#86

TC 0076-12

FINAL
SITE CLOSURE REPORT

BUILDING 212 – BATTERY OPERATIONS

CAMP NAVAJO
BELLEMONT, ARIZONA

October 1997

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

and

Arizona Army National Guard
Camp Navajo
Bellemont, Arizona 86015-5000

Prepared by:

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SITE CLOSURE
AT
CAMP NAVAJO

BUILDING 212

FINAL REPORT

Contract DACA05-93-D-0019

PREPARED BY:

TETRA TECH, INC.

Approved by: _____ 10/22/97
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Date

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Date

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Date

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LIST OF ACRONYMS

Acronym	Full Phrase
ADEQ	Arizona Department of Environmental Quality
AZNG	Arizona National Guard
bgs	below ground surface
msl	mean sea level
SWMU	solid waste management unit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

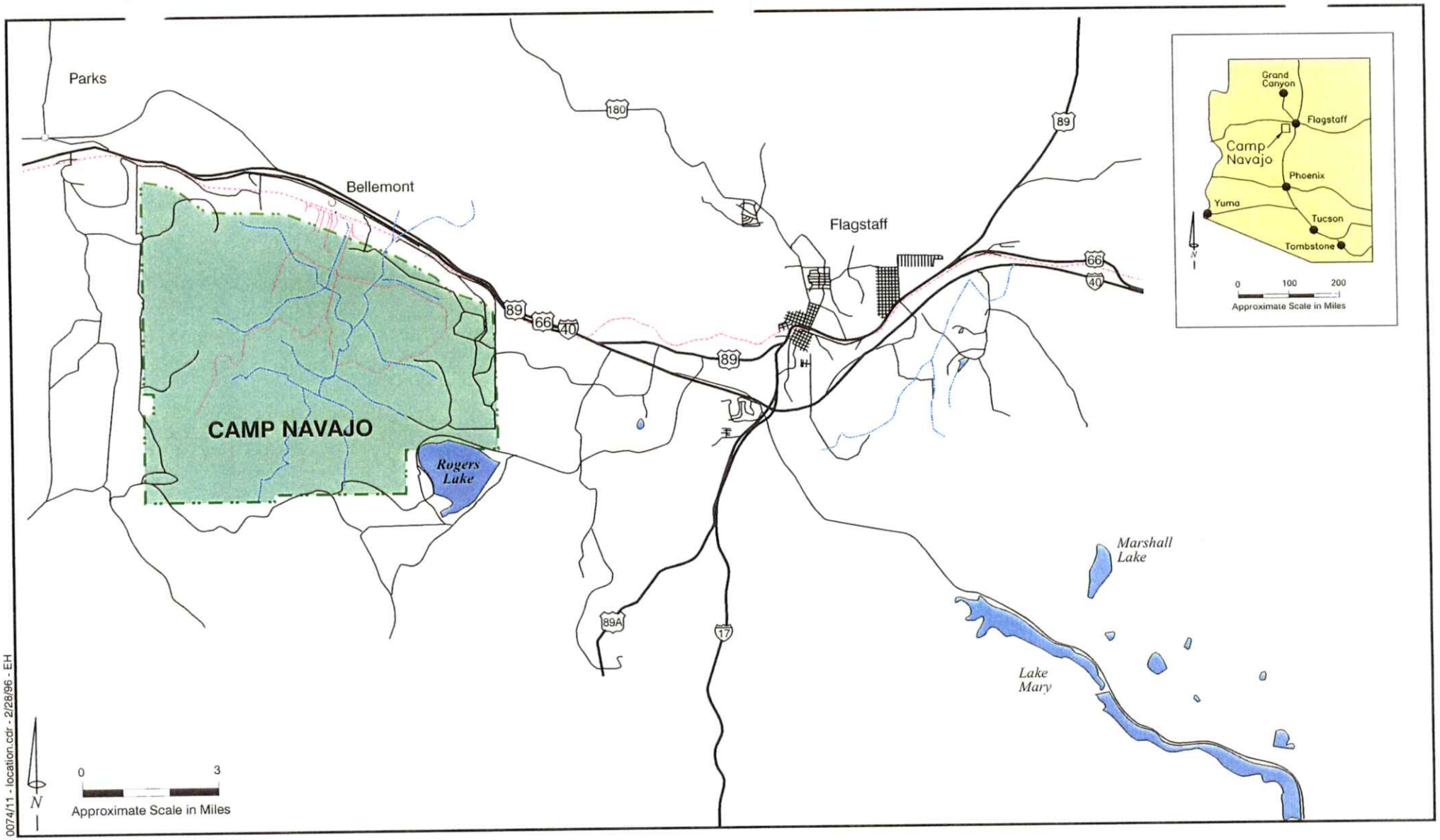
SECTION 1
INTRODUCTION

This closure report summarizes the preliminary investigation of Building 210, (NAAD 61, NADA 61) (Site) at Camp Navajo (formerly Navajo Depot Activity), in Bellemont, Arizona (Figure 1-1). Tetra Tech, Inc. (Tetra Tech) was retained by the United States Army Corps of Engineers (USACE) to investigate the environmental conditions at potential solid waste management units (SWMUs) at Camp Navajo. The Site has been listed by the United States Environmental Protection Agency (USEPA) and the Arizona Department of Environmental Quality (ADEQ) as a SWMU.

The purpose of this preliminary investigation was to document existing environmental conditions at the Site and to evaluate the environmental concerns that may require additional assessment or characterization. The scope of work for this preliminary investigation of potential SWMUs included the following tasks: (1) obtaining site specific background data; (2) conducting a visual inspection of the Site; and (3) preparing a report containing recommendations on further action that should be conducted at the Site. Based on Tetra Tech's conclusion, outlined in Section 5, this report is intended as a closure report to obtain a "no further action" designation from the state of Arizona for the Site.

1.1. SITE LOCATION AND DESCRIPTION

Camp Navajo (Base) is an approximately 28,000-acre government facility located in north central Arizona, approximately 12 miles west of Flagstaff in Coconino County. The Site is located in the Warehouse Area (Figure 1-2) of the northern portion of the Base and consists of the remnants of a 50,663 square foot building (Figure 1-3).



0074/11 - location.cdr - 2/28/96 - EH

Camp Navajo is in north central Arizona about 12 miles west of the city of Flagstaff.

LEGEND:

