DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

ENTERED

14 APR 93

1993 APR RECEIVED HAZARDOUS WASTE PROGRAM

377 ABW/EM
2000 Wyoming Blvd SE
Kirtland AFB NM 87117-5659

Ms Stephanie Stoddard
New Mexico Environment Department
1190 St Francis Drive
PO Box 26110
Santa Fe NM 87502

Dear Ms Stoddard

AOP IV

In the original version of the 2B Work Plan, para 3.4.1.4 Release Characterization, contained a description of the placement of horizontal instrumentation portals under the trenches at Radioactive Burial Site 11 (Atch 1). We are currently working with Sandia National Laboratories (SNL) to place two horizontal portals that will pass under the trenches. One portal will pass under four of the trenches, the other portal will pass under five trenches.

It is possible that soil entrapped on the equipment may be "mixed" waste (hazardous chemical plus radioactive waste) for both the vertical penetrometer that Kirtland Air Force Base will use and SNL's pushed horizontal rod (Atch 2). Because mixed waste is so difficult to dispose of, we are not certain it can be accomplished within 90 days.

Please advise us if we are required to obtain a permit relative to the generation or storage for more than 90 days before disposal can be accomplished. It will not be known if the rinseate is "mixed" until the samples are run at a laboratory.

Thank you for your assistance.

Sincerely

Harry McPherson (for)

THOMAS A. NORRIS, Colonel, USAF
Director
Environmental Management Division

2 Atch
1. RB-11, 2B Work Plan, 9/92
2. RB-11, 2B Work Plan, 1/93

cc: Ms Barbara Driscoll
EPA Region VI

KAFB1301

INSTALLATION RESTORATION PROGRAM
STAGE 2B

WORK PLAN

Kirtland Air Force Base
New Mexico 87117-5000

U.S. Geological Survey - Water Resources Division
4501 Indian School Rd. NE, Suite 200
Albuquerque, New Mexico 87110

September 1992

Draft 1

PREPARED FOR

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Air Force Center for Environmental Excellence
Environmental Services Office
Environmental Restoration Division (AFCEE/ESR)
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622 002

AFSh-1

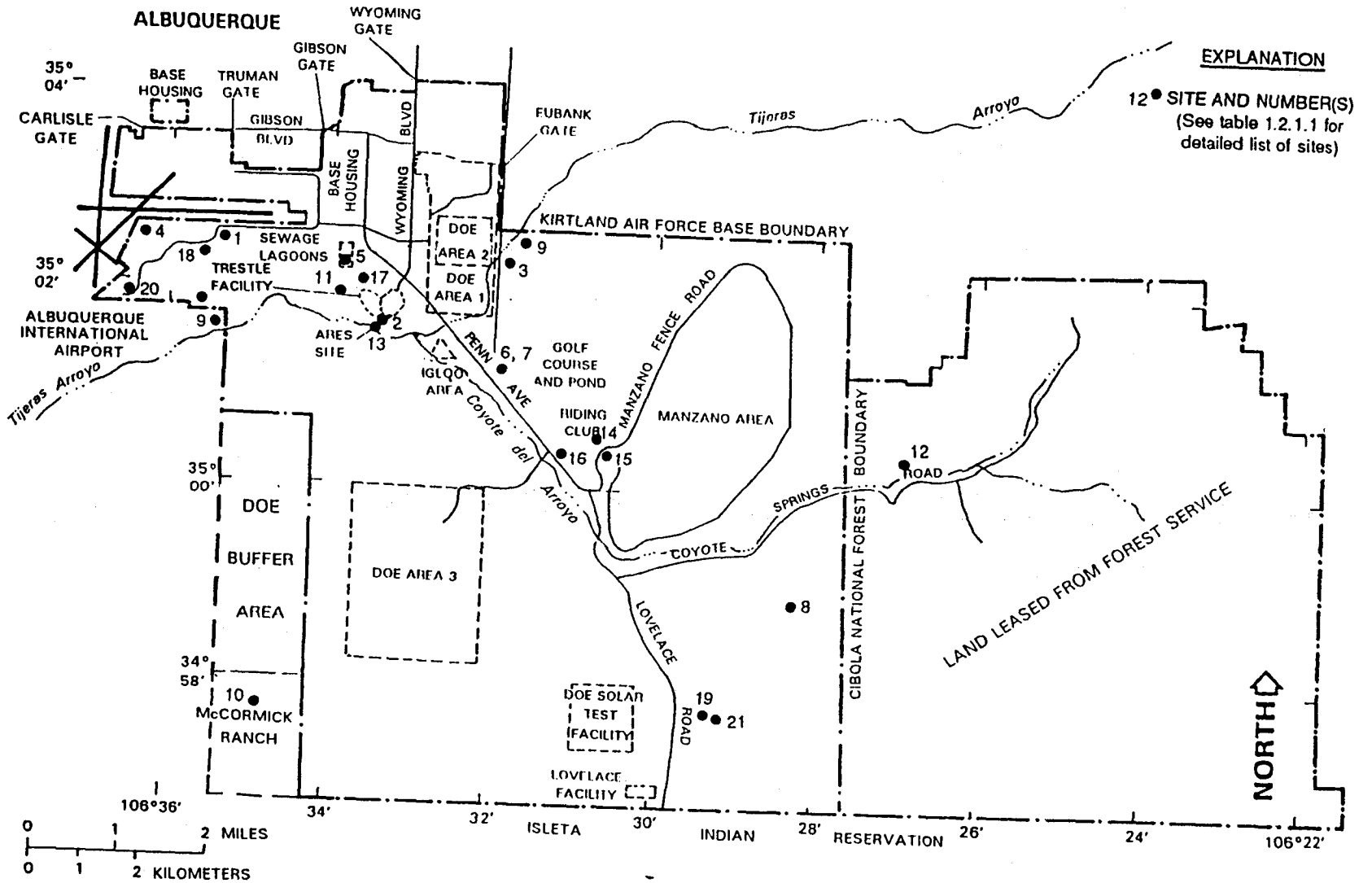

Figure 1.2.1.1.--Location of IRP Stage 2 and 2A investigation sites on Kirtland AFB.

3.2.2.5 Land Surveying

A registered land surveyor will survey the elevations and horizontal locations of all soil borings and other sampling points at all sites. Horizontal locational surveys are used to properly locate the sampling point with respect to other features at the site and to relocate the sampling point should that be necessary.

