their use. Do not consider a stock standard valid for more than one year unless it is rechecked and standardized. With each use, record readings for the working standards and be aware of changes that may indicate a spent reagent. When preparing reagents or standards, label the container with the reagent name, date prepared, preparer's name and the expiration date of the reagent, if a shelf life is known.

FIELD AND WORK AREA EQUIPMENT

A maintenance protocol and documentation of all equipment must exist. The following are general guidelines for the protocol and documentation.

pH Meter

Standardize pH meter with each use period with two pH 7.0 standardized buffer solutions. Frequently check the meter response to pH buffer solutions 4.0 and 10.0, after standardization with pH 7.0 buffer. Rinse electrode(s) with distilled water between each measurement. Electrodes should be maintained according to manufacturer's recommendation. Date commercial buffer solutions upon receipt and discard after the expiration date.

Temperature Reading Devices

If glass thermometers are used, check frequently to make sure that the mercury is not separated. The temperature device should be graduated in at least one degree increments. Check the device(s) annually against a reference NBS thermometer.

Balance

Calibrate balances monthly using Class S or S-1 weights.

Conductance Meter

Check conductance for each period with a standard potassium chloride solution or with an EPA reference standard. Record the temperature of each sample and apply temperature compensation. Rinse the electrode with distilled water between each sample. Perform maintenance and calibration each month.

Dissolved Oxygen Membrane Electrode

Calibrate the meter each time before use, using the manufacturer's instructions or the Winkler-Azide method. Maintain electrode(s) according to the manufacturer's recommendations. Check the instrument calibration and linearity at least monthly using a series of at least three dissolved oxygen standards.

Flow Measurements

In the instrument's logbook, keep a record of calibration by NBS, manufacturer's recommendation, or other methods. Document all additional calibration or maintenance.

Automatic Samplers

Before each use check the intake velocity vs head (minimum of three samples) and check the time setting against the actual time interval. Record the information in a logbook.

Portable Spectrometers

The first thing to do before each use is to check the battery. A weak battery may produce erroneous results. Use the utmost care with calibration curves supplied by the manufacturer or in the use of commercially prepared permanent standards of colored liquids or glass.

CHAIN-OF-CUSTODY AND DOCUMENTATION PROCEDURES

For the purpose of litigation, it may be necessary to have an accurate written record which can be used to trace the possession and handling of samples from the moment of collection to delivery at the Laboratory. It is important that a minimum number of people be involved in sample collection and handling. Field records should be completed at the time the sample is collected and should be initialed, including the date and time by the sample collector. The sample containers should then be placed in a transportation case along with the proper sample request forms. The sample case should then be sealed and labeled. Attach an envelope for the chain-of-custody form and fill in the required information. ALL RECORDS MUST BE FILLED OUT IN INK!!

When transferring the possession of the samples, the transferee must sign and date the chain-of-custody form. Every person who takes custody of the sample(s) must fill out the appropriate section of the form. Mailed packages should be registered with a return receipt requested. If packages are sent by a common carrier, receipts should be retained as part of a permanent chain-of-custody documentation package. Laboratory officials receive the samples and sign the form. If the samples are to be returned for storage please annotate the sample analysis request form in the remarks section. A new chain-of-custody form will be started for the return trip and will be mailed with the old form and the results enclosed. An example of the form is found in Appendix B.

TRAINED PERSONNEL

Sampling water is not just dipping out a sample. Use of trained personnel in the collection of the samples cannot be overemphasized. The collector should be carefully trained by experienced personnel in the procedures of sampling and/or supervised by trained personnel. The USAF School of Aerospace Medicine, Brooks AFB TX 78235-5001, teaches the Environmental Technician Courses for 907XX.

REFERENCES

1. EPA 600/4-82-029, Handbook For Sampling and Sample Preservation of Water and Wastewater, (1982).
2. Federal Register, Vol. 49, No. 209, Friday, October 26, 1984.
3. Standard Methods For The Examination of Water and Wastewater, 16th Ed, Port City Press, Baltimore (1985).