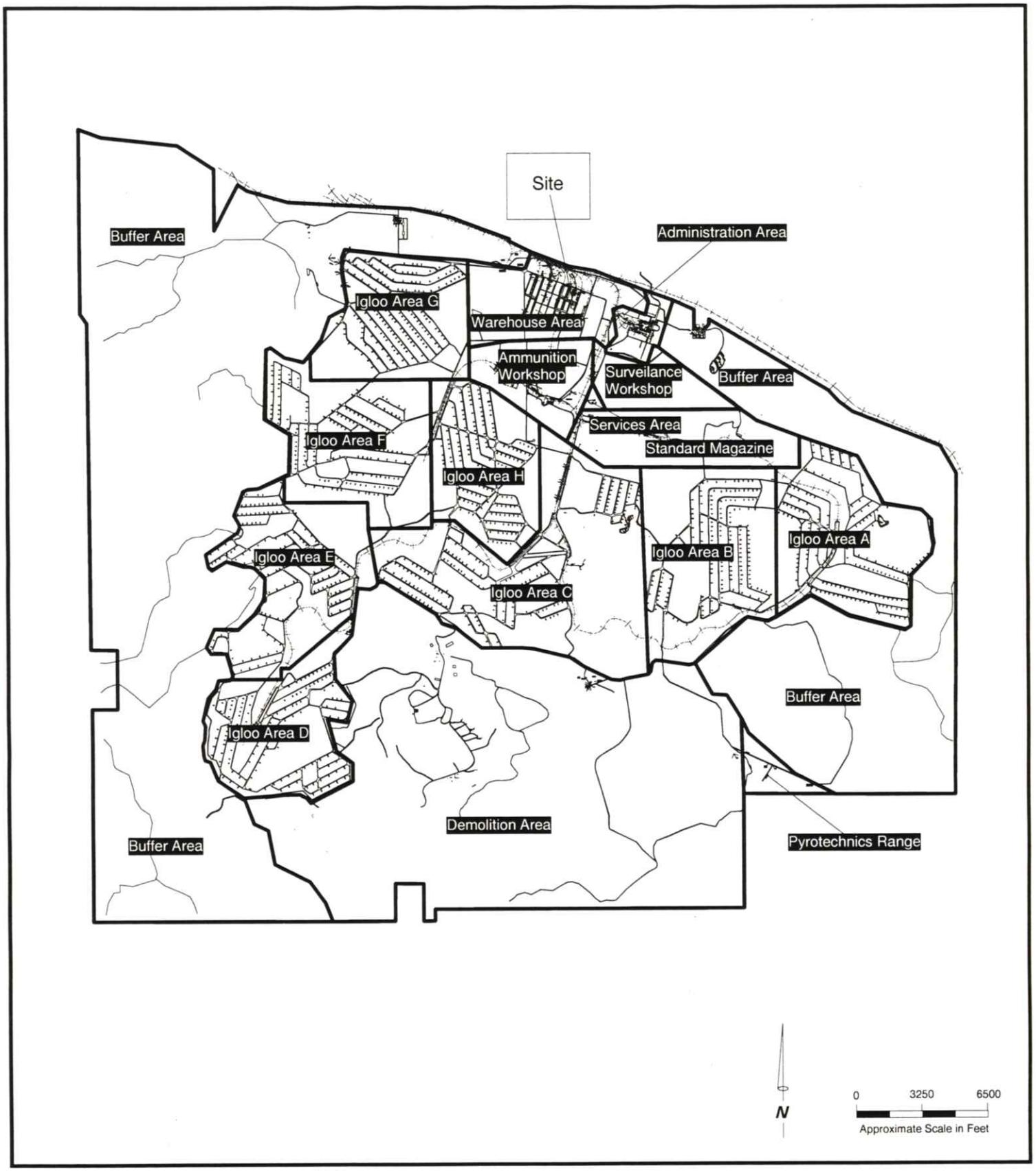
- Highways
- Roads
- Railroad
- Rivers/Streams

Camp Navajo Location Map

Camp Navajo
Bellemont, Arizona

Figure 1-1

Tetra Tech, Inc.



Camp Navajo encompasses approximately 28,300 acres and is divided into 18 functional areas.

Site Map

Camp Navajo, Bellemont, Arizona

Figure 1-2

Tetra Tech, Inc.

Legend:

Ditch
Railroad
Slope

N

0 37.5 75
Approximate Scale in Feet

Tetra Tech, Inc.

Building 212 - Battery Operations Site Plan

Camp Navajo, Bellemont, Arizona

Figure 1-3

1.2. SITE BACKGROUND

The federal government established the Base as an ordnance depot in 1942, and the Base has been used by various military branches of the government since this time. In 1975, the government granted permission to the Arizona National Guard (AZNG) to use the facility for training and support activities. Operational control of the Base was turned over to the AZNG in 1982. AZNG uses the Base for training, support activities, and for the storage of US Air Force Minuteman and US Navy Trident rocket motors.

Building 212 was constructed in 1942 and used as a maintenance area. Activities conducted in the building included charging Edison cell batteries, vehicle maintenance, and welding (USATHAMA 1979). The building was partially demolished in 1995, leaving the concrete foundation and floor as remnants.

SECTION 2
PHYSICAL SETTING

1.1 TOPOGRAPHY AND VEGETATION

The topography at the Base is characterized by the relatively flat Bellemont Flat (plateau) in the northern portion of the Base. The Base is surrounded by rolling hills of low to moderate relief in the eastern and southern portions. More rugged terrain is evident along the western portion of the Base in the vicinity of Volunteer Mountain. Steep-sided hills and knobs from eroded volcanic vents are generally scattered across the northwestern and eastern portions. Elevation ranges from 6,780 feet above mean sea level (msl) at the bottom of Volunteer Canyon in the southwest corner of the Base to 8,047 feet above msl at the top of Volunteer Mountain in the western portion. Volunteer Canyon is an incised, predominately northeast-southwest trending canyon in the south-central portion and drains the northern portion of the Base southward.

The hills and higher elevations of the Base support a forest of ponderosa pine, blue spruce, and Douglas fir. The low-lying areas generally support grasses and low-lying shrubs.

The Site is located in a relatively flat portion of the plateau at an elevation of approximately 7,140 feet above msl.

2.1. GEOLOGY

The Base is within the western portion of the Colorado Plateau Province on the Flagstaff-Mogollon slope. In addition, the Base is located in the southwestern margin of the San Francisco Volcanic Field within an up-thrown block (horst) between the Oak Creek Fault, three miles east of the Base, and the Volunteer Fault, which trends along the western portion of the Base. The San Franciscan Volcanic Field consists of Pliocene- to Pleistocene-age basalt flows that encompass an area of more than 2,000 square miles surrounding the San Franciscan Peaks, which are approximately 15 miles northeast of the Base. These volcanic rocks

have been extruded through and deposited on Paleozoic- and Mesozoic-age sedimentary rocks.