3.3 Preliminary Activities

Preliminary activities to be conducted prior to the field work include mobilizing drilling and safety equipment and supplies, and reconnaissance visits to RFI sites to familiarize personnel with the sites and to determine logistics. Before field work begins, all USGS field and contract personnel must have received proper briefings on site history, health and safety requirements, and field procedures.

A literature search will identify and gather information on the source and potential release of contaminants in the SWMU sites to be investigated in Stage 2B. All available records and reports concerning the hydrogeologic and environmental setting, and previous site investigations will be researched for each site. Much of this information is contained in previous IRP reports from Phase I (Engineering Science, Inc., 1981),[7] Stage 1 (Science Applications International, Inc., 1985),[20] the Preliminary Review/Visual Site Inspection report (Kearney/Centaur, 1988)[9], and the Stage 2 remedial investigation performed by the USGS (report in progress). Additional information will be gained from discussion with the base Point of Contact (POC) and by review of site activities with current base employees.

3.4 Characterization Exploration and Sampling Program

The following sections address collection of background samples and site-specific exploration samples. A summary of the site history, location, dimensions, and possible sources and types of contamination precedes the proposed exploration program for each site.

3.4.1 Site 16, Radioactive Burial 11 (RW-06)

Site 16, Radioactive burial 11 (RW-06) is outside the southern edge of the riding club area (fig. 3.4.1.1). The site is approximately one-half acre. The site has been inactive since 1970. Animal carcasses are buried in eight to ten trenches at Site 16.

3.4.1.1 Environmental Setting

Geology: Geologic information for Site 16 is limited. The thickness of the Santa Fe Group at Kirtland production well 9 (abandoned) is 750 feet (fig. 3.4.1.2). The production well is located approximately 1,400 feet east of Site 16. The Santa Fe Group thickens to the west, and it is probably more than 750 feet thick at Site 16. Surface soils are sandy.

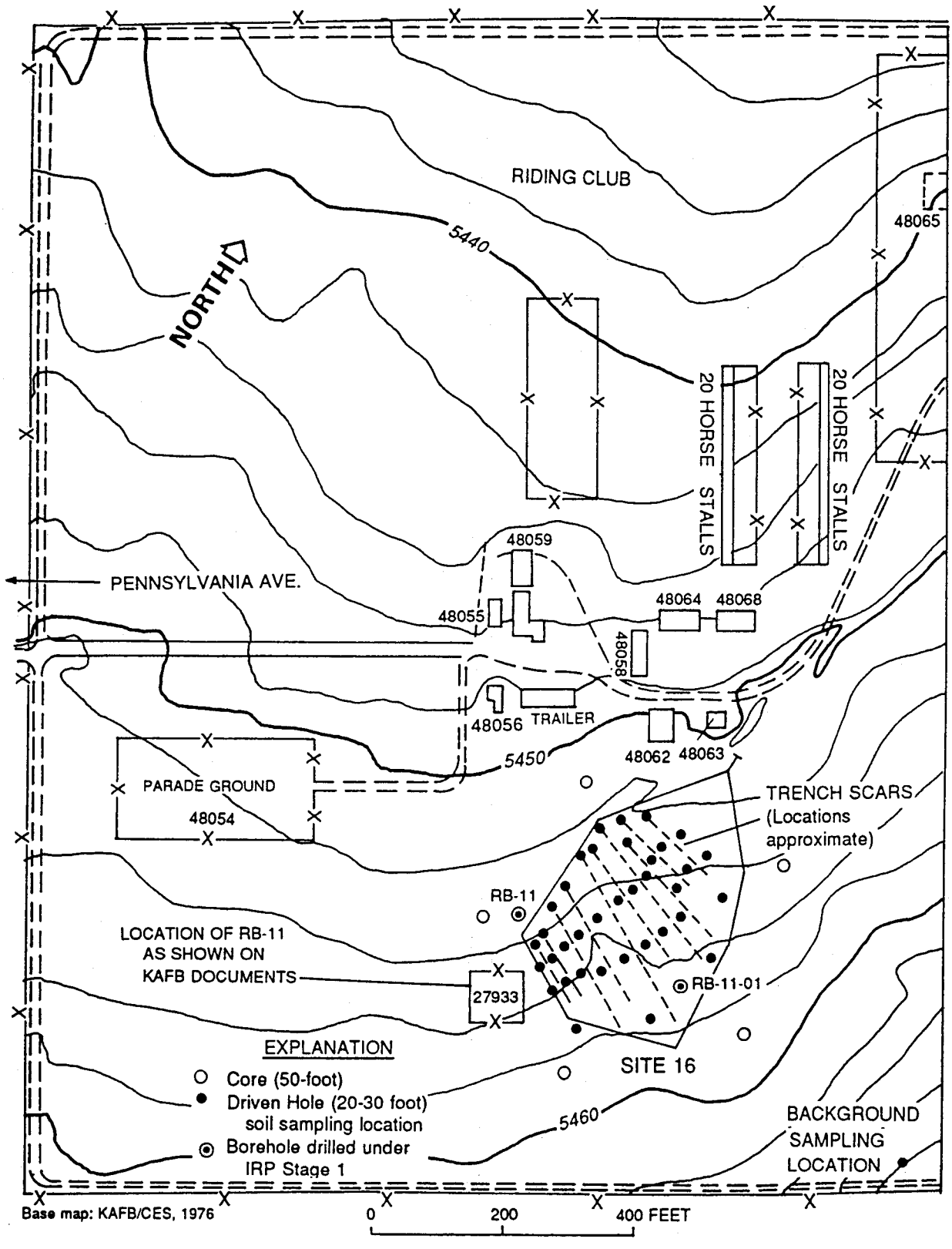

Figure 3.4.1.1.--Sampling locations at Site 16, Radioactive Burial 11 (RW-06).