Appendix A

Required Containers, Preservation Techniques and Holding Times

Required Containers, Preservation Techniques, and Holding Times

Parameter	Container	Preservative	Maximum Holding Time
Bacterial Tests			
Coliform Fecal and Total	P,G	Cool to 4°C 0.008% Na ₂ S ₂ O ₃	6 Hours
Fecal streptococci	P,G	Cool to 4°C 0.008% Na ₂ S ₂ O ₃	6 Hours
Inorganic Tests			
Acidity	P,G	Cool to 4°C	14 Days
Alkalinity	P,G	Cool to 4°C	14 Days
Ammonia	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Biochemical Oxygen Demand (BOD)	P,G	Cool to 4°C	48 Hours
Biochemical Oxygen Demand (BOD) (Carbonaceous)	P,G	Cool to 4°C	48 Hours
Bromide	P,G	None Required	28 Days
Chemical Oxygen Demand (COD)	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Chloride	P,G	None Required	28 Days
Chlorine Residual (Total)	P,G	None Required	Analyze Immediately
Color	P,G	Cool to 4°C	48 Hours
Cyanide (Total)	P,G	Cool to 4°C NaOH to pH >12 0.6 gm Ascorbic Acid	14 Days
Cyanide (Amenable to Chlorine)	P,G	Cool to 4°C NaOH to pH >12 0.6 gm Ascorbic Acid	14 Days
Fluoride	P	None Required	28 Days

Required Containers, Preservation Techniques, and Holding Times (Cont.)

Parameter	Container	Preservative	Maximum Holding Time
Hardness	P,G	HNO ₃ to pH <2	6 Months
Hydrogen Ion (pH)	P,G	None Required	Analyze Immediately
Kjeldahl and Organic Nitrogen	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Chromium VI (Hexavalent)	P,G	Cool to 4°C	24 Hours
Mercury	P,G	HNO ₃ to pH <2	28 Days
All Metals (except listed)	P,G	HNO ₃ to pH <2	6 Months
Nitrate	P,G	Cool to 4°C	48 Hours
Nitrate-Nitrite	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Nitrite	P,G	Cool to 4°C	48 Hours
Oil and Grease	G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Organic Carbon (TOC)	P,G	Cool to 4°C HCl or H ₂ SO ₄ to pH <2	28 Days
Orthophosphate	P,G	Filter Immediately Cool to 4°C	48 Hours
Oxygen, Dissolved Probe	G	None Required	Analyze Immediately
Winkler	G	Fix On-Site Store in Dark	8 Hours
Phenols	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days
Phosphorous (Elemental)	P,G	Cool to 4°C	48 Hours
Phosphorous (Total)	P,G	Cool to 4°C H ₂ SO ₄ to pH <2	28 Days

Required Containers, Preservation Techniques, and Holding Times (Cont.)

Parameter	Container	Preservative	Maximum Holding Time
Residue (Total)	P,G	Cool to 4°C	7 Days
Residue (Filterable)	P,G	Cool to 4°C	7 Days
Residue (TSS) (Nonfilterable)	P,G	Cool to 4°C	7 Days
Residue (Volatile)	P,G	Cool to 4°C	7 Days
Silica	P	Cool to 4°C	28 Days
Specific Conductance	P,G	Cool to 4°C	28 Days
Sulfate	P,G	Cool to 4°C	28 Days
Sulfide	P,G	Cool to 4°C Add Zinc Acetate NaOH to pH >9	7 Days
Sulfite	P,G	Cool to 4°C	Analyze Immediately
Surfactants	P,G	Cool to 4°C	48 Hours
Temperature	P,G	None Required	Analyze Immediately
Turbidity	P,G	Cool to 4°C	48 Hours
Organic Tests			
Purgeable Halocarbons (VOH)	G-(TLS)	Cool to 4°C 0.008% Na ₂ SO ₃	14 Days
Purgeable Aromatics (VOA)	G-(TLS)	Cool to 4°C 0.008% Na ₂ SO ₃ HCl to pH <2	14 Days
Acrolein and Acrylonitrile	G-(TLS)	Cool to 4°C 0.008% Na ₂ SO ₃ Adjust pH to 4 - 5	14 Days

Required Containers, Preservation Techniques, and Holding Times (Cont.)