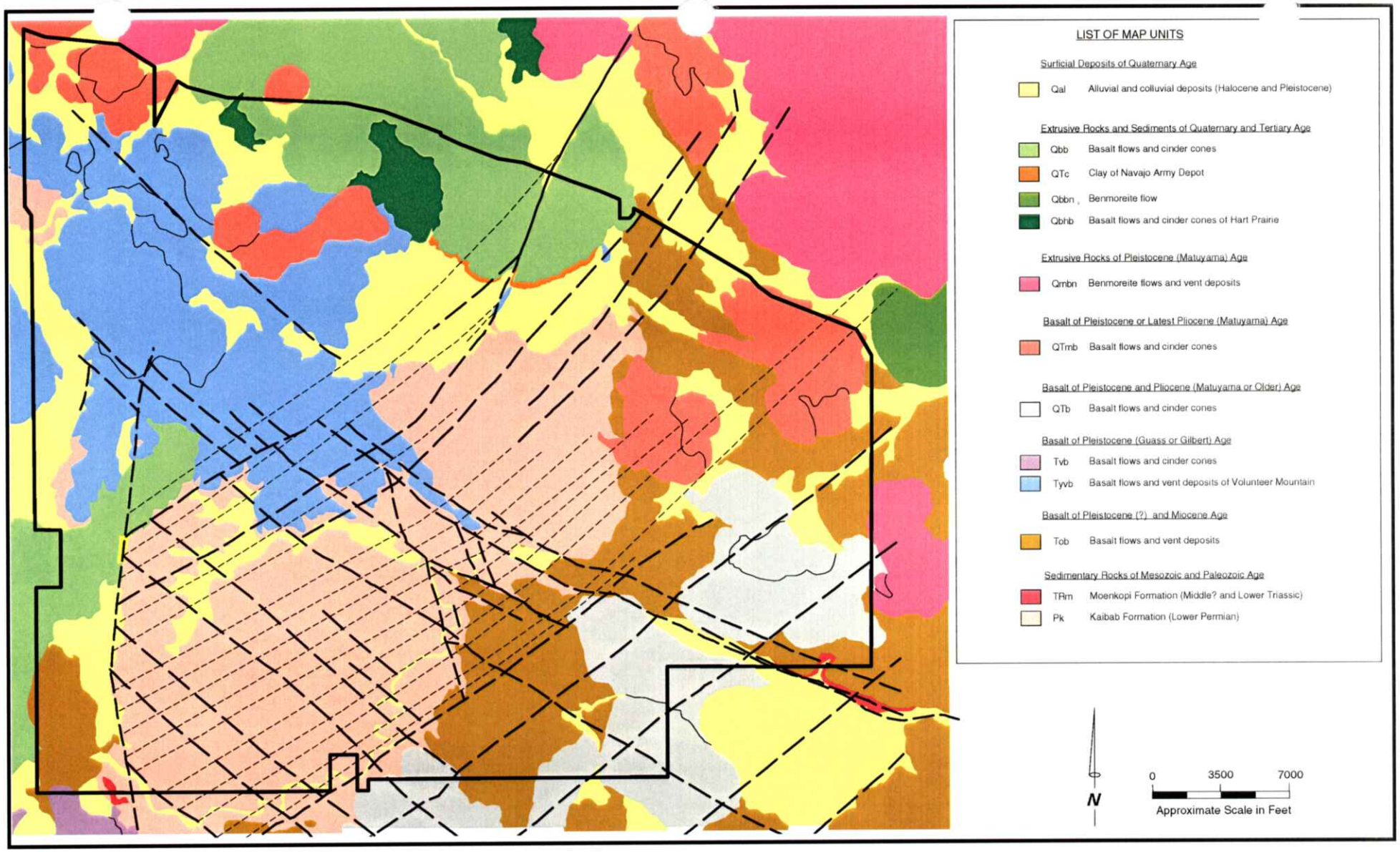
The youngest strata beneath the Base consist of unconsolidated Quaternary-age alluvial deposits and consolidated Quaternary- and Tertiary-age volcanic rocks. The alluvial sediments and volcanic rocks have been deposited onto an irregular erosional surface composed of the rocks of the Kaibab Formation (Figure 2-1). The Kaibab Formation is conformably underlain by the stratagraphic sequence of Paleozoic-age sedimentary rocks of the Colorado Plateau, such as the Toroweap Formation, Coconino Sandstone, and Supai Group.

The alluvium deposits generally are found along the drainages and in low-lying areas at the Base. These deposits vary in thickness from a few feet up to approximately 100 feet and are composed of silt, sand, and gravel detritus. The alluvium sediments were derived from the volcanic and sedimentary rocks that compose the surrounding highlands of the Base.

Volcanic rocks of Quaternary- and Tertiary-age have been deposited throughout the western, northern, and eastern portions of the Base. The volcanic rocks consist of late Holocene- to Pliocene-age scoria (cinder) cones with associated basalt flows and ash fall deposits, and Miocene- to late Pliocene-age basalt flows. Thirteen cinder cones have been identified at the Base, the largest of which is Volunteer Peak. The volcanic deposits in the western and eastern portions of the Base generally are associated with the local vents and cinder cones. The volcanic deposit in the northern portion of the Base generally are associated with the San Franciscan Volcanic Field and have been buried by alluvium deposits in many areas.

Bentonite clay (sometimes referred to as the Navajo Army Depot Clay), derived from Pliocene-age or older rhyolitic ash deposits, is exposed along a scarp south of the ammunition workshop and administration areas (Figures 1-2 and 1-3). The clay unit underlies the ammunition workshop, the warehouse area, and the administration area (Figures 1-2 and 2-1). The clay unit's extent northward of the Base is not known.

The rocks of the Kaibab Formation generally are exposed in the central portion of the Base and consist of yellowish to light gray, well-bedded silty dolomite, dolomitic sandstone, and dolomitic limestone of Permian Age. The unit is up to 450 feet thick and has individual beds from one to three feet thick. These rocks are moderately to extensively jointed and/or fractured in some locations of the formation. Approximately 350 feet of massive sandstone from the Toroweap Formation underlies the Kaibab Formation, followed by the sandstone of the Coconino Sandstone Formation.



Legend:

Lithologic Contact

Camp Navajo Boundary

Faults

Lineaments/ Fracture Zones

Geologic Map of Camp Navajo

Camp Navajo, Bellemont, Arizona

Tetra Tech, Inc.

Figure 2-1

The fault traces of several generally north-south trending faults have been mapped on the Base. The fault trace of the Bellemont Fault, the dominant North –South trending fault, transects through the central portion of the Base. The strata on the eastern side of this fault appear to have been vertically displaced upward between 100 and 500 feet. Several ponds have developed along the fault.

2.2. HYDROGEOLOGY

Shallow ground water beneath plateau, west of the Bellemont Fault, is found in up to three discontinuous perched water-bearing zones above the regional aquifer, which is within the Supai Formation. These perched zones are encountered to depths of approximately 350 feet below ground surface (bgs) and occur under confined and unconfined conditions in the alluvial sediments and volcanic rocks. These zones are the primary source of ground water in the vicinity of the Base. The primary aquifer for ground water supply to the Base is a water-bearing zone that occurs within a fractured zone in the uppermost basalt unit and overlies the Navajo clay unit west of the Bellemont Fault.

Shallow ground water beneath the plateau east of the Bellemont Fault is found in one perched water bearing zone above the regional aquifer. The perched zone is encountered at the surface along the southeast edge of the plateau and increases in depth to about 80 feet bgs beneath the Site. The aquifer exists in a basalt flow and is perched on the Navajo Army Depot Clay which has been determined to directly overlie the Kaibab Formation.

Water-bearing zones in the alluvial sediments are found above aquitards of less permeable materials, such as clay deposits and unfractured consolidated basalt flows and the Kaibab Formation. Ground water in the basalt flow deposits is found in interbedded layers of fractured basalt, lava tubes, basalt derived alluvium and/or permeable volcanic air fall deposits that are underlain with less permeable volcanic deposits. Ground water flow in the alluvial sediments and volcanics generally mimics the local topography. Ground water in the Kaibab Formation (if present) generally is found above interbedded chert and siltstone lenses, in extensively fractured or joints areas, and in solution cavities within the limestone rocks.

The regional water table at the Base is encountered at a depth of approximately 1,300 feet bgs and is found approximately 200 feet below the top of the Supai Formation. The Supai Formation becomes increasingly more shaley and less permeable with depth. The regional aquifer is tapped by a number of large production wells owned by the city of Flagstaff. These wells are located approximately three miles east of Base in the Woody Mountain Well Field (EBASCO 1990).

1.2 SITE SPECIFIC HYDROGEOLOGY

The Site is located on a thin veneer of alluvial sediments 10 to 25 feet thick that overlies basalt flows associated with the Franciscan Volcanic Field. Ground water

beneath the Site is likely to be encountered in the basalt rocks at a depth of 35 to 45 feet bgs. Ground water flow beneath the Site is likely to flow southward. The ground water wells closest to the Site are 150 feet northwest and 300 feet northeast of the Site.

SECTION 3
PREVIOUS INVESTIGATIONS

Based on our review, no previous environmental investigations specific to the Site are known to have been conducted.

SECTION 4
VISUAL ASSESSMENT

On October 18, 1995, a site inspection was conducted to observe and document the existing conditions. The Site consists of the remnants of the structure outlined in Section 1.1. Color photographs of the Site are presented in Appendix A.

The remnants of Building 212 consist of an approximately 3-foot high concrete slab foundation with a loading ramp in its southeastern corner. A truck loading dock is located along the west side of the foundation, and a railroad loading dock is located along the east side of the foundation.