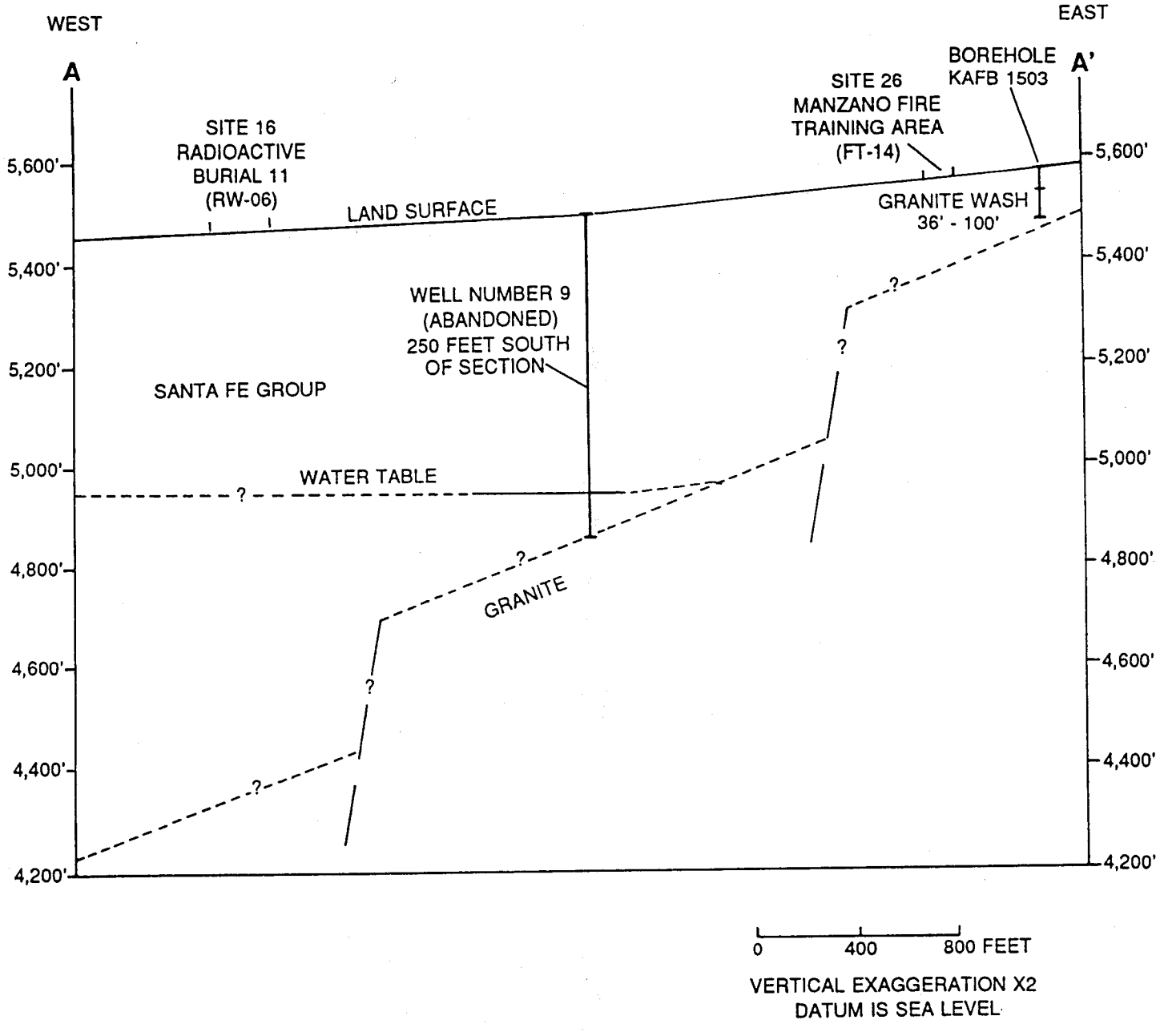

Figure 3.4.1.2.--Diagrammatic section through Sites 16 and 26, Radioactive Burial 11 (RW-06) and Manzano Fire Training Area (FT-14). (Line of section shown on figure 1.4.1.1.)

Ground water: Depth to ground water at the site is approximately 500 feet (fig. 3.4.1.2). Based on the geohydrology of the area, ground water probably flows westward. Aquifer characteristics specific to this site are unknown. Ground water is probably potable based on ground-water quality in the basin to the west. The nearest active production well, No. 11, is approximately 2.5 miles north of Site 16.

Surface water: The site is nearly flat, with a northward slope of about 2 percent. The site is within a broad swale, and no surface-water drainage channels are located on or adjacent to the site. Surface-water drainage, after heavy rainfall, is restricted to overland flow or surface soil infiltration. Surface-water runoff at the site has not been sampled. No sanitary sewers are known to exist at the site.

Air: Wastes at the site are apparently well covered by local soil and are not exposed to the atmosphere. Ambient air quality has not been analyzed at the site. The site is on a schedule for annual surficial radiation monitoring by Kirtland AFB. No radiation has been found above background levels.

Biology: The site is in the riding club area (fig. 3.4.1.1.); because it is fenced, the possibility of grazing by horses exists, although it does not appear to be grazed. A trench with surface subsidence is clearly visible and did not show signs of frequent animal tracking at the point where it was observed on August 13, 1992. Horses are kept in barns and pastures on the premises. There are no trees to attract birds, though ground-dwelling birds are probably present in the grass and herblike plants at the site. Rabbits were observed September 9, 1992, and other rodents and various insects are probably present. See the discussion of biology in section 2.1.7. Although the nearest permanent human habitation is about 2.5 miles to the north, a family is currently living in a trailer approximately 300 feet northwest of the trenches.

3.4.1.2 Source Characterization

Site 16 is within a 40-acre facility which was formerly operated by the Radiobiology Laboratory, Biophysics Branch, Air Force Weapons Laboratory (AFWL). In 1970, the facility became part of the Environics Branch of the AFWL's Civil Engineering Research Division, and in 1974 the site was turned over to the KAFB Riding Club, its present owner (Engineering Science, Inc., 1981).[7]

Phase I of the IRP revealed that the site was a trench and fill operation from 1961 to 1970, with possibly 10 trenches filled (fig. 3.4.1.1). Four of the trenches are approximately 50 feet long by 9 feet deep by 2 feet wide. These four trenches are covered with approximately 4 feet of earthen material; two have asphalt covers and the other two have a compacted earth cover. Two more trenches are approximately 100 feet long by 20 feet deep by 6 feet wide. These trenches also have a 4-foot earth cover. Three trenches are reported to be at least 24 feet deep and are covered with earthen material. The site is relatively flat with apparent trenching scars that (at one time) showed depleted vegetation. Radiation warning signs are located on the site but the site is not fenced. A seismic refraction geophysical survey estimated the maximum trench depth of 24 feet. Areas between trenches are apparently barren (Science Applications International Corporation, 1985).[20]

On August 13, 1992, trench scars seemed to be indicated by strikingly more verdant vegetation than the surrounding terrain. A very obvious sunken trench was marked with green vegetation and six such vegetation markings were observed, all north of the two asphalt-covered trenches. This adds up to eight trenches observed on August 13, 1992.