Parameter	Container	Preservative	Maximum Holding Time
Phenols	G-(TLC)	Cool to 4°C 0.008% Na ₂ SO ₂ O ₃	7 Days Until Extraction 40 Days After Extraction
Benzidines	G-(TLC)	Cool to 4°C 0.008% Na ₂ SO ₂ O ₃	7 Days Until Extraction 40 Days After Extraction
Phthalate Esters	G-(TLC)	Cool to 4°C	7 Days Until Extraction 40 Days After Extraction
Nitrosamines	G-(TLC)	Cool to 4°C Store in Dark 0.008% Na ₂ SO ₂ O ₃	7 Days Until Extraction 40 Days After Extraction
PCB's	G-(TLC)	Cool to 4°C Adjust pH to 5 - 9	7 Days Until Extraction 40 Days After Extraction
Nitroaromatics and Isophorone	G-(TLC)	Cool to 4°C	7 Days Until Extraction 40 Days After Extraction
Polynuclear Aromatic Hydrocarbons (PAH)	G-(TLC)	Cool to 4°C Store in Dark 0.008% Na ₂ SO ₂ O	7 Days Until Extraction 40 Days After Extraction
Haloethers	G-(TLC)	Cool to 4°C 0.008% Na ₂ SO ₂ O ₃	7 Days Until Extraction 40 Days After Extraction
Chlorinated Hydrocarbons	G-(TLC)	Cool to 4°C	7 Days Until Extraction 40 Days After Extraction

Required Containers, Preservation Techniques, and Holding Times (Cont.)

Parameter	Container	Preservative	Maximum Holding Time
TCDD	G-(TLC)	Cool to 4°C 0.008% Na ₂ SO ₃	7 Days Until Extraction 40 Days After Extraction
Pesticides	G-(TLC)	Cool to 4°C Adjust pH to 5 - 9	7 Days Until Extraction 40 Days After Extraction
Radiological Tests			
Alpha, Beta and Radium	P,G	HNO ₃ to pH <2	6 Months

NOTES

1. P = Polyethylene
G = Glass
G-(TLS) = Glass with Teflon Lined Septum
G-(TLC) = Glass with Teflon Lined Cap
2. Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When using an automated sampler, it is impossible to preserve each aliquot, then samples may be preserved by maintaining the temperature at 4°C until compositing and sample splitting is accomplished.
3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that a sample may be held before analysis and still be considered valid.
4. Samples should be filtered immediately, on-site, before adding the preservative for dissolved metals. Do not filter if total metals are required.
5. Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.
6. Should only be used if a chlorine residual is present.
7. For the analysis of diphenylnitrosamine, add 0.008% Na₂SO₃ and adjust the pH to 7 - 10 with NaOH within 24 hours of sampling.

Required Containers, Preservation Techniques, and Holding Times (Cont.)

8. The pH adjustment may be performed upon receipt at the Laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $\text{Na}_2\text{S}_2\text{O}_3$ (no more than 80 mg total).
9. Maximum holding time is 24 hours when sulfide is present.
10. Sample receiving no pH adjustment must be analyzed within seven days of collection.
11. Samples for acrolein receiving no pH adjustment must be analyzed within three days of collection.
12. When any sample is to be shipped by a common carrier or sent through the U.S. Mail, it must comply with the Department of Transportation (DOT) regulations for hazardous materials (40 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For preservation requirements of Table 17.1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials:
 - a. Hydrochloric Acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH of about 1.96 or greater).
 - b. Nitric Acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH of about 1.62 or greater).
 - c. Sulfuric Acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH of about 1.15 or greater).
 - d. Sodium Hydroxide (NaOH) in water solutions at concentrations of 0.08% by weight or less (pH of about 12.30 or less).

Appendix B
Chain-of-Custody Form

CHAIN-OF-CUSTODY

Base Sample No.: _____

BASE: _____ COMMERCIAL PHONE: _____

ADDRESS: _____ AUTOVON: _____

COLLECTOR'S NAME: _____
(Signature and Date)

DATE SAMPLES: _____ TIME SAMPLES: _____ HOURS

TYPE OF PROCESS PRODUCING THE WASTE: _____

FIELD INFORMATION: _____

SHIP TO: USAFOEHL/SA
BLDG 140
BROOKS AFB TX 78235-5501

SHIPPER: _____ PHONE: _____

ADDRESS: _____

CHAIN OF POSSESSION:

	SIGNATURE	TITLE	INCLUSIVE DATES
1.	_____	_____	TO _____
2.	_____	_____	TO _____
3.	_____	_____	TO _____
4.	_____	_____	TO _____
5.	_____	_____	TO _____

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Keesler AFB MS 39534-5300

149 TAC Clinic/SGPB
Kelly AFB TX 78241-5000

USAF Clinic Kelly/SGB
Kelly AFB TX 78241-5000

150 TAC Clinic/SGPB
P.O. Box 5510
Kirtland AFB NM 87185-5000

USAF Hospital Kirtland/SGPB
Kirtland AFB NM 87117-5300

USAF Hospital K I Sawyer/SGPB
K I Sawyer AFB MI 49843-5300

Wilford Hall USAF Med Cen/SGKFE
Lackland AFB TX 78236-5300

HQ TAC/SGPB
Langley AFB VA 23665-5001

USAF Rgn Hosp Langley/SGPB
Langley AFB VA 23665-5300

USAF Hospital Laughlin/SGPB
Laughlin AFB TX 78843-5000

189 USAF Clinic/SGPB
Little Rock AFB AR 72076-5000

USAF Hosp Little Rock/SGPB
Little Rock AFB AR 72099-5300

USAF Hospital Loring/SGPB
Loring AFB ME 04751-5300

USAF Clinic Los Angeles/SGPB
P.O. Box 92960 Worldway Post Cen
Los Angeles CA 90009-2960