The concrete slab floor of the former building appears to be in fair to good condition. Minor cracking of the concrete slab is apparent in a few areas of the floor. The concrete slab in the vicinity of the doorways that formerly led to the truck loading dock appears to be mechanically worn, possibly due to high use in these areas.

No evidence of distressed vegetation, chemical etching, or disposal of potentially hazardous wastes were observed during the Site inspection. In addition, no visual evidence of features that may be of environmental concern, such as oil-cooled transformers, underground storage tanks, clarifiers or hazardous material containers, were observed at the Site.

SECTION 5
SUMMARY AND CONCLUSIONS

Based on the information presented in this report and in the professional judgment of the Tetra Tech the following conclusion have been reached:

- The Site consists of a concrete slab foundation for a structure that was demolished in 1995. The structure is reported to have been used historically for storing and charging forklift batteries.

- Batteries typically contain metal elements and acid and/or base compounds. The periodic release of acid and/or base compounds to the concrete slab floor is likely to chemically etch the surface of the concrete. There is no visual evidence of chemical etching or the release of significant quantities of potentially hazardous materials at the Site.

- The concrete slab floor appears to be in good to fair condition with only a few areas of the slab appearing mechanically worn or cracked.

- There is no visual evidence of features that may be of environmental concern, such as oil-cooled transformers, underground storage tanks, clarifiers and/or hazardous materials containers at the Site.

- Historic activities at the Site are not likely to have had an adverse impact to the soil and/or ground water quality beneath the Site.

SECTION 6
RECOMMENDATIONS

Based on the conclusions presented in this report, it is the professional judgment of Tetra Tech that additional environmental work at the Site is not warranted, and the Site should be listed as a no further action SWMU.

SECTION 7
REFERENCES

EBASCO Environmental (EBASCO). 1990. *Enhanced Preliminary Assessment Report: Navajo Army Depot Activity, Bellemont, Arizona*. March 1990.

United States Army Toxic and Hazardous Materials Agency (USATHAMA). 1979. *Installation Assessment of Navajo Depot Activity*. Report No. 137. December 1979.

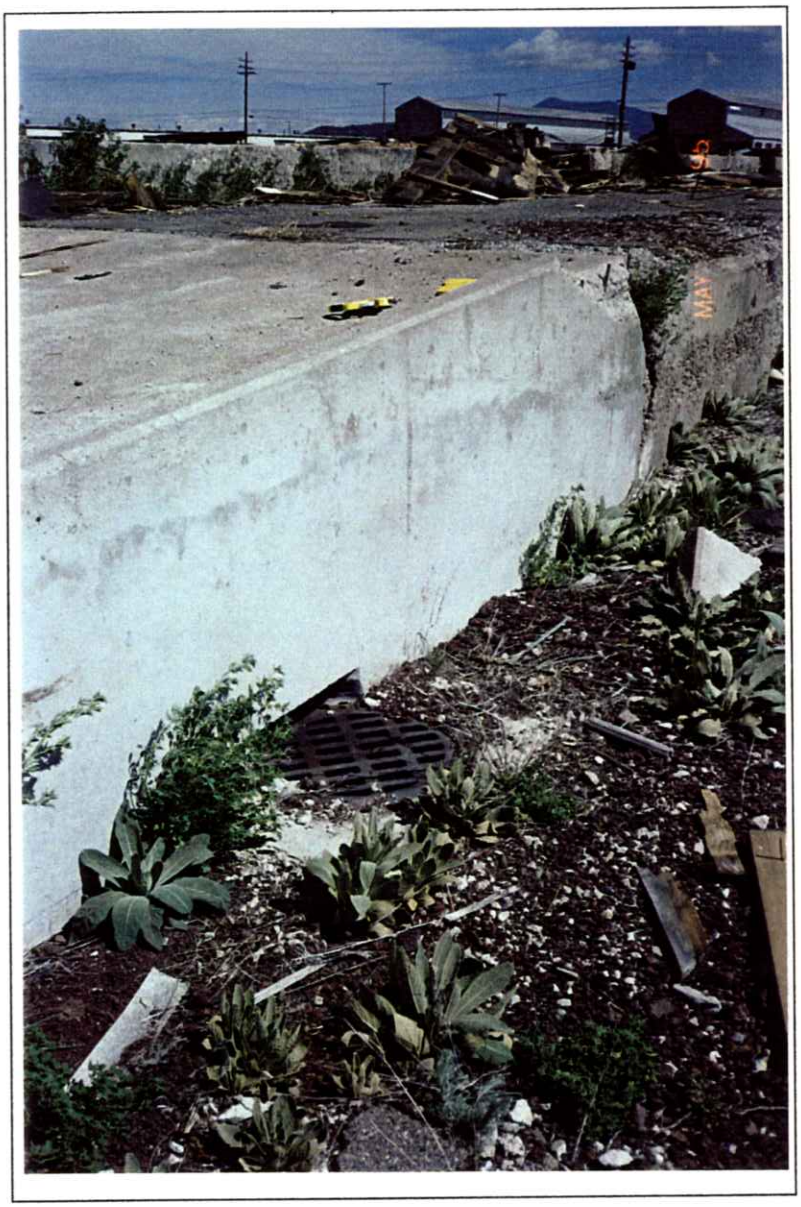
Uribe & Associates (Uribe). 1994. *Final RCRA Facility Assessment Report, Camp Navajo*. Prepared for Environmental Protection Agency, Region IX. *May 1994*.

APPENDIX A

PHOTO DOCUMENTATION

4-21 Panorama Bldg. 212 (Shot 1 of 2), SE, 7/23/94, by Brad Hall

4-22 Panorama Bldg. 212 (Shot 2 of 2), S, 7/23/94, by Brad Hall



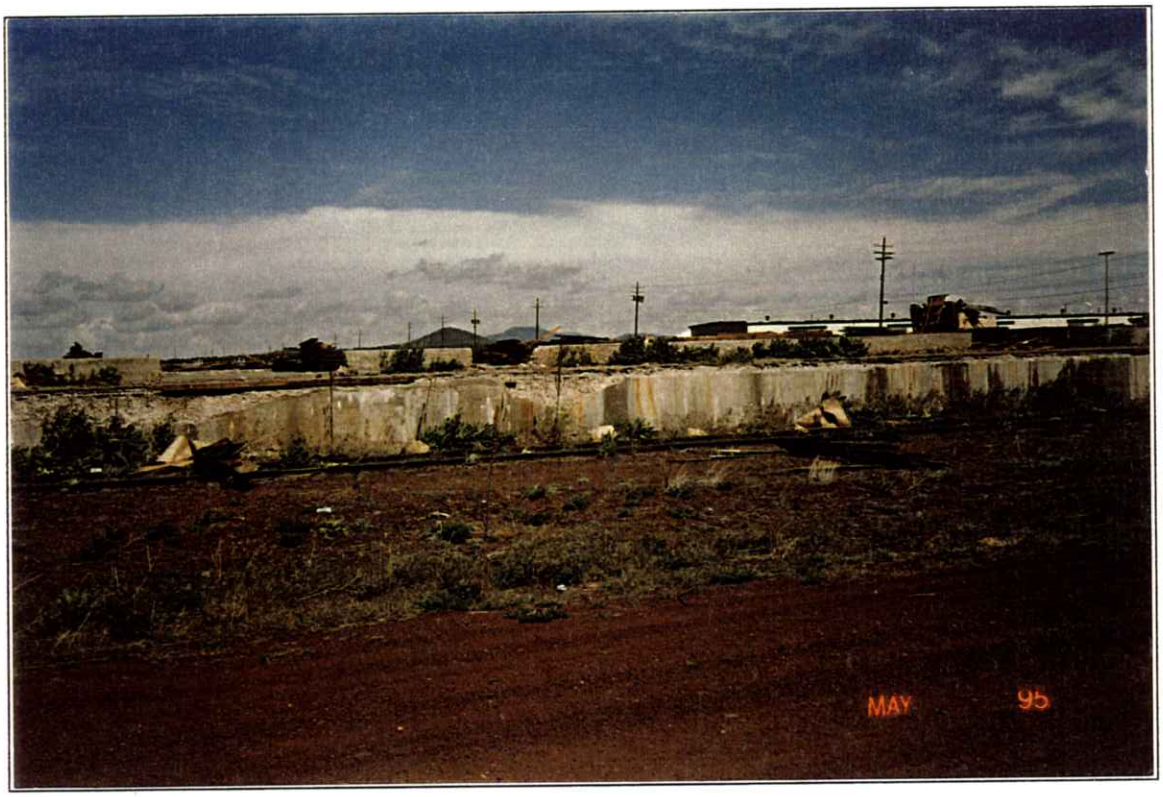
28-13 S.E. corner looking .W. at rail loading dock - VSI, NW, 6/7/95, by Kevin Joyce