Site 16 was used as a burial ground for animal carcasses that had received doses of radioactivity; animal excreta; and small amounts of hazardous and toxic chemicals, including acids, mercury, cyanides, and silver. In the Phase I study, Environmental-Science (1981) reported that most of the radioactivity was in the form of induced activity and short half-lived elements, but several millicuries of elements with longer half-lives likely may be present. Although no accurate records were kept on the amounts of wastes that were disposed of, the following numbers of animals were estimated to have been disposed of at the site (Environmental-Science, 1981): sheep, 1,000 to 1,500; burros, 60 to 75; goats, 40 to 50; chickens, 100 to 120; rats, 500 to 1,000; cows, 5 to 10; and dogs, 50 to 60. Some of the waste was buried in drums, but most was not. There have also been reports of the disposal of a 55-gallon drum of mercury. The results of a geophysical survey indicate that several metal drums are present in the trenches. The site was generally not locked during the time the trenches were open (Dr. DeBoer, oral commun., August 13, 1992), allowing for the possibility that substances other than those generated by the Radiobiology Laboratory are buried there. The decomposition of buried animal carcasses could result in the production of methane gas and odors, the duration and concentration of which would depend on the rate of decomposition.

A previous IRP field investigation, Phase II, Stage 1, drilled a 100-foot exploratory hole at the southeast corner of the site and placed a lysimeter under the largest trench. Surface monitoring of the drill cuttings from the holes for gamma radiation did not yield any readings in excess of normal background levels (Science Applications International Corporation, 1985, p. 4-10).[20] A radiation survey of the site was conducted during November and December 1974. No surface radiation levels were found at the site in excess of natural background levels. A soil sample collected at a depth of 37 feet below the largest trench was analyzed for halogenated organics, pesticides, and oil and grease. No detectable levels were found in the sample (Science Applications International Corporation, 1985, p. 4-10).[20]

Site 16 was considered but not studied during the Phase II, Stage 2A investigation because the site contains mixed wastes (radioactive and hazardous), and the investigation of mixed waste sites was beyond the scope of the Stage 2A investigation.

3.4.1.3 Potentially Contaminated Media

Waste is reportedly buried under 4 or more feet of soil. However, contaminants could possibly be brought to the surface by plants as nutrients or by ants or other deep-burrowing animals. Should contaminants surface they could be dispersed as fugitive dust or they could be washed downslope and into arroyos by surface-water runoff. If these processes are assumed to occur gradually, then they may be addressed by the Kirtland AFB program for annual surface monitoring at this site.

Contaminants can possibly escape to the air as fugitive vapors. This process is likely to occur on a continuous basis. Therefore, annual surface monitoring would detect fugative vapors if concentrations are at measurable levels. Any vapors will be more concentrated in soil gas than in the atmosphere.

Downward migration of contaminants into soil beneath the landfill toward ground water is possible. This migration is likely to have a lateral component due to the lenticularity of the Santa Fe Group and the likely presence of caliche layers in the subsurface. Water-borne contaminants could migrate downward with water. Considering the slow or non-existent ground-water recharge in areas similar to this, downward migration of water-borne contaminants is likely to be slow after the initial water is drained from the fill material. Downward migration of mercury may be possible, depending on many factors including possible chemical reactions with soil and the original chemical form of the mercury (Alloway, 1990, p. 230).[1]

3.4.1.4 Release Characterization

The objective of the investigation at Site 16 is to determine if contamination that has been released from the trenches exists near the land surface and in the unsaturated zone beneath the site. Geologic and surface geophysical data are needed to better develop a conceptual model of this site. Soil data are needed to characterize the possible extent of downward or lateral migration of radioactive contaminants buried at the site. The possibility of ground-water contamination will not be investigated at this site during this phase of the investigation. If contamination in the soil beneath or adjacent to the landfill exists, additional data collection will be recommended to determine the extent of contamination. Transport of contaminants by surface water will not be investigated directly because there is no surface-water drainage through the site. However, soil sampling at the surface will indicate if any residual contaminants are exposed to the possibility of sheet erosion.

Kirtland AFB plans to contract with Sandia National Laboratories (SNL) to place horizontal holes under this site. SNL will be using an experimental drilling method, and in situ soil and soil-moisture testing procedures which will help to characterize this site. However, because the methods employed by SNL will be experimental, the investigation conducted by the USGS at this site will not rely on the SNL investigation to fill any existing data gaps.

In the SNL plan a horizontal/directional hole will be driven the length of each trench at a depth of about 30-40 feet. The analytical tests are expected to include the following: The holes will be scanned for alpha, beta, and gamma radiation. Soil and gas samples collected and analyzed for Appendix VIII constituents and TCLP metals. Details of sampling from the horizontal/directional holes are not the subject of this workplan.

To characterize the near-surface geology at Site 16, five continuous-core holes will be drilled on the perimeter of the site (fig. 3.4.1.1). Each of the continuous-core holes will be drilled to a depth of 50 feet. Geologic strata will be correlated between the holes to develop a three-dimensional model of the near-surface stratigraphy at the site. Continuous or discontinuous caliche layers, argillaceous layers, coarse layers, or gravelly layers may form preferential flow paths or flow boundaries for potential contaminants.

To characterize the lateral and vertical extent of the trenches a 2-day ground penetrating radar (GPR) survey of the site will be conducted. The seismic refraction survey previously conducted at the site (Science Applications International Corporation, 1985)[20] was a reconnaissance and delineates neither the areal extent nor depths of the trenches.

Soil and soil-gas samples will be collected from 36 holes driven adjacent to the perimeter and between the trenches (fig. 3.4.1.1). Ten of the holes will be driven at the downslope (western) end of each trench. Two north-oriented rows of 11 holes each (22 holes) will be driven at the site. These two rows will be perpendicular to the alignment of the trenches. The end holes in each row will be located outside the outermost trench, and the other 9 holes in each row will be located between the trenches. Four holes will be driven at the upslope (south) end of the trenches.

One soil sample will be collected from each hole and analyzed for metals (ICP screen), Volatile organic compounds (VOC), semivolatile organic compounds, cyanide, mercury, gross alpha and beta, radium 226, radium 228, and soil moisture. The depth below the trenches at which soil samples are collected will be determined on the basis of interpretations of the near-surface stratigraphy and the GPR survey. The soil samples will probably be collected from 20 to 30 feet deep.

Soil-gas samples will be collected from a depth of 3 feet in each hole and analyzed with a portable gas chromatograph (GC), and a mercury detector.

Six soil samples will be collected from the surface at the downslope (north) end of the trenches. The surface soil samples will be analyzed using the same methods as the hole soil samples. If contamination has migrated to the surface; it should also be moving downslope with sheet wash and should be detectable at the downslope end of the trenches.

One background hole will be driven approximately 400 feet upslope from the site. A soil-gas sample, surface soil sample, and deep soil sample will be collected from this hole and analyzed by the same analytical methods as the environmental samples.

United States Air Force

Environmental Restoration Program

Work Plan
Stage 2B

Kirtland Air Force Base
New Mexico 87117-5000

January 1993

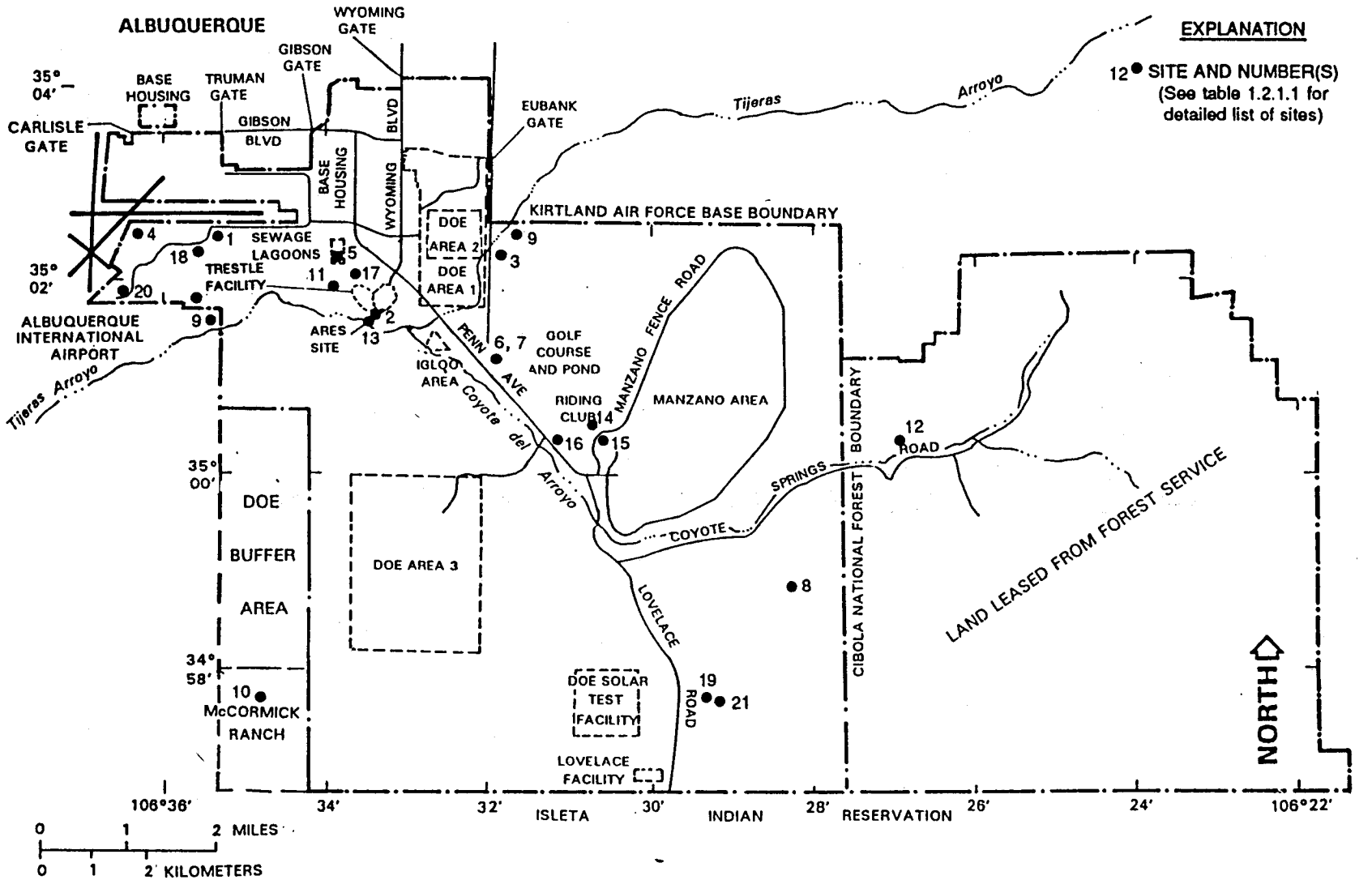

Figure 1.2.1.1.--Location of IRP Stage 2 and 2A investigation sites on Kirtland AFB.

Experimental horizontal/directional holes have been proposed beneath Site 16, Radioactive Burial 11, by Sandia National Labs under separate contract with Kirtland AFB. Although these horizontal/directional holes are not the subject of this workplan, the following description is included to attempt to relate the two projects. Horizontal/directional holes are driven with equipment that forces a drill rod into the earth with a hydraulic ram, producing no cuttings. The drill rod has a directional bit that is controlled by rotating the rod, thus allowing for a curved hole that can dip beneath the site and surface at the other side. The horizontal/directional holes would begin from a trench about 60 feet from the site (Site 16, Radioactive Burial #11) and proceed under the site. The side of the trench is used to oppose the reactive force of the hydraulic ram. After the drill rod is withdrawn, the hole may be fitted with a membrane liner which is forced under pressure into the hole so that it turns inside out exposing only the inside of the membrane to the earth. The liner might be instrumented with sensors, such as x-ray fluorescence and neutron activation analysis to detect metals, and gamma-ray spectroscopy to detect radioactive materials. The drilling technology is borrowed from the utilities industry and is experimental in this RCRA application. Also, the use of a membrane liner and sensors is an experimental, non-approved method. This technology for making measurements beneath landfills that do not have discrete trenches and for obtaining "real-time" results can prove to be beneficial because:

- It may prove useful for interpolation between the sampling points of the vertically-driven holes.
- It may indicate where to drive additional vertical holes for sampling.
- It will help prove the <u>in situ</u> techniques by comparison between the analyses of samples from vertical holes and the <u>in situ</u> measurements, and
- It may accrue safety by determining near "real-time" analysis, even though, safety will be assured by other proven methods and measures.