USAF Clinic Lowry/SGPB
Lowry AFB CO 80230-5300

USAF Hospital Luke/SGPB
Luke AFB AZ 85309-5300

USAF Rgn Hospital MacDill/SGPB
MacDill AFB FL 33608-5300

USAF Hospital Malmstrom/SGPB
Malmstrom AFB MT 59402-5300

163 TAC Clinic/SGPB
March AFB CA 92518-5000

USAF Rgn Hospital March/SGPB
March AFB CA 92518-5300

USAF Hospital Mather/SGPB
Mather AFB CA 95655-5000

HQ AU/SGPB
Maxwell AFB AL 36112-5304

USAF Rgn Hospital Maxwell/SGPB
Maxwell AFB AL 36112-5304

USAF Clinic McChord/SGPB
McChord AFB WA 98438-5300

USAF Clinic McClellan/SGB
McClellan AFB CA 95652-5300

184 TAC Clinic/SGPB
McConnell AFB KS 67221-5000

USAF Hospital McConnell/SGPB
McConnell AFB KS 67221-5300

108 TAC Hospital/SGPB
McGuire AFB NY 08641-5000

170 USAF Clinic/SGPB
McGuire AFB NJ 08641-5000

USAF Clinic McGuire/SGPB
McGuire AFB NJ 08641-5300

USAF Rgn Hospital Minot/SGPB
Minot AFB ND 58705-5300

USAF Hospital Moody/SGPB
Moody AFB GA 31699-5300

USAF Hospital Mt Home/SGPB
Mountain Home AFB ID 83648-5300

USAF Hospital Myrtle Beach/SGPB
Myrtle Beach AFB SC 29579-5300

USAF Hospital Nellis/SGPB
Nellis AFB NV 89191-5300

USAF Clinic Norton/SGPB
Norton AFB CA 92409-5300

HQ SAC/SGPB
Offutt AFB NE 68113-5001

Ehrling Berquist
USAF Regional Hospital/SGPB
Offutt AFB NE 68113-5300

USAF Hospital Patrick/SGPB
Patrick AFB FL 32925-5300

USAF Hospital Pease/SGPB
Pease AFB NH 03803-5300

157 USAF Clinic/SGPB
Pease AFB NH 03801-5000

USAF Clinic Peterson/SGPB
Peterson AFB CO 80914-5300

USAF Hospital Plattsburgh/SGPB
Plattsburgh AFB NY 12903-5300

USAF Clinic Pope/SGPB
Pope AFB NC 28308-5300

HQ ATC/SGPAB
Randolph AFB TX 78150-5001

USAF Clinic Randolph/SGPB
Randolph AFB TX 78150-5000

USAF Hospital Reese/SGPB
Reese AFB TX 79489-5300

HQ AFRES/SGPB
Robins AFB GA 31098-6001

USAF Hospital Robins/SGB
Robins AFB GA 31098-5300

USAF Med Cen Scott/SGPB
Scott AFB IL 62225-5001

HQ MAC/SGPB
Scott AFB IL 62225-5001

Det 1 Michigan ANG/SGC
Selfridge ANG Base MI 48045-5004

USAF Hosp Seymour Johnson/SGPB
Seymour Johnson AFB NC 27531-5300

USAF Hospital Shaw/SGPB
Shaw AFB SC 29152-5000

USAF Rgn Hospital Sheppard/SGPB
Sheppard AFB TX 76311-5300

USAF Hospital Tinker/SGB
Tinker AFB OK 73145-5300

David Grant USAF Med Cen/SGPB
Travis AFB CA 94535-5300

USAF Hospital Tyndall/SGPB
Tyndall AFB FL 32403-5000

USAF Clinic Vance/SGPB
Vance AFB OK 73705-5000

USAF Hospital Vandenberg/SGPB
Vandenberg AFB CA 93437-5300

USAF Hospital Whiteman/SGPB
Whiteman AFB MO 65305-5300

USAF Hospital Williams/SGPB
Williams AFB AZ 85240-5300

HQ AFLC/SGPB
Wright-Patterson AFB OH 45433-5001

USAF Medical Center
Wright-Patterson/SGPB
Wright-Patterson AFB OH 45433-5300

USAF Hospital Wurtsmith/SGPB
Wurtsmith AFB MI 48753-5300

101 USAF Clinic/SGPB
Bangor IAP ME 04401-4393

102 USAF Clinic/SGPB
Otis ANGB MA 02542-5001

103 TAC Clinic/SGPB
Bradley ANG Base
East Grandy CT 06026-5000

104 TAC Clinic/SGPB
Barnes Muni Arpt MA 01085-5000

105 TAC Hospital/SGPB
Westchester City Airport
White Plains NY 10604-5000

106 USAF Clinic/SGPB
Suffolk Co ANGB NY 11978-5300

107 USAF Clinic/SGPB
Niagara Falls IAP NY 14302-1699

109 TAC Clinic/SGPB
RD1 ANG Rd
Scotia NY 12302-5000

110 TAC Clinic/SGPB
3367 West Dickman Rd
Battle Creek MI 49015-1291

111 TAC Clinic/SGPB
Willow Grove NAS PA 19090-5000

112 TAC Clinic/SGPB
Greater Pittsburgh IAP
Pittsburgh PA 15231-5000

114 TAC Hospital/SGPB