28-14 S.W. corner looking N.E. - VSI, NE, 6/7/95, by Kevin Joyce

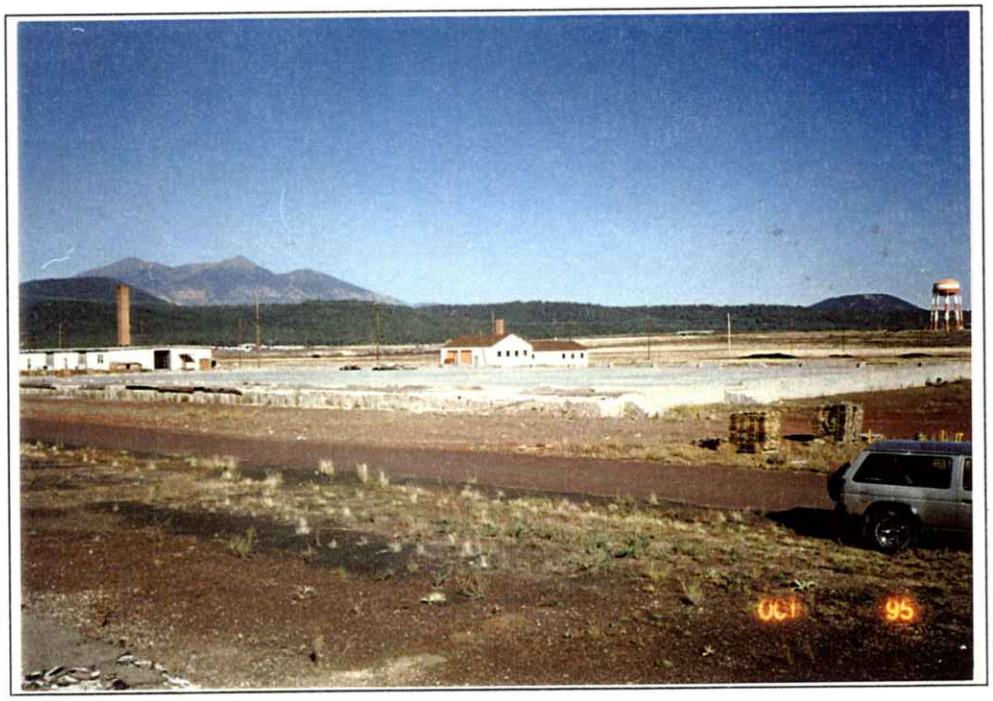
28-15 S.W. corner looking N.E. - VSI, DE, 6/7/95, by Kevin Joyce

28-16 Northwest corner looking southeast - VSI, S, 6/7/95, by Kevin Joyce

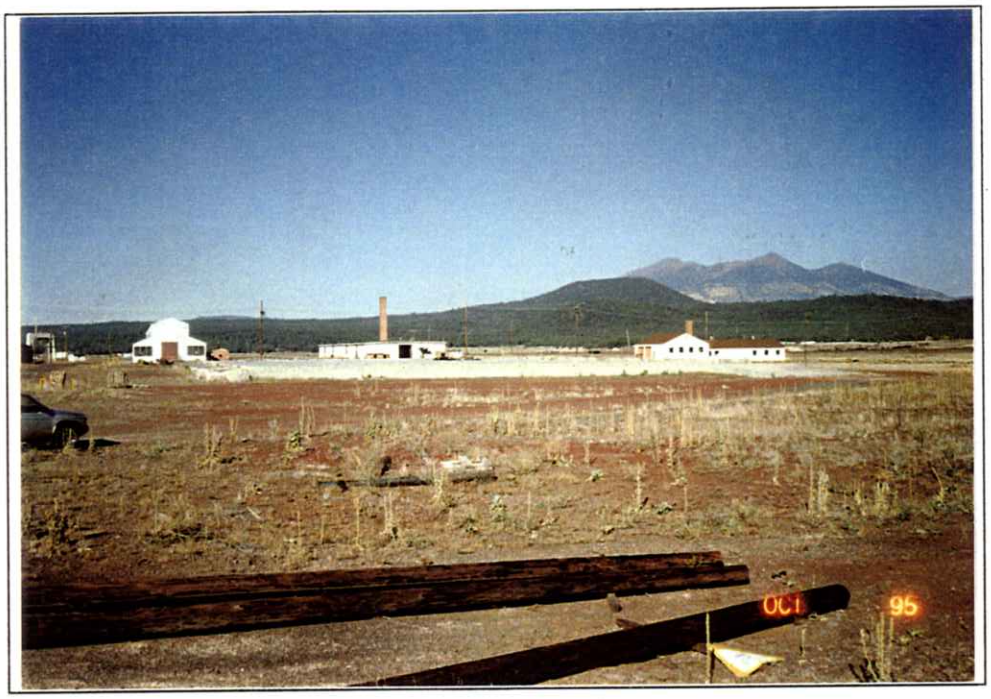
28-17 North central looking south at brick formation - VSI, S, 6/7/95, by Kevin Joyce



28-18 Looking west at foundation from east side - VSI, W, 6/7/95, by Kevin Joyce



40-23 Building 212, E, 10/18/95, by Mike Guy



40-24 Building 212, N, 10/18/95, by Mike Guy

41-1 Wood debris pile, N, 10/18/95, by Mike Guy

41-2 Damaged concrete slab in entrance to building, N, 10/18/95, by Mike Guy

APPENDIX B

COMMENTS AND RESPONSES

Document: Draft VSI, Building 212

Name: Capt. J. Morrow

Comment	Response
Section 2. Please use the correct form of the following names; Kaibab Formation, Coconino Sandstone, San Francisco Peaks, San Francisco Volcanic field.	Text will be revised accordingly.
Section 2.2. Figure 2-1; In the older February and March reports this map has one area of alluvium along the northern boundary that is shaded as basalt. In the newer November report two more areas (along eastern boundary and along Dunham fault) are incorrectly shaded. The blatant statement regarding faults as conduits on the older maps is made palatable by the addition of "potential" on the newer version, but would probably be best if deleted entirely. Also on the November report, the legend contains incorrect symbols for the railroad and suspected fault. Personally, I liked the geologically meaningful rock symbols of the older map better than the hatchured symbols of the newer map.	Figures in all closure reports will be revised to be clear and consistent.
Section 2.3. Paragraph 3; The water table is 200 feet below the top of the Supai Formation, and is not within the strata commonly assumed to be the aquifer in the Flagstaff area. Please revise this statement to reflect actual conditions below the Base. There is no justification for the statement regarding declining water levels. Only a handful of measurements exist, some of which are dubious. However, consider the following observations. Water levels since 1977 have remained higher than the 1369 feet measured then. Water levels measured during 1996 ranged from a low of 1343 (Tetra Tech) in January to a high of 1303 (USGS) in August, after a drought winter. Another 30 feet of rise is entirely conceivable in a wet year. Please remove your statement. See the comments for the Deep Well Report for further discussion.	Text will be revised in final.
Section Appendix. Will photographs in the appendices of Final Reports be in color, as stated in Sections 4 of the Draft Reports?	Yes.
Section 5. Building 212, Bullet 1; These uses do not correlate to those described in Section 1.2, paragraph 2. Please review and revise.	

