August 27 - September 6, 1990

KIRTLAND AIR FORCE BASE
COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

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Hazardous and Radioactive Materials Bureau
New Mexico Environment Department

May 6, 1991

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OFFICE CHECKLIST

ATTACHMENTS

NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE PROGRAM

COMPREHENSIVE GROUNDWATER MONITORING EVALUATION REPORT (CME)

INSPECTION COVER SHEET

EPA I.D. NUMBER: NM9570024423

NAME OF FACILITY: Kirtland Air Force Base

MAILING ADDRESS:

Col. Jack A. Martines, Director, Environmental Management Division
1606 ABW/EM
Kirtland Air Force Base, NM 87117-5000

LOCATION: East of Albuquerque, NM, West of Sandia Mountains

TELEPHONE: 846-2773

TYPE OF FACILITY: Department of Defense Air Force Base
DATE OF INSPECTION: August 27, 1990 - September 6, 1990

INSPECTION PARTICIPANTS:

NAME	AGENCY/COMPANY/POSITION	TELEPHONE
Bruce Swanton	NMEID/HWB	827-2898
John Gould	KAFB IRP Supervisor	846-2773
Richard Lopp	USGS	262-6641
Kim Ong	USGS	262-6636
Robert McBreen	Kim Ong Assistant, USGS	761-4615
John Miller	MITRE Corporation	(703) 883-6472
Ralph Wilcox	USGS - USGS Supervisor	262-6679
Bill Dam	USGS - USGS Proj. Manag.	262-6678
RK Dewese	USGS - Sampler	262-6639
Jim Hudson	USGS - Sampler	262-6642

TYPE OF EVALUATION: State CME lead

PREPARED BY: Bruce Swanton DATE: April 12, 1991

INSPECTION SUMMARY

GENERAL COMMENTS:

The well locations are suspect for each unit included in this report (Sewage Lagoons and the Golf Course Pond). There are not three downgradient wells at either location. The question to be resolved is: Are the well locations adequate for acceptance as an alternate groundwater monitoring system? Arguing for this proposition are the units in question. Both are surface impoundments which will act as large, generally homogeneous sources of any groundwater plume resulting from percolation water. It remains to be seen whether an application for alternate groundwater monitoring systems will be accepted by the HWB.

The sampling techniques observed were excellent. Great care was taken in equipment decontamination. All wells were purged beyond three well volumes and the stability parameter of electrical conductivity and pH were allowed to stabilize prior to sampling.

There were no class 1 violations.

DEFICIENCIES:

There were no significant deficiencies observed in the field practices. It was discovered that the USGS has failed to take four replicate samples for background data in its initial two quarterly monitoring events; however, KAFB has agreed to commit to an alternate parameters monitoring program to include one semi-annual event for VOC's and one annual event for Appendix IX. As KAFB has already sampled for the complete list of Appendix IX parameters, HWP will not issue an enforcement action for failure to obtain four replicate indicator parameter samples during establishment of background. Also, HWP's data from this CME has shown there to be no groundwater contamination.

CME TECHNICAL REPORT
INTRODUCTION

WASTE MANAGEMENT UNITS REQUIRING GROUNDWATER MONITORING

UNIT NAME: Sewage Lagoons
WASTE TYPE: Domestic Sewage, halogenated organics, heavy metals
SIZE: Two lagoons, each 6.35 acres, each about 6 feet deep, when in use. Have been dry approximately 2 years.
CONSTRUCTION: Native soil bottom, concrete sides.
STATUS (Active, non-active, closed): non-active, closure plans submitted
YEARS OF OPERATION: 1962-1987

UNIT NAME: Golf Course Main Pond
WASTE TYPE: As above, received waste from sewage lagoons system
SIZE: 2.61 acres.
CONSTRUCTION: Plastic lined.
STATUS (Active, non-active, closed): inactive
YEARS OF OPERATION: 1962 - 1987

Have any RCRA units at the facility been granted a groundwater monitoring waiver? NO

What was the date that the waiver was granted? N/A

Was the waiver granted for interim status, permitted status or both? N/A

If yes, then fill out a Groundwater Waiver Checklist for this unit and re-evaluate the appropriateness of the waiver.