Joe Foss Fld SD 57104-5000

115 TAC Hospital/SGPB
3110 Mitchell St
Madison WI 53704-5000

117 TAC Hospital/SGPB
Birmingham Muni Aprt AL 35217-0198

118 TAC Hospital/SGPB
P.O. Box 17267
Nashville TN 37217-5000

119 USAF Clinic/SGPB
P.O. Box 5536 St Univ Stn
Fargo ND 58105-5536

120 USAF Clinic/SGPB
Great Falls IAP MT 59404-5000

121 TAC Hosp/SGPB
Rickenbacker ANGB OH 43217-5000

122 TAC Hosp/SGPB
Fort Wayne Muni Aprt IN 46809-5000

123 TAC Hosp/SGPB
Standiford Field
Louisville KY 40213-2678

124 USAF Clinic/SGPB
P.O. Box 1045
Boise ID 83707-0045

125 USAF Clinic/SGPB
P.O. Box 18018
Jacksonville FL 32229-5000

127 TAC Hosp/SGPB
Selfridge ANGB MI 48045-5004

128 TAC Clinic/SGPB
Gen Mitchell ANG Base
Milwaukee WI 53207-5000

129 USAF Clinic/SGPB
Hayward ANG Base
Hayward CA 94545-1386

130 TAC Clinic/SGPB
Kanawha Co Arpt WV 25311-5000

131 TAC Hosp/SGPB
Lambert-St Louis IAP (ANG)
10800 Natural Bridge Road
Bridgeton MO 63044-2371

132 TAC Hosp/SGPB
4200 SW 34 St
Des Moines IA 50321-2799

132 TAC/SGPB
3100 McKinley Ave
Des Moines IA 50321-2799

133 TAC Hosp/SGPB
Minneapolis-St Paul IAP MN 55111-4098

134 TAC Clinic/SGPB
McGhee-Tyson Airport
Knoxville TN 37901-5300

135 TAC Clinic/SGPB
2701 Eastern Blvd
Baltimore MD 21220-0000

136 TAC Hosp/SGPB
Hensley Field
Dallas TX 75211-9503

137 USAF Clinic/SGPB
P.O. Stn 18
Will Rogers Field
Oklahoma City OK 73169-5000

138 TAC Clinic/SGPB
4200 N 93rd East Ave
Tulsa OK 74115-5000

139 TAC Clinic/SGPB
Rosecrans Memorial Airport
St Joseph MO 64503-2371

140 TAC Hosp/SGPB
Buckley ANGB CO 80011-9599

142 USAF Clinic/SGPB
Portland IAP OR 97218-2792

143 TAC Clinic/SGPB
Quonset State Airport
N Kingstown RI 02852-0794

144 USAF Clinic/SGPB
Fresno ANG Base
Fresno CA 94727-5300

145 TAC Clinic/SGPB
5225 Morris Field Drive
Douglas Municipal Airport
Charlotte NC 28208-5014

146 TAC Hosp/SGPB
8030 Balboa Blvd
Van Nuys CA 91406-1195

147 USAF Clinic/SGPB
510 Ellington Field
Houston TX 77034-5586

148 TAC Clinic/SGPB
Duluth ANGB MN 55811-5000

151 TAC Clinic/SGPB
765 N. 2200 West
Salt Lake City UT 84116-0000

152 TAC Clinic/SGPB
Reno International Airport
Reno NV 89502-4494

153 TAC Clinic/SGPB
P.O. Box 2268
Cheyenne Muni Aprt WY 82003-2268

155 TAC Clinic/SGPB
Lincoln Muni Arpt NE 68524-1897

156 TAC Clinic/SGPB
P.O. Box 12307, Loiza Station
San Juan PR 00914-5000

158 USAF Clinic/SGPB
Burlington IAP VT 05401-5895

159 TAC Clinic/SGPB
US Naval Air Station
New Orleans LA 70143-0200

160 USAF Clinic/SGPB
Rickenbacker ANGB OH 43217-5000

161 TAC Clinic/SGPB
2001 S. 32 St
Phoenix AZ 85034-5000

162 USAF Clinic/SGPB
P.O. Box 11037
Tucson IAP AZ 85734-1037

164 USAF Clinic/SGPB
P.O. Box 18026
Memphis IAP TN 38118-5000

165 TAC Hospital/SPGM
P.O. Box 7568
Savannah GA 31498-7568

166 TAC Clinic/SGPB
Greater Wilmington Airport
New Castle DE 19720-5300

167 TAC Clinic/SGPB
Eastern WVA Regional Airport
Martinsburg WV 25401-5000

169 TAC Clinic/SGPB
McEntire ANGB SC 29044-9690

171 TAC Hospital/SGPB
G. Pittsburgh IAP PA 15231-0459

172 TAC Clinic/SGPB
P.O. Box 5810
Jackson MS 39208-0810

174 TAC Clinic/SGPB
Hancock Fld NY 13211-7099

175 TAC Clinic/SGPB
2701 Eastern Blvd
Baltimore MD 21220-2899

176 TAC Clinic/SGPB
Kulis ANGB AK 99502-1998

177 USAF Clinic/SGPB
NAFEC
Atlantic City NJ 08405-5000

178 TAC Clinic/SGPB
Springfield Municipal Airport
Springfield OH 45501-5000