Name: S. Reynolds

Comment	Response
Figure 2-1: Remove paragraph on faults as conduits	Will change text to say that a fault is a potential conduit.
Signature block: Please add Mr. Aala's title	Will be revised in final.
Appendix A: Are color photos available?	Color photos will be printed in final report.
Section 1.2. 1st paragraph, last sentence; rewrite as follows: ...for the storage of ARNG material and munitions, and the United Sates Air Force...	Will be revised in final and will also include US Navy.
Include reference to Uribe & Associates VSI report for USEPA/ADEQ: RCRA Facility Assessment Report, 1994, prepared for Region 9 United States Environmental Protection Agency	Will be revised in final.
Section 2.4. 1st paragraph, 1st sentence: strike approximately	Will be revised in final.
Section 1.1. Add reference to NADA and AREE numbers/designations to tie to historic documents and to regulatory listings	Will be revised in final.
Figure 1-2 Indicate (arrow) site location	Will be revised in final.

APPENDIX C

SCOPE OF WORK

*Revised 8 March 1996
16 February 1995

Raj

AMENDMENT TO THE SUPPLEMENTAL SCOPE OF WORK

dated 23 June 1994
(8 March 1996 Revisions are in bold print, preceded by an asterisk. Deleted requirement is so indicated.)

Subject: Remedial Investigation/ Feasibility Study
Groups B-3 Sites
Camp Navajo
Bellemont, Arizona

A-E: Tetra Tech, Inc.
180 Howard Street, Suite 250
San Francisco, CA 94105

A-E Contact: ***Bradley Hall** Phone (415) 974-1221
Fax: (415) 974-5914

Contract Number: Indefinite Delivery Contract DACA05-93-D-0019

Delivery Order: No. 21, Modification No.2

Authorization: Working Authorization Directive No. 859, issued 18 June 1994

Technical Manager: Maynardo Aala
U.S. Army Corps of Engineers, Sacramento District
Attn: CESPK-ED-EB (DERP Section)
1325 J Street, 12th Floor
Sacramento, CA 95814-2922
Telephone: (916) 557-7771
Facsimile: (916) 557-7865

1. General: Camp Navajo occupies 28,347 acres of land in North Central Arizona. Beginning with activation in 1942, Camp Navajo had functioned primarily as a munitions supply depot, providing storage and limited maintenance of assigned commodities.

A preliminary assessment and site inspection of 6 Group B-3 sites have been completed. This effort will build on that PA/SI and complete characterization of each site, develop compliance actions and conduct feasibility studies for remediation of site contamination. The sites include Bldgs 216 and 218- Maintenance Shops (NAAD 24B); Former Asphalt Plant (NAAD 29); Bldgs 231 and 233- Former Mercury Storage (NAAD 31); Former Open Air Storage Area (NAAD 38); Warehouse Area Waste Pile (NAAD 47); and Bldgs 210 and 212- Battery Operations (NAAD 61), all in the Warehouse Area of Camp Navajo.

2. DESCRIPTION OF WORK AND SERVICE:

A: Tasks Requirements: The A-E shall provide all labor, material, equipment, transportation and supervision necessary to complete the work described as follows and accomplish the tasks in accordance with ***State/Federal** requirements.

2.A.1 Remedial Investigation ***Planning**-

2.A.1.1 Work Plan : The A-E shall prepare a Group B-3 group- specific/ sites- specific Work Plan (GS/SSWP), Sampling and Analysis Plan (GS/SSSAP), and Health and Safety Plan (GS/SSHSP) to supplement the Master Work Plan, Sampling and Analysis Plan and Health and Safety Plan prepared for the entire installation in a separate contract.. The A-E shall prepare the GS/SSWP in accordance with all applicable Federal, State and local laws and/or regulations. The GS/SSWP to be developed shall detail proposed activities for further characterization of the sites in this group. The following requirements shall be incorporated into the GS/SSWP, as a minimum-

2.A.1.1.1 a) Introduction, including sites location; b) Site features, including demography, land use, natural resources, climatology; c) Historical information, including background, site history and hazardous waste characteristics/management, statement of the problem/s at each site- perceived problem/s to be characterized, the purpose of doing this work, etc. ; d) Environmental setting, including local meteorology, regional geology, site geology (known or suspected), surface and ground water data from all previous investigations/study; and e) Site Investigation- objectives (to include gathering of data for characterizing/defining the problem), chemicals of concern, methodology, sampling techniques, sampling locations and depths, sampling rationale, analyses of samples.

2.A.1.1.2 Health and Safety Plan . The A-E shall prepare the GS/SSHSP to establish the protocol necessary for the recognition, evaluation, and control of all hazards associated with the tasks required in this contract. Prior to beginning each major phase of work, an Activity Hazard Analysis shall be prepared for the phase. The GS/SSHSP shall be approved by a certified Industrial Hygienist, prior to initiation of any field effort. (See attached Appendix A- Safety and Health, HTRW Site Investigative Activities with Attachment 1 (Appendix B, Safety and Health Elements For HTRW and OEW Documents). The A-E shall execute work activities according to the accepted HSP and GS/SSHSP.

2.A.1. 1.3 Sampling and Analysis Plan . The A-E shall prepare the GS/SSSAP and execute all work according to the accepted plan. Among other issues, the GS/SSSAP shall describe the standard protocols for sampling, QA/QC sampling, taking water level measurements, decontamination procedures, and air surveillance equipment requirements. (See attached Appendix B- Environmental Data Quality Management.On a separate memo, submitted with the draft document, the A-E shall identify any variations from the Environmental Quality Data Management document which the A-E may have reason to propose in the sampling and Analysis Plan. The A-E (also referred to as "Consultant" in the EDQM document) is reminded of the task required in Section 6.14- Data Validation.)

2.A.1.1.4 The A-E shall prepare an annotated bibliography of the records which were obtained and reviewed for guidance to accomplish the tasks in this Amendment to the Supplemental Scope of Work, to include but not limited to the title, author, and publication date of the record, the agency or office from which the record was obtained, a brief description of the contents of the document, and a brief evaluation of the document. The bibliography shall be included in the Appendices of the Work Plan.

2.A.1.1.5 Project Personnel. The resumes of Tetra Tech personnel shall be included, indicating their education and qualifications to effectively perform the work. Any subsequent substitution of personnel after acceptance of the Work Plan shall be restricted to those with equal qualifications or who exceed the qualifications of the personnel originally accepted to do the work. The resumes of the replacement personnel including their qualifications shall be submitted for review and acceptance prior to assigning them to do the tasks. The A-E shall avoid any delay in tasks completion dates due to the substitution of personnel. The A-E shall shoulder any additional expense caused by this change in personnel.