3.2.2.4 Soil Sampling

Soil samples will be analyzed for constituents on a site-by-site basis as specified in section 3.4. Soil samples will be analyzed for one or more of the following constituents: total petroleum hydrocarbons, volatile organic compounds, semivolatile organic compounds, metals, toxic characteristic leaching procedure metals, ignitability, soil moisture content, silver, organochlorine pesticides and PCB's, organophosphorous pesticides, chlorinated phenoxy acid herbicides, dioxins, polynuclear aromatic hydrocarbons, cyanide, pH, fluoride, gross alpha and beta, radium 226, and radium 228. Metals is herein defined as the ICP screen plus mercury. If the ICP screen detects specific metals at concentrations in excess of the RCRA action levels (Appendix C), and interelement interference is suspected (USEPA, 1986, p. 6010-4)[25]; the RFI will be expanded to reanalyze the soil samples using atomic absorption method(s).

Soil samples will be collected at depths below the bottom of each unit as specified individually in section 3.4. The horizontal locations of soil samples are shown in figures for each individual site; however, precise locations will depend on various factors such as buried utilities, piping, and overhead clearance. An effort will be made, with the concurrence of the TPM, to collect samples where color, texture, or field screening (such as OVA, HNu, or GC) indicate possible contamination. Soil sample will be extruded from the solid (Geoprobe) core barrel directly into the sample container except for volatile organic compound samples, which require a California brass ring or equivalent sampler.

3.2.2.5 Land Surveying

A registered land surveyor will survey the elevations and horizontal locations of all soil borings and other sampling points at all sites. Horizontal locational surveys are used to properly locate the sampling point with respect to other features at the site and to relocate the sampling point should that be necessary.

3.3 Preliminary Activities

Preliminary activities to be conducted prior to the field work include mobilizing drilling and safety equipment and supplies, and reconnaissance visits to RFI sites to familiarize personnel with the sites and to determine logistics. Before field work begins, all USGS field and contract personnel must have received proper briefings on site history, health and safety requirements, and field procedures.

A literature search will identify and gather information on the source and potential release of contaminants in the SWMU sites to be investigated in Stage 2B. All available records and reports concerning the hydrogeologic and environmental setting, and previous site investigations will be researched for each site. Much of this information is contained in previous IRP reports from Phase I (Engineering Science, Inc., 1981),[7] Stage 1 (Science Applications International, Inc., 1985),[20] the Preliminary Review/Visual Site Inspection report (Kearney/Centaur, 1988)[9], and the Stage 2 remedial investigation performed by the USGS (report in progress). Additional information will be gained from discussion with the base Point of Contact (POC) and by review of site activities with current base employees.

3.4 Characterization Exploration and Sampling Program

The following sections address collection of background samples and site-specific exploration samples. A summary of the site history, location, dimensions, and possible sources and types of contamination precedes the proposed exploration program for each site.

3.4.1 Site 16, Radioactive Burial 11 (RW-06)

Site 16, Radioactive burial 11 (RW-06), is on the southeastern side of the riding club (fig. 3.4.1.1). The site is approximately one-half acre. This site was used primarily to bury irradiated animal carcasses from a radio-biology lab that once occupied the riding club area. The site has been inactive since 1970. Considering conditions at the site, described in the following sections, a fence separating the site from the riding club would be a reasonable interim measure.

3.4.1.1 Environmental Setting

Background concentrations of mercury could be affected by a mercury spill located about 1,000 feet upslope to the east-southeast which is currently being investigated by Kirtland AFB. That spill is possibly related to manometer instrumentation at abandoned well No. 9.

Geology: Geologic information for Site 16 is limited. The thickness of the Santa Fe Group at abandoned Kirtland production well No. 9 is 750 feet (fig. 3.4.1.2). Well No. 9 is located approximately 1,400 feet east of Site 16. The Santa Fe Group thickens to the west, and it is probably more than 750 feet thick at Site 16. Surface soils are sandy.

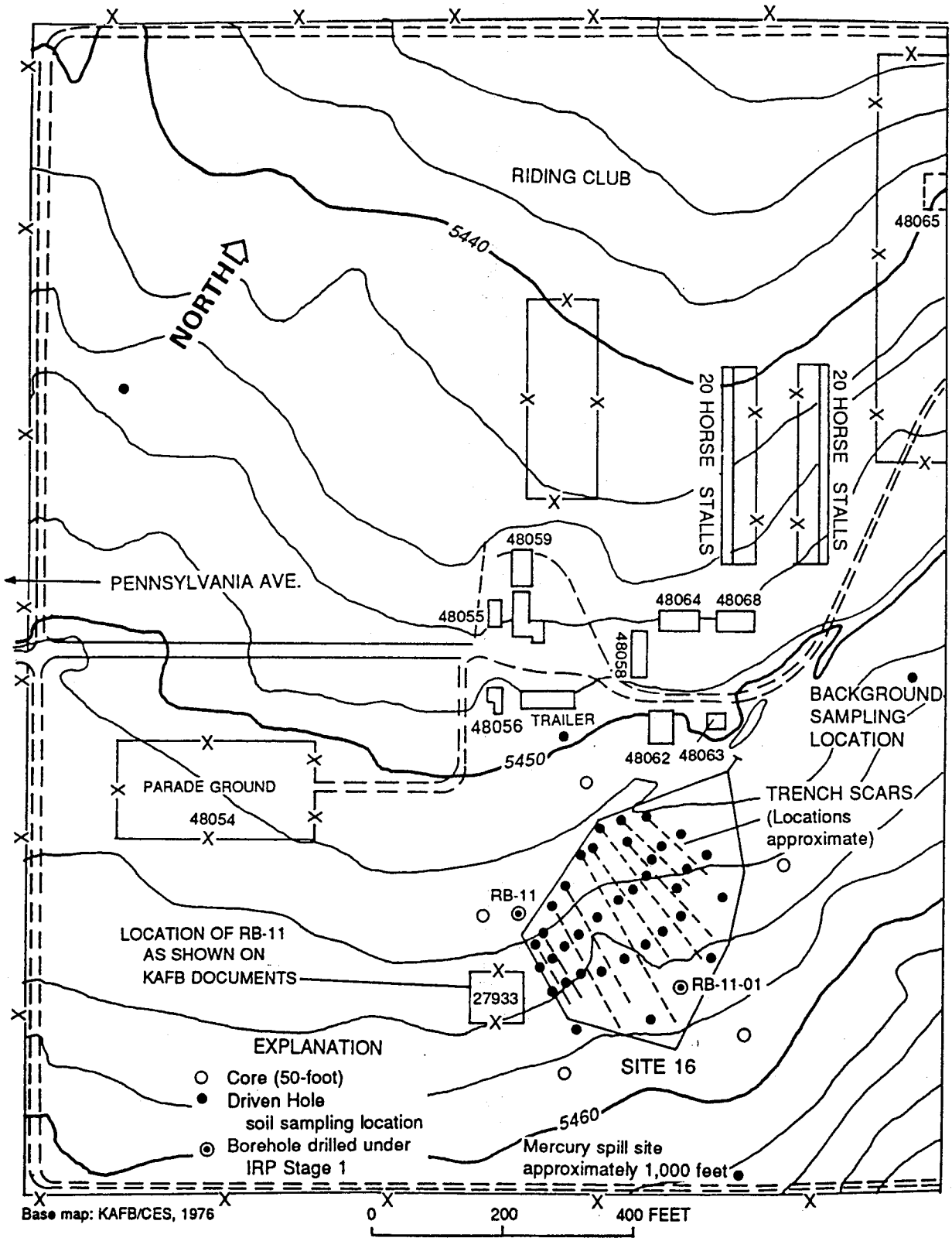

Figure 3.4.1.1.--Approximate sampling locations at Site 16, Radioactive Burial 11 (RW-06).

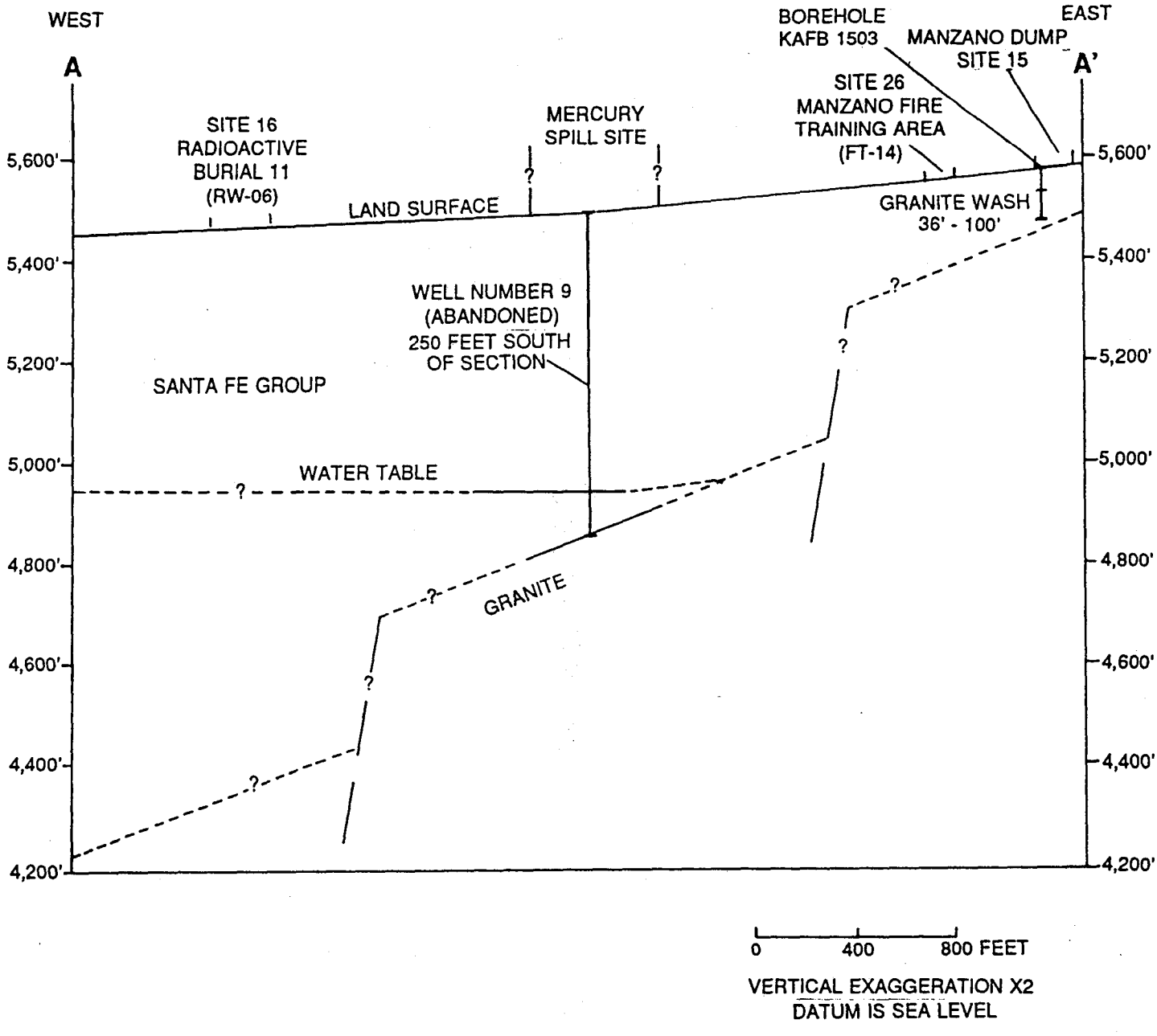

Figure 3.4.1.2.--Diagrammatic section through Sites 16 and 26, Radioactive Burial 11 (RW-06) and Manzano Fire Training Area (FT-14). (Line of section shown on figure 1.4.1.1.)

Ground water: Depth to ground water at the site is approximately 500 feet (fig. 3.4.1.2). Based on the geohydrology of the area, ground water probably flows generally westward. Aquifer characteristics specific to this site are unknown. Ground water is probably potable based on ground-water quality in the basin to the west. The nearest active production well, No. 11, is approximately 2.5 miles north of Site 16.

Surface water: The site slopes northwestward about 2 percent. The site is within a broad swale, and no surface-water drainage channels are located on or adjacent to the site. Surface-water drainage, after heavy rainfall, is restricted to overland flow or surface soil infiltration. Surface-water runoff at the site has not been sampled. No sanitary sewers are known to exist at the site.

Air: Wastes at the site are apparently well covered by local soil and are not exposed to the atmosphere. The site is on a schedule for annual surficial radiation monitoring by Kirtland AFB. No radiation has been found above background levels.

Biology: The site is in the riding club area (fig. 3.4.1.1.); because it is not fenced, the possibility of grazing by horses exists, although it does not appear to be grazed. A trench with surface subsidence is clearly visible and did not show signs of frequent animal tracking at the point where it was observed on August 13, 1992. Horses are kept in barns and pastures on the premises. There are no trees to attract birds, though ground-dwelling birds are probably present in the grass and herblike plants at the site. Rabbits were observed September 9, 1992, and other rodents and various insects are probably present. See the discussion of biology in section 2.1.7. Although the nearest permanent human habitation is about 2.5 miles to the north, a family is currently living in a trailer approximately 300 feet northwest of the trenches.