179 TAC Clinic/SGPB
Mansfield LAHM Airport OH 44901-5000

180 TAC Clinic/SGPB
Toledo Express Airport OH 43558-5300

181 TAC Clinic/SGPB
Hulman Regional Airport
Terre Haute IN 47803-5000

182 TAC Clinic/SGPB
Greater Peoria Airport
Peoria IL 61607-5000

183 TAC Clinic/SGPB
Capitol Muni Aprt IL 62707-5000

185 TAC Clinic/SGPB
P.O. Box 278
Souix City Muni Aprt IA 51054-1002

186 TAC Clinic/SGPB
P.O. Box 1825
Meridian MS 39302-1825

187 TAC Clinic/SGPB
Dannelly Field AL 36105-0001

188 TAC Clinic/SGPB
Fort Smith Muni Aprt AR 72901-5000

190 USAF Clinic/SGPB
Torbes Field (ANG)
Topeka KS 66620-5000

191 USAF Clinic/SGPB
Selfridge ANGB MI 48045-5004

192 TAC Clinic/SGPB
Byrd Field VA 23150-0297

193 TAC Clinic/SGPB
Harrisburg Intl Airport
Middletown PA 17057-5086

Det 1, Ohio ANG/SGX
Rickenbacker ANGB OH 43217-5001

USAF Clinic Alconbury/SGPB
APO New York 09238-5300

USAF Clinic Andersen/SGPB
APO San Francisco 96334-5300

USAF Clinic Ankara/SGPB
APO New York 09254-5300

USAF Clinic Aviano/SGPB
APO New York 09293-5300

USAF Clinic Bentwaters/SGPB
APO New York 09755-5300

USAF Hospital Bitburg/SGPB
APO New York 09132-5300

USAF Clinic Camp New Amsterdam/SGPB
APO New York 09292-5300

USAF Clinic Chicksands/SGPB
APO New York 09193-5300

USAF Rgn Med Cen Clark/SGPB
APO San Francisco 96274-5300

USAF Med Aid Station Comiso/SGPB
APO New York 09694-5000

USAF Clinic Fairford/SGPB
APO New York 09125-5300

USAF Med Aid Station Florennes/SGPB
APO New York 09188-5000

USAF Med Aid Station Gielenkirchen/SGP
APO New York 09104-5000

USAF Clinic Greenham Common/SGPB
APO New York 09150-5300

USAF Hospital Hahn/SGPB
APO New York 09109-5300

USAF Hospital Hellenikon/SGPB
APO New York 09223-5300

USAF Clinic Howard/SGPB
APO Miami 34001-5000

USAF Hospital Incirlik/SGPB
APO New York 09289-5300

USAF Hospital Iraklion/SGPB
APO New York 09291-5300

USAF Clinic Izmir/SGPB
APO New York 09224-5300

USAF Clinic Kadena/SGPB
APO San Francisco 96239-5300

57 FIS/SGPB
Keflarick Iceland
FPO New York 09571-2055

USAF Med Aid Station/SGPB
Kwang Ju AB Korea
APO San Francisco 96324-5300

USAF Hospital Kunsan/SGPB
APO San Francisco 96264-5300

USAF Hospital Lakenheath/SGPB
APO New York 09179-5300

USAF Hospital Lajes/SGPB
APO New York 09406-5300

Det 1, USAF Hospital
Little Rissington UK
APO New York 09194-5300

USAF Hospital Misawa/SGPB
APO San Francisco 96519-5300

USAF Hospital Osan/SGPB
APO San Francisco 96570-5300

USAF Clinic Ramstein/SGPB
APO New York 09012-5300

USAF Clinic Rhein-Main/SGPB
APO New York 09057-5300

USAF Clinic San Vito/SGPB
APO New York 09240-5300

USAF Clinic Sembach/SGPB
APO New York 09130-5300

USAF Clinic Shemya/SGPB
APO Seattle 98736-5000

USAF Clinic Spangdahlem/SGPB
APO New York 09123-5300

USAF Clinic Suwon/SGPB
APO San Francisco 96461-5300

OL AB, USAF Clinic Taegu/SGPB
APO San Francisco 96213-0006

USAF Hospital Torrejon/SGPB
APO New York 09283-5300

USAF Hospital Upper Heyford/SGPB
APO New York 09194-5300

USAF Rgn Med Cen Wiesbaden/SGPB
APO New York 09220-5300

USAF Hospital Yokota/SGPB
APO San Francisco 96328-5300

USAF Clinic Zaragoza/SGPB
APO New York 98286-5300

USAF Clinic Zweibrucken/SGPB
APO New York 09860-5300

HQ USAFE/SGPA
APO New York 09012-5000

OL AD, USAFOEHL
APO San Francisco 96274-5000

DTIC
Cameron Station
Alexandria VA 23214

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