2.A.1.1.6 The Master Work Plan/ GS/SSWP shall state that all field personnel understand the Master Sampling and Analysis Plan/ GS/SSSAP, and Master Health and Safety Plan/ GS/SSHSP and will comply with the provisions and procedures outlined in the plans.

2.A.1.1.7 The GS/SSWP shall list the individuals who will be involved in the field work and shall include as attachments, the certificates of their 40-hour safety and health for hazardous waste site training and annual follow-up refreshers; and other certifications (e.g. SCBA training, etc.) necessary to properly and safely complete the tasks required in this contract.

2.A.1.2 Field Activities-

2.A.1.2.1 At each site, the A-E shall delineate the occurrence of ground water, and soil and ground water contamination. (The proposed method and equipment to accomplish this task shall be described in the Work Plan.)

2.A.1.2.2 The A-E shall propose locations and depths of soil and ground water samples to be collected , along with the supporting rationale for choosing these locations at each of the sites requiring investigation. (The proposed sampling method and equipment shall be described in the GS/SSSAP). The A-E shall also conduct an expedited investigation of possible PCB contamination at the Bldg 218 site, ***including the sampling of the sludge pile (southwest of the current STP pond) for PCB contamination which may have received flow from Bldg-218 through its floor drainage system.**

2.A.1.2.2.1 The A-E shall ***perform sampling task per attached SWMU Group B-3 Investigation Summary Table. (Delete:** conduct twenty four hydropunch or similar tests, install six 30-ft, 2-inch monitoring wells, and conduct sixteen 20-ft. soil borings.)

2.A .1.2.2.2 The A-E shall collect ***samples for analyses per attached SWMU Group B-3 Investigation Summary Table. (Delete:** 32 soil samples and 6 ground water samples for VOCs, SVOCs, Pesticides & PCBs, Metals, TPH, TRPH, BOD/COD, and TOC level III analysis.The A-E shall also take two screening/confirmatory samples at each site for dioxin(s) analysis.)

2.A.1.2.2.3 The A-E shall collect 94 soil samples, 28 wipe samples for PCB analysis at Bldg 218 site.

2.A.1.2.2.4 The A-E shall collect QA samples equal to approximately 10% of field samples ***required in the attached SWMU Group B-3 Analytical Summary Table** and shall be analyzed for the same suite of analytes as the field samples and QC samples.

2.A.1.2.3 The A-E shall propose locations of survey control points where no existing monument can be found. The Survey shall include a map of of each site, showing locations of proposed borings and monitoring wells. Survey in all borings and monitoring wells shall have a minimum accuracy of +/- 0.1 foot horizontal to +/- 0.01foot vertical. *(Delete: The direction of perceived or known groundwater flow information shall also be included in the Survey map.)

2.A.1.2.4 The A-E shall develop a list of potential chemicals of concern that the A-E believes must be added and provide this list for each site in the Work Plan.

2.A.1.2.5 *The A-E shall conduct Visual Site Inspection (VSI) of Bldgs 210 and 212 to verify the absence of contaminants which were supposed to have been present at these sites.

***2.A.1.2.6 The A-E shall restore the concrete floor slab/railroad track of Bldg 218 to its pre-investigation condition.**

***2.A.1.2.7 The A-E shall conduct Phase 2 (Deep) Geophysical Investigations to establish the impact of subsurface geologic structure, faults, stratigraphic conditions or other hydrogeologic features on ground water flow and distribution of potential contaminants. The investigations shall include DC Resistivity profiling and high resolution Seismic Reflection (nominal 24 fold, repeated incidence acquisition) or an alternative geophysical method capable of producing accurate and valid soundings up to 350 feet bgs at the site.**

***2.A.1.2.8 The A-E shall also :**

***1) Conduct Phase 2 Geophysical Investigation using Ground Penetrating Radar;**
***2) Conduct Phase 2 Geophysical Investigation using the Magnetotelluric Method.**

***2.A.2** The A-E shall prepare a Remedial Investigation *(Delete: Summary) Report for the ***other five Group** B-3 sites to include the result of the sampling program and the remedial alternatives applicable to each site.

***2.A.3** Feasibility Study. The A-E shall prepare a plan for comparative analysis of the feasibility of at least four remedial alternatives ***for Bldgs 216 and 218 Sites** proposed in the remedial investigation *(Delete: summary) report. The A-E shall consider the "No Further Action" recommendation as the first option for the remediation of sites whenever feasible. Each remedial alternative shall be described in the Feasibility Study ***Section of the** Report and shall include an evaluation of each alternative. Each alternative shall be assigned an evaluation rating. The highest ranking rating shall be proposed as the recommended remediation option for the site.

***2.A.4** The A-E shall prepare a Health-Based Risk Assessment ***for Group B-3** to specifically address the concern related to direct exposure of humans to the chemicals of concern, and to the cattle grazing activity (food chain). This task shall consist of a) compilation of applicable criteria for the chemicals of concern; and b) conducting an exposure assessment; and comparison of the levels within each environmental medium against the list of criteria ***with the corresponding conclusion drawn from this task.**

***2.A.5 The A-E shall require the Data Validation subcontractor to prepare Data Evaluation Reports as well as other submittals specified in paragraphs 6.14.1 A, B, and C of the EDQM document. (Delete:** Management

of Investigation-Derived Waste (IDW). The A-E shall properly handle, characterize, and dispose of investigation-derived waste that will be generated. The A-E shall include in the Work Plan the proposed method of handling this waste. The A-E shall prepare a Technical Memorandum of the management of Investigation-Derived Waste.This memorandum shall include description of how the waste was handled, its transportation manifest, certification of destruction, and the name, location and telephone number of the disposal facility for this waste. Include in the quantity of IDW approximately 335 tons (220 cu. yds of contaminated soil and approximately 35 drums contaminated liquid which may be generated at the Bldg 218 PCB contamination site).)

***(Delete:** 2.A.5 Meetings and Presentation. The A-E shall attend meetings with the Arizona Regulatory personnel, Camp Navajo environmental staff, and/or US Army Corps of Engineers, Sacramento District Staff. Two meetings will be held in Phoenix and four meetings will be held at Camp Navajo (Bellemont), Arizona to make an oral presentation and review of the work performed, as well as projected. Attendance shall be limited to two persons from the A-E firm.)

2.A.6 Submittals and Reports-

2.A.6.1 The A-E shall ***submit draft, draft final and final versions of the Group B-3 Work Plan Addendum documents and** submit draft and final versions of ***all other documents/** reports and submittals. The A-E shall not proceed with the development of the final version until all Government (Corps of Engineers), regulatory agency, National Guard Bureau and installation comments on the draft documents had been addressed and the Government has accepted the A-E's responses to the comments. The A-E shall:

2.A.6.1.1 Submit for review and acceptance the Group B-3 group-specific/site specific Work Plan (GS/SSWP), Sampling and Analysis Plan (GS/SSSAP), Health and Safety Plan (GS/SSHSP), and all the attachments required in the Work Plan (See paragraph 2.A.1.1 through 2.A.1.1.7). The A-E shall also submit for review and acceptance all subcontractors' Health and Safety Program documentations prior to subcontractors' field work activities.