3.4.1.2 Source Characterization

Site 16 is within a 40-acre facility which was formerly operated by the Radiobiology Laboratory, Biophysics Branch, Air Force Weapons Laboratory (AFWL). In 1970, the facility became part of the Environics Branch of the AFWL's Civil Engineering Research Division, and in 1974 the site was turned over to the KAFB Riding Club, its present owner (Engineering Science, Inc., 1981).[7]

Phase I of the IRP revealed that the site was a trench and fill operation from 1960 to 1971, with possibly 10 trenches filled (fig. 3.4.1.1). Four of the trenches are approximately 50 feet long by 9 feet deep by 2 feet wide. These four trenches are covered with approximately 4 feet of earthen material; two have asphalt covers and the other two have a compacted earth cover. Two more trenches are approximately 100 feet long by 20 feet deep by 6 feet wide. These trenches also have a 4-foot-thick earth cover. The site is relatively flat with apparent trenching scars that (at one time) showed depleted vegetation. Radiation warning signs are located on the site but the site is not fenced. A seismic refraction geophysical survey estimated the maximum trench depth of 24 feet. Areas between trenches are apparently barren (Science Applications International Corporation, 1985).[20]

On August 13, 1992, trench scars seemed to be indicated by strikingly more verdant vegetation than the surrounding terrain. A very obvious sunken trench was marked with green vegetation and six such vegetation markings were observed, all north of the two asphalt-covered trenches. This adds up to eight trenches observed on August 13, 1992.

Site 16 was used as a burial ground for animal carcasses that had received doses of radioactivity; animal excreta; and small amounts of hazardous and toxic chemicals, including acids, mercury, cyanides, and silver. In the Phase I study, Environmental-Science (1981) reported that most of the radioactivity was in the form of induced activity and short half-lived elements, but several millicuries of elements with longer half-lives (zirconium, nyobium, cesium, iodine, and yttrium) likely may be present. Although no accurate records were kept on the amounts of wastes that were disposed of, the following numbers of animals were estimated to have been disposed of at the site (Environmental-Science, 1981): sheep, 1,000 to 1,500; burros, 60 to 75; goats, 40 to 50; chickens, 100 to 120; rats, 500 to 1,000; cows, 5 to 10; and dogs, 50 to 60. Some of the waste was buried in drums, but most was not. There have also been reports of the disposal of a 55-gallon drum of mercury. The results of a geophysical survey indicate that several metal drums are present in the trenches. The site was generally not locked during the time the trenches were open (Dr. DeBoer, oral commun., August 13, 1992), allowing for the possibility that substances other than those generated by the Radiobiology Laboratory are buried there. The decomposition of buried animal carcasses could result in the production of methane gas and odors, the duration and concentration of which would depend on the rate of decomposition.

A previous IRP field investigation, Phase II, Stage 1, drilled a 100-foot exploratory hole at the southeast corner of the site and placed a lysimeter under the largest trench. Surface monitoring of the drill cuttings from the holes for gamma radiation did not yield any readings in excess of normal background levels (Science Applications International Corporation, 1985, p. 4-10).[20] A radiation survey of the site was conducted during November and December 1974. No surface radiation levels were found at the site in excess of natural background levels. A soil sample collected at a depth of 37 feet below the largest trench was analyzed for halogenated organics, pesticides, and oil and grease. No detectable levels were found in the sample (Science Applications International Corporation, 1985, p. 4-10).[20]

On 26 June 92, a periodic radiation survey was conducted on the air and soil surface at Site 16. Instrumentation was a Ludlum Model 19 Micro-R meter and a Technical Associates Model TBM-3S Contamination meter. No radiation was detected above background. A memo reporting these results also refers to the same conclusion, no radiation above background, for "numerous historical surveys" at the site (written commun., Capt. D.F. Caputo, Base Radiation Safety Officer, USAF, BSC, 23 Oct 92).

Site 16 was considered but not studied during the Phase II, Stage 2A investigation because the site contains mixed wastes (radioactive and hazardous), and the investigation of mixed waste sites was beyond the scope of the Stage 2A investigation.

3.4.1.3 Potentially Contaminated Media

Waste is reportedly buried under 4 or more feet of soil. However, contaminants could possibly be brought to the surface by plants as nutrients or by ants or other deep-burrowing animals. Should contaminants surface they could be dispersed as fugitive dust or they could be washed downslope by surface-water runoff. If these processes are assumed to occur gradually, then they may be addressed by the Kirtland AFB program for annual surface monitoring at this site.

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Downward migration of contaminants into soil beneath the landfill toward ground water is possible. This migration is likely to have a lateral component due to the lenticularity of the Santa Fe Group and the likely presence of caliche layers in the subsurface. Water-borne contaminants could migrate downward. Considering the slow or non-existent ground-water recharge in areas similar to this, downward migration of water-borne contaminants is likely to be slow after the initial water is drained from the fill material. Downward migration of mercury may be possible, depending on many factors including possible chemical reactions with soil and the original chemical form of the mercury (Alloway, 1990, p. 230).[1]

3.4.1.4 Release Characterization

The objective of the investigation at Site 16 is to determine if contamination that may have been released from the trenches exists near the land surface and in the unsaturated zone beneath the site. Geologic and surface geophysical data are needed to better develop a conceptual model of this site. Soil data are needed to characterize the possible extent of downward or lateral migration of radioactive contaminants buried at the site. If contamination at concentrations above action levels in the soil beneath or adjacent to the landfill is found, remediation will be considered. If field tasks proposed herein do not define the extent of contamination fully, the RFI will be expanded, pending EPA approval, to fully define the extent. Transport of contaminants by surface water will not be investigated directly because there is no evidence of surface-water channeling across the site. However, soil sampling at the surface will indicate if any residual contaminants are exposed to the possibility of sheet erosion.

To characterize the near-surface geology at Site 16, five continuous-core holes will be drilled on the perimeter of the site (fig. 3.4.1.1). Each of the continuous-core holes will be drilled to a depth of 50 feet. Geologic strata will be correlated between the holes to develop a three-dimensional model of the near-surface stratigraphy at the site. Continuous or discontinuous caliche layers, argillaceous layers, coarse layers, or gravelly layers may form preferential flow paths or flow boundaries for potential contaminants.