Site: Kirtland Air Force Base

Inspector: Bruce Swanton

Date: October 3, 1990

EVALUATION OF FACILITY FIELD PROCEDURES & FACILITY LAB PROCEDURES

If appropriate: use "Y" = yes, "N" = no, "N/A" = not applicaable, "U" = unknown.

A. MEASUREMENT OF WELL DEPTHS/WATER ELEVATIONS

Y 1. Are measurements of both depth to standing water and depth to the bottom of the well made and recorded before purging unless the well has a dedicated, permanently installed pump that prevents total depth measurements?

N 2. Are all water elevations measured within a 24 hour period or less?

I spoke with Bill Dam, the project manager about this after doing the bailing at 05-02. He said they would alter their protocols to get all elevations of depth to water on the same day.

Y 3. Are all measurements calculated from the top of the well casing? (i.e., the water elevation and total depth are not measured from the bottom of the well)

Y 4. Are measurements for water elevations taken to the 0.01 feet?

Y 5. Are all total depth measurements recorded to the nearest 0.25 foot or less?

6. What devices are used?

Steel tape with a piece of rebar weldedto the end for total depth. Solinst electric tape for water level. 486.95 feet to water surface. 505.7 feet total depth.

Y 7. Is there a visibly marked surveyed reference point on the well casing rim which was established by a licensed surveyor?

Y 8. Is this reference point accurate to the 0.01 foot with

respect to sea level?

Y 9. Is the measuring equipment cleaned before and between well locations by washing with a non-phosphate detergent followed by a tap water rinse?

Y 10. If the well has evidenced organic contamination or inorganic contamination, are more stringent decontamination methods used such as a hexane rinse or a hydrochloric acid rinse, respectively?

steel cable, sounding tape are deconned w/ just alconox followed by deionized water steam. Bailers are additionally deconned w/ reagent grade hexane and methanol followed by deionized water.

N 11. If a plastic or polytetrafluoroethylene (PTFE) measuring tape is used, is the tape checked periodically, at least once a year, with a steel tape for calibration purposes?

Y 12. Does the owner/operator note in the field notebook whether there are there any nearby wells that could potentially impact the water elevation measurements?

Y 13. At sites with relatively flat gradients, are the water elevations measured several times to ensure an accurate measurements?

Rough estimate of gradient yields 4 foot drop over about 2000 feet of run = 0.002 feet/foot. They measure depth to water once.

B. DETECTION OF IMMISCIBLE LAYERS

N 1. Are procedures used which will detect heavy phase immiscible layers?

Y 2. Are procedures used which will detect light phase immiscible layers?

Visual inspection of the water surface using a clear teflon bailer.

N/A 3. Are procedures used to measure the thickness of the immiscible layers?

C. SAMPLING OF IMMISCIBLE LAYERS

N/A 1. Are the immiscible layers sampled separately prior to well evacuation?

N/A 2. Do the procedures used minimize mixing with water soluble

phases?

N/A 3. Describe how the immiscible samples are collected:

N/A 4. Are appropriate methods used to collect the immiscible samples?

D. WELL EVACUATION

Y 1. Are low yielding wells evacuated once to dryness?

Y 2. Are high yielding wells evacuated so that at least three casing volumes are removed?

Y 3. For high yielding wells, are measurements of pH, specific conductivity, and temperature obtained before, during and after purging in order to verify that these parameters have stabilized? (Stabilization indicates that well has been adequately purged.)

N/A 4. If **NO**, has documentation been provided that demonstrates that stabilization occurs at this well after a specific volume of water has been purged?

5. What device is used to evacuate the wells: PVC bailer, bottom fill.

N/A 6. During purging, was the discharge rate slower than the rate used during development?

Y 7. Was the purge rate slow enough to prevent recharging water rushing turbulently into the well?

Y 8. Was the purge water containerized until the groundwater analytical results whether the water is contaminated?

See 9, below.

Y 9. If the groundwater analyses evidence contamination, is the purge water treated on site in accordance with applicable and relevant regulations or disposed as hazardous waste?

Purge water is disposed of in the RCRA surface impoundment.

Y 10. If any problems are encountered (e.g. equipment malfunction) are they noted in a field logbook?

E. SAMPLE WITHDRAWAL

Y 1. Are samples withdrawn with either fluorocarbon/resins or

stainless steel sampling devices?

Y 2. Are sampling devices either bottom valve bailers or positive gas displacement bladder pumps?

Y 3. Are precautions used to ensure that all sampling equipment that could potentially come into contact with the sample is constructed of inert materials?

Y 4. Is an inert bailer cord used?

N/A 5. If a non-inert bailer cord is used, is it discarded between sampling points?

N/A 6. If bladder pumps are used, are they operated in a continuous manner to prevent aeration of the sample?

N/A 7. If bladder pumps are used, is a flow rate of 100ml/minute or less used to collect organic samples, metal samples, and any other samples which could be chemically unstable due to aeration and turbulence?

Y 8. If bailers are used, are they lowered slowly to prevent degassing of the water?

Bailer is lowered very rapidly, then stopped and lowered slowly prior to reaching the water surface.

Y 9. If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration?

Y 10. Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior in insertion into the well?

Y 11. If dedicated sampling equipment is not used, is all sampling equipment that could potentially come into contact with the sample, dissembled and thoroughly cleaned between samples?

12. If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps:

Y a. Nonphosphate detergent wash?

Y b. Tap water rinse?

N c. Dilute acid rinse HNO3 or HCL?

Y d. Distilled or deionized water rinse?

Y e. Air dry before use?

13. If samples are for organic analysis, does the cleaning procedure include the following sequential steps:

Y a. Nonphosphate detergent/hot water wash?

Y b. Tap water rinse?

Y c. Distilled/deionized water rinse?

N d. Acetone rinse?

Y e. Pesticide-grade hexane rinse?

F. IN-SITU OR FIELD ANALYSES

N 1. For low yielding wells, are official field measurements for pH, specific conductivity, and temperature obtained as soon as the well has recovered enough to yield water for a sample?

Low yielding wells are purged and sampled on successive days.

N 2. For high yielding wells, are official field measurements for pH, specific conductivity, and temperature obtained as soon as the unofficial field measurements have stabilized?

KAFB CONSIDERS ONLY THE SAMPLES RUN BY THEIR LABORATORY TO BE OFFICIAL SAMPLES

Y 3. Are the official field measurements for pH recorded to the 0.01 pH unit?

Y 4. Are the official field measurements for specific conductivity recorded to the nearest 10 umhos?

5. Indicate which of the following chemically unstable parameters are determined in the field:

X pH? X Temperature?

X Specific conductivity?

Redox potential? Chlorine?

Dissolved oxygen? Turbidity?

Other:

Y 6. If the sample is withdrawn from the well, is the parameter measured from a split portion?

N 7. Is monitoring equipment calibrated according to manufacturers' specifications?

Richard did not run the manufacturer's meter checkout procedure (slope, isopotential, etc.) HE SAID HE WOULD INCORPORATE THIS PROCEDURE INTO THE SOP.

N 8. Is the date, procedure, and maintenance for equipment calibration documented in the field logbook?

G. SPECIAL HANDLING CONSIDERATIONS

Y 1. Are organic samples handled without filtering?

N* 2. Is one equipment blank prepared each day of groundwater sampling?

***Procedure is for 10% of all samples to be equipment blanks. They will do one equipment blank in the current round of sampling which includes 8 RCRA wells.**

Y 3. Is one unfiltered sample taken for total metals?

H. SAMPLE LABELS

Y 1. Are sample labels used?

2. Do they provide the following information:

Y a. Sample identification number?

Y b. Name of collector?

Y c. Date and time of collection?

Y d. Place of collection?

Y e. Parameter(s) requested and preservatives used?

N 3. Do they remain legible even if wet?

*They want information from EID on waterproof labels.

N 4. Are sample seals placed on those containers to ensure samples are not altered?

N 5. If individual bottle seals are not used, is the container for holding the bottles sealed?

I. FIELD LOGBOOK

Y Is a field logbook maintained?

If yes, does it document the following:

N 1. Purpose of sampling (e.g., detection or assessment)?

Y 2. Location of well(s)?

Y 3. Total depth of each well?

Y 4. Static water level depth and measurement technique?

Y 5. Presence of immiscible layers and detection method?

N/A 6. If immiscible layers exist, collection method for immiscible layers?7

Y 7. Well purging procedures?

Y 8. Sample withdrawal procedure?

Y 9. Dates and times of collection?

Y* 10. Well sampling sequence?

***Chromium concentrtion in past samples is used as an "order of magnitude" decision device for sequence of sampling, but sequence will not be determined by difference if the difference is small.**

Y 11. Types of sample containers and sample identification number(s)

Y 12. Preservative(s) used?

Y 13. Field analysis data and method(s)?

N 14. typical well recharge rates?

J. CHAIN-OF-CUSTODY RECORD

Y 1. Is a chain-of-custody record included with each sample?

2. Does it document the following:

Y a. Sample number?

Y b. Signature of collector?

Y c. Date and time of collection?

Y d. Sample type?

Y e. Station location?

Y f. Number of containers?

Y g. Parameters requested?

Y h. Signatures of persons involved in chain-of-custody?

Y i. Inclusive dates of custody?

Field Sampling Notes

There are four wells at each unit (golf course pond and sewage lagoons). The SL lagoons are numbered 05 01 - 05 04. The GCP wells are 0602 (SE corner), 0608 (NW corner), 0609 (NE corner) and 0610 (SW corner).

8/27 Well bailing at KAFB 05-02. Uses a woven stainless steel cable. Have a clear teflon bottom fill bailer for immiscible layer detection. Use eye to judge if present or not. ???Check decon of cable. After first teflon bailerful did depth water.

Purge water from second bailer was very grey and carried a load of sediment.

Well 05-02 was purged to dryness on 8/27 after deconning the equipment w/ steam and alconox. Ralph Wilcox said the plan was to sample the well tomorrow morning. This avoids the necessity of re-deconning the equipment until after tomorrow's sampling.

8/28/90. Sampling at Well KAFB 05 02.

EID pH meter did not appear to check out properly. At the "sample" check the readout was 5.88, and could not be altered by resetting to read out 7.00. I checked the battery. OK. I calibrated aginst the 4 and 10 solutions and it seemed good.

Sampling begins at 9:00 w/ pH and EC samples.

VOA's furst a 9:10

Sulfide at 9:13

Total cyanide at 9:20

8150's at 9:26 and 9:33

8270's at 9:39 and 9:45

metals at 10:oo

turbidity at 10:10

Well 05-01. 8/28/90
Finished purging (to dryness) at 2:11 pm

First samples for pH and EC at 3:15. Problems with the meter. One half hour after calibration at 10 and 4, reading the 10 got 9.54 and read the groundwater here at 6.35. Recalled, final results:

pH meter temp: 24.2C
EC meter temp: 26.8C

pH: 7.69
EC: 630 umhos/cm2

VOC:	3:15
8270's:	3:30 and 4:05
8240's:	4:10 and 4:16
Total sulfide:	4:22
Total CN:	4:40
Total metals:	4:45

8/29/90

Well 05 04 was purged this morning. Purging was to dryness, took about two hours.

Well 06 09. Began purging at 1:32. I put sample containers on ice and labelled them in preparation for a sampling this afternoon.

Completed purging 3 well volumes at 3:21.

Solution temp was 23.9

pH: 7.85

EC: 328

VOC'S:	3:30
TOTAL SULFIDE:	3:30
CYANIDE:	3:48

METHOD 8150S: 3:54, 4:00
METHOD 8270S: 4:04, 4:14
TURBIDY: 4:26
METALS: 4:30

Bob McBreen discovered that not exposing the fill hole by sliding down the tygon tubing ring caused the pH meter reading to drift downward and gave false results. Was reading 7.39 prior to discovering this. Read 7.85 after adjusting the tubing position so that the fill hole was exposed.

August 30, 1990.

Well 05-04.

Equipment decontamination took one hour. Began sampling at 8:45.

Water temp: 21.0 C
pH: 8.15
EC: 272

VOCS: 8:45
TOTAL CYANIDE: 9:12
TOTAL SULFIDE: 9:06
METHOD 8150S: 9:15, 9:43
METHOD 8270'S: 9:47,9:50
METALS: 9:55
TURBIDITY: 10:00AM

WELL 05 03

Water temp: 20.6C
pH 7.86
EC: 565

VOCS: 4:00
SULFIDE: 4:00
CYANIDE: 4:10
METHOD 8150: 4:14, 4:17
METHOD 8270: 4:20, 4:25
TURBIDITY: 4:30
METALS: 4:30

September 4, 1990

Labelled 3rd and 4th Golf Course Pond wells as 06-01 and 06-02. These are duplicates for the northwest gcp well.

8:00 am. Standardized our pH meter using 4 & 10 buffers. The 7 buffer reads exactly 7.00.

9:22 am. Recalibrated pH meter. 4.00 reads 4.04 and 7 buffer reads 9.88 prior to recal. Took 2 liters from the PVC bailer:

WELL 06-08 (EID labelled 06-01 and 06-02)
EID Readings:

Water temperature	20.1C
pH	8.42
EC	575

KAFB Readings:

water temperature	19.4C
pH	8.54
EC	736

Parameter	06-01 & 06-02 Actual Sample Times	Time on 06-01 Label
VOLATILES	8:04 am	12:30 pm
SULFIDES	8:24, 8:24	12:34
8270	8:30/:35, 8:49/:52	12:40/:45
8150	8:56/9:01, 8:41/:45	12:56/1:01
CYANIDES	9:08, 9:08	1:15
TURBIDITY	9:12, 9:12	1:20
METALS	9:18, 9:18	1:30

9/5/90

Observed steam decontamination procedures after well 06-08. The steam line was running only about 120°. After Mr. Dewese adjusted to temperature to maximum the reading rose to 200°.

Sequence of decontamination for all equipment which contacts groundwater:

Steam, deionized water, methanol, hexane without a final deionized water rinse.

September 5, 1990

Well 06-02

I labelled this well as 06-03 as had already used 06-02 as the duplicate for 06-08.

KAFB/USGS crew had been purging this well since this morning. It is an extremely deep well (about 450 feet) with over 100 feet of standing water. Over one well casing had been purged when I arrived at the well site. I looked at KAFB's periodic recordings

of pH, temp and EC; these parameters seemed already to have stabilized.

I calibrated the EID pH meter at 2:20. By 2:52 the 4.00 buffer read 3.99, the 10.00 buffer read 10.00.

3:00

Water temp	21.6C
pH	7.52
EC	550

3:30 pH meter check: 4.00 reads 3.98, 10.00 reads 10.00

3:30

	EID	KAFB
Water temp	21.5C	22C
pH	7.57	7.59
EC	530	630

KAFB's EC meter still reading higher than EID's

Site: Kirtland Air Force Base

Inspector: Bruce Swanton

Date: August 27-September 6, 1990

Use "Y" = yes, "N" = no, "N/A" = not applicable, "U" = unknown.

This checklist was filled out in the office of Ralph Wilcox of the USGS. John Gould, the KAFB Installation Restoration Program supervisor was present.

I mentioned the problems with coordination of effort between KAFB/GS/EID and suggested we coordinate better in future.

MONITORING WELLS - FACILITY PROVIDED INFORMATION

These questions should be answered for each different well design and construction present at the facility. Wells designed or constructed using the same procedures may be grouped.

1. Drilling Methods:

   a. What drilling method was used for the well? Check which method was used.

      (1) Hollow-stem auger

      (2) Solid-stem auger

      X (3) Mud rotary

      (4) Air rotary

      (5) Reverse rotary

      (6) Cable tool

      (7) Jetting

      (8) Air drill w/casing hammer

      (9) Other (explain)

   b. Were any cutting fluids (including water) or additives used during drilling? If **YES**, specify.

      No. No additives. Just potable base water and the natural bentonite mud. No polymers.

      (1) Type of drilling fluid (e.g., type of foam, Wyoming

pure sodium bentonite, etc.):

(2) Source of water used: Base potable water.

Y c. Was the drilling equipment steam-cleaned prior to drilling the well?

All drilling equipment was steam cleaned between sites. Used a Landa hot water/high pressure washer. Possibly 180 F.

If other cleaning methods were used, please describe:

N/A d. Was compressed air used during drilling?

N/A e. If **YES**, was the air filtered to remove oil?

f. How were core samples obtained? Check sample collection method used.

split spoon core drilling

shelby tube other:

Cores were not taken during drilling. Prior to drilling an augar rig was used at each site to take soil samples at 5, 20, 50 and 100 feet using a split barrel.

g. Were the following analytical tests performed on the core samples or cuttings? Check which tests were performed.

Y Gross description of moisture content (e.g., moist, wet, saturated, etc.)

N Mineralogy (e.g. microscopic tests and x-ray diffraction)

N Petrographic analysis

N degree of sorting, size fraction (i.e. sieving), texture

N degree of crystalinity and cementation of matrixal variations

Y rock type(s) (e.g., limestone, granite, etc.)

Y soil type (sandy loam, sandy clay, etc.)

Soil texture determined by visual inspection. One geologiest did the elasticity measurements by hand for percent clay.

N approximate bulk geochemistry (e.g., 5% feldspar, 80% limestone, etc.)

N/A existence of microstructures that may effect or indicate fluid flow

Soil was unconsolidated to the depth drilled. Wilcox said the entire depth of all wells drilled was in the unconsolidated, Santa Fe formation.

N Falling head tests

N Static head tests

N Settling measurements

N Centrifuge tests

N Column drawings

Y Analyses for contaminants. If contaminants were identified, please list:

Data is not yet available for the 5,20, 50 and 100 foot cores. The cores were lab evaluated for: Forms of nitrogen, metals, volatiles, and EP-tox constituents.

Y h. Were the sample corings logged by a qualified professional in geology?

j. Does the lithology log (driller's log) include the following information:

Y (1) Hole name/number?

Y (2) Date started and finished?

Y (3) Driller's name?

Y (4) Hole location (i.e. map and elevation)?

Y (5) Drill rig type and bit/auger size?

Y (6) Gross petrography (e.g. rock type) of each geologic unit?

N (7) Gross mineralogy of each geologic unit?

N (8) Gross structural interpretation of each geologic unit and structural features (e.g.

fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material)?

N (9) Development of soil zones and vertical extent and description of soil type?

N (10) Depth of water bearing unit(s) and vertical extent of each?

Due to mud rotary techniques, it was not possible to determine the point at which the water table was reached.

N (11) Depth and reason for termination of borehole?

***Boreholes were terminated at 50 feet below the anticipated water table depth.**

N (12) Depth that water was encountered in hole?

N (13) Depth and location of any contaminant encountered in borehole?

The augar holes were FID evaluated for contaminants in a two foot length of every five feet of core. This data will not be in the data report due on Oct 31, but will be in USGS's final technical report to KAFB (due maybe in June of 91).

N/A (14) Sample location/number?

Yes, for the augar holes.

N/A (15) Percent sample recovery?

Yes, for the augar holes.

N (16) Narrative descriptions of geologic observations?

N (17) Narrative descriptions of drilling observations?

This information was noted in the field logbook, not the drill log.

2. Monitoring Well Construction Materials

a. Identify well construction materials (by number) and diameters (ID/OD)

(1) Primary Casing:

material: above sat zone, PVC (don't know if NSF), below the sat zone, Temco 304 stainlesss steel with schedule 80 ends.

diameter: 4 inch. The internal diameter of the PVC is about 3.75", the internal diameter of the stainless steel is greater than 4"

(2) Screen

The wells have 10 feet of stainless steel tailpipe, 20 feet of screen and 20 feet of stainless steel casing above the screen. All is the Temco schedule 80 material.

(3) Centralizers

material: Stainless steel of an unknown type

U b. If PVC materials were used, did they bear the National Sanitation Foundation logo for potable water applications (NSF-pw) or American Society of Testing Materials (ASTM)?

Y c. Were inert materials used below and including the static water level within the well?

d. How are the sections of casing and screen connected? Check type of connection.

Y Pipe sections threaded

PVC/PVC connections were all threaded with a teflon o ring seal.
Stainless steel/stainless steel connections were all flush joint threaded without the o ring.

N Couplings (friction) with adhesive or solvent

N Couplings (friction) with retainer screws

Other (specify)

Y e. Were the materials steam-cleaned prior to installation?

Actually used an alconox wash with an approximately 180 F hot water rinse.

f. Well Intake Design and Well Development

Y (1) Was a well intake screen installed?

Y (2) Was the screen manufactured?

(3) Provide the slot size:
Wire wrap to 0.020 inch

g. If well construction logs were provided, do they

This section is N/A as well construction logs will be provided by agreement between EID and KAFB on or before October 31, 1990 in a report.

N/A 1. depict the dimensions, locations, elevations and depths of the screen, casing, sump, bentonite seal, bentonite-cement seals and other annular seals, filter pack, centralizers?

N/A 2. specify materials of construction (casing, screen, sump, centralizers)?

N/A 3. specify the screen slot size?

N/A 4. specify the total depth of the well?

N/A 5. specify the filter pack grain size?

N/A 6. specify the mineralogy of the filter pack (e.g., 96% silica, 4% feldspar)?

N/A 7. specify the surveyed elevation of the top of casing?

Y h. Was a tailpipe or sump installed?

(1) How far does the sump extend below the screen? **10 feet**

Y (2) Was the sump capped with an inert bottom?

If **NO**, explain:

Y i. Was a filter pack installed? If so:

(1) Specify which wells have an artificial filter pack:
All RCRA wells.

Y (2) Does the filter pack consist of inert, siliceous granular material?

(3) How was the filter pack installed?
Tremie pipe
(4) What is the particle size range: **10/20**

i. Well development

Y (1) Was the well developed?

(2) Check which method was used:)

surge block **X** bailer **X** air (**air lift**)

surging water pumping

other:

(3) What were the turbidity readings? (Please indicate well number)

No readings taken after development

Y j. Was only an additive free bentonite slurry used as a sealant within the saturated zone

3. Surface protection of the well.

Y a. Is the surficial expression of the well above grade?

All wells will have concrete pads of 4 x 4 foot dimensions. Some wells do not have this pad yet but will within two weeks.

All wells will have bumper guards within two weeks. Some do not yet have these.

N b. Is the surficial expression of the well below grade?

If **YES**, please describe surface configuration of the well.

Y c. Is the upper portion of the borehole sealed with a concrete cap to divert drainage away from the casing?

Y d. Are the dimensions of the concrete cap at least 3 feet by 3 feet by 4 inches thick?

See 3a, above.

Y e. If motor vehicles can approach the well, is the well fitted with an above-ground protective device and bumper guards?

See 3a, above.

Y f. Has the protective cover been installed with locks to prevent tampering?

N 4. Have any facility wells been abandoned or plugged? If yes,

Only one well, 05-01 (SE corner of the sewage lagoon) was plugged, and this unintentionally by cement penetrating to and through the screen. On the following day it was found that the cement had solidified up to 200 feet from the surface. This well was backfilled with native soil cuttings.

a. Was only an additive free bentonite slurry used as a plug within the saturated zone? **See above**

If **NO**, specify what type of material was used as the additive.

b. How thick was this plug: N/A

N/A c. Was a different plug used in the unsaturated zone? If yes,

(1) If yes, did the plug consist of a bentonite-cement slurry?

(2) If bentonite-cement was not used, specify the materials used (grit and type):

(3) Was the plug emplaced as a slurry in a continuous process to the surface using a tremie pipe?

N/A d. Were the plugs appropriate for the site conditions and ensure an adequate seal and do not adversely affect groundwater chemistry? (E.g., cement was not used in the saturated zone, backfill was not used, bentonite grout was used in the saturated zone, etc)

N e. Was the casing removed before the wells were plugged?

If **NO**, describe how the screen and filter pack were plugged:

See 3.a., above

COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

OFFICE DOCUMENT REVIEW

KIRTLAND AIR FORCE BASE EVALUATION 8/27-9/6/90

4/5/91

List the names and dates of all documents which were reviewed for the office portion of the CME review:

For each question, respond with "Y" for yes, "N" for no, "N/A" for not applicable, and "U" for unknown.

EVALUATION OF THE OWNER/OPERATOR'S HYDROGEOLOGIC CHARACTERIZATION

A. Regional and Facility Maps

N 1. Did the owner/operator obtain a regional map of the area and delineate the facility? If yes, attach a copy to this report.

If YES, does this map illustrate:

N/A a. Surficial geologic features?

N/A b. Streams, rivers, lakes or wetlands near the facility?

N/A c. Discharging or recharging wells near the facility?

Y 2. Did the owner/operator prepare a facility site map? If yes, attach a copy to this report.

KAFB DID NOT PROVIDE ONE MAP WITH THESE DATA, BUT SEVERAL. THE BASE WIDE GENERAL MAP INCLUDES THE DRAINAGES, ETC., WHILE THE SITE SPECIFIC MAP (ATTACHED NEXT PAGE) INCLUDES THE RCRA UNIT DATA.

If YES, does the site map show:

Y a. Regulated units of the facility (e.g. landfill areas, impoundments)?

Y b. Any seeps, springs, streams, ponds, or wetlands?

c. Location of:

Y active monitoring wells?

N/A decommissioned monitor or production wells?

Figure 3-1

Borehole Location Map - Sewage Lagoons