2.A.6.1.2 Submit for review and acceptance contour maps for each site, depicting ground water surface elevations and contaminant levels in soil and ground water. In addition, the A-E shall prepare geologic/ geotechnical cross sections from those contour maps depicting subsurface conditions. (See paragraph 2.A.1.2.1)

2.A.6.1.3 Submit for review and acceptance ***the Visual Site Inspection Reports for Bldg 210 and Bldg 212 sites.**

2.A.6.1.4 Submit for review and acceptance ***the Remedial Investigation Report and the applicable** Feasibility Study Report and Recommendations for the remediation of each ***of the other five Group B-3 sites.**

***2.A.6.1.5 Prepare and submit for review the Phase 2 (Deep) Geophysics Report. The Report shall include complete description of acquisition test and production procedures for all methods employed, a fully integrated interpretation combining all surveys, previous geophysical surveys, and known site surface and subsurface geology, and conclusions and recommendations concerning the remediation or closure of sites. Data shall be submitted on standard, commercially available 3.5 disk dat tape. Data submittals shall include seismic reflection trace field data, velocity corrected stack trace data, DC resistivity profile data, and conductivity sounding data. Seismic data submittals shall be in SEG-D, SEG-Y, or other accepted industry standard format.**

Resistivity and conductivity data shall be submitted in ASCII file format. All data submittals shall be accompanied by sufficient documentation to clearly identify the data type, method, sounding position and depth, and observation value. Data submittals shall be accompanied by complete and accurate copies of all observers logs and data processing records. Hard copy submittals shall include interpreted and unmarked seismograms of stack data, inmarked migrated seismograms, resistivity profile plots, and conductivity soundings. Plots, seismograms, and soundings shall be appended to the Geophysics Report.

*(Delete: 2.A.6.1.5 Submit for review and acceptance a technical memorandum on the management of Investigation-Derived waste (IDW). This report shall be submitted with the summary report of the sampling program following the completion of the investigations and shall include a discussion of the management of all IDW from all six sites.)

2.A.6.1.5 Prepare and submit by the 10th day of the current month, Monthly Progress Report describing the work performed of the past month, the work currently underway, and work anticipated. The report shall indicate if work is on schedule and if not, the reasons for the delay and what actions are to be taken to be back on schedule.

2.A.6.1.6 Provide documentation of activities identified in the group-specific/site-specific Work Plan, Health and Safety Plan and Sampling and Analysis Plan, including log book of daily activities.

2.A.6.1.7 Require the Data Validation subcontractor to submit for review and acceptance the Data Evaluation Reports and submittals specified in paragraphs 6.14.1 A, B, and C. (See paragraph *2.A.4)

2.A.6.1.8 Submit other technical memoranda, reports, and/or submittals referred to in other sections of the contract requirements of this amended supplemental scope of work.

2.A.6.2 The draft GS/SSWP and its attachments shall be due within 45 calendar days after notice to proceed (NTP) is issued to the A-E. Comments to the draft documents shall be provided to the A-E no later than 65 calendar days after NTP. Resubmittals of the documents shall be 10 calendar days after the A-E receives the comments from Sacramento District. All other draft documents shall be due within 14 calendar days after completion of specific task, event, or field activity, unless otherwise specified in the other sections of this scope of work. Review time and resubmittal requirements for these other draft documents shall be the same as required for the Work Plan.

2.A.6.3 Submittals and reports shall be prepared in 8 1/2" by 11" white bond papers using a word processor *(Delete: (compatible with the software in use at the installation and at the U.S . Army Corps of Engineers District Office)) and a quality printer. Drawings shall be engineering quality, showing sufficient details to identify interrelations of major features on the installation site map. Drawings shall include the scale used, provide a legend and show the North direction. Drawings shall be folded to the size of the report paper. The submittals and report shall be in the draft (for review and comment) and final form. The final submittal shall incorporate all comments (submitted and processed using the Automated Review Management System Program) generated by Sacramento District Staff, State of Arizona Regulators and Camp Navajo staff. The final submittals and reports shall be provided in both hard copy and on a 3.5" HD disk. The Scope of Work, the Supplemental Scope of Work and Amendments to the Supplemental Scope of Work shall be attached as an appendix to the final summary report indicated in paragraph 2.A.6.2.1. A section shall be provided describing the disposition of each comment made on all draft submittals. All final submittals/reports shall be sealed by a certified professional geologist ***or the engineer-in-charge, registered in the State of Arizona.**

2.A.6.4 The A-E shall submit sixteen copies of the draft reports and submittals to the Technical Manager and four copies to Camp Navajo.

2.A.6.5 The A-E shall submit the originals and sixteen copies of the final printed documents to the Technical Manager and four copies of the documents to Camp Navajo. The 3 1/2" disks shall be labeled with the following data: a) A-E's name; b) Project's name; c) Description of Contents; d) name of software and release number; e)Plotting scale of drawings.

Submittal Addresses:

US Army Corps of Engineers, Sacramento District
1325 J Street, 12th Floor
Sacramento, CA 95814-2922
ATTN: CESPK-ED-EB (Aala)

Camp Navajo Environmental Office
Bldg. 1
Bellemont, AZ 86015-5000
ATTN: Cpt. John A. Morrow, Jr. (AZIA-ASE)

B. Miscellaneous Requirements:

2.B.1 Notification. The A-E shall immediately notify both the Technical Manager and Camp Navajo by telephone of any data or results generated during the investigation which may indicate an imminent risk to the environment, human health or safety, or violation of federal, state, or local laws/regulations, followed by a written report within 3 days of discovering the imminent risk. The points of contact are:

a) Camp Navajo: Cpt. John A. Morrow, Jr. Tel. (*520) 773-3208; 3207
b) Sacramento District Technical Manager: Maynardo Aala Tel. (916) 557-7771

2.B.2 Minutes of Meetings. Following each meeting, the A-E shall prepare and submit minutes of the meeting within 10 days to the Sacramento District Technical Manager.

2.B.3 Correspondence/Telephone Conversation. The A-E shall keep a record of each phone conversation and written correspondence related to the performance of this delivery order. A summary of the telephone conversations and written correspondence of the past month shall be submitted to the Sacramento TM as an attachment to the monthly progress report.

2.B.4 The A-E shall refer all questions from the public to the Technical Manager.

2.B.5 The A-E shall be responsible to immediately notify the Technical Manager of any missing or unclear criterion required for completion of work/report so work milestones are not impacted.

2.B.6 All data, plans and other materials generated by the activities in this amendment to the supplemental

scope of work are the property of the U.S. Government and shall not be released to any unauthorized person or entity by the A-E, its subcontractors, or their employees, without written authorization from the Contracting Officer.

2.B.7 The A-E is cautioned not to accept guidance from any source other than the Contracting Officer in the course of this work and shall immediately notify the Technical Manager of any such action by the said source.

2.B.8 The A-E shall notify the COE technical manager at least two weeks in advance of any planned site visit/activity.

Period of Service: The A-E shall complete all efforts in this amendment to the supplemental scope of work on or before 31 **January 1997.**

References:

a) CETHA-R-CR-91040, Master Environmental Plan: Camp Navajo, Bellemont, Arizona, Final Report, October 1993.
b) CESPK-ED-EB, Installation Action Plan: Camp Navajo, Bellemont, Arizona, Draft Final, June 1994.
c) Guide to Management of Investigation-Derived Waste, EPA Publication No. 9345.3-02FS, May 1991.
d) Human Health-Based Guidance Levels for the ingestion of Contaminants in Drinking Water and Soil, Arizona Department of Environmental Quality, latest edition or revision.

Attachment:

a) Appendix A- Safety and Health, HTRW Site Investigative Activities with attachments 1- Appendix B, Safety and Health Elements for HTRW and OEW Documents.
b) Appendix B- Environmental Data Quality Management.

IAW FIRMR 201-20.3
ACQUISITION HAS BEEN REVIEWED AND APPROVED
5/7/96
INFORMATION MANAGEMENT OFFICE

Mayhardo Aala
Technical Manager
DERP Section

Distribution:
A-E- Tetra Tech
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A-E Negotiation Section
DERP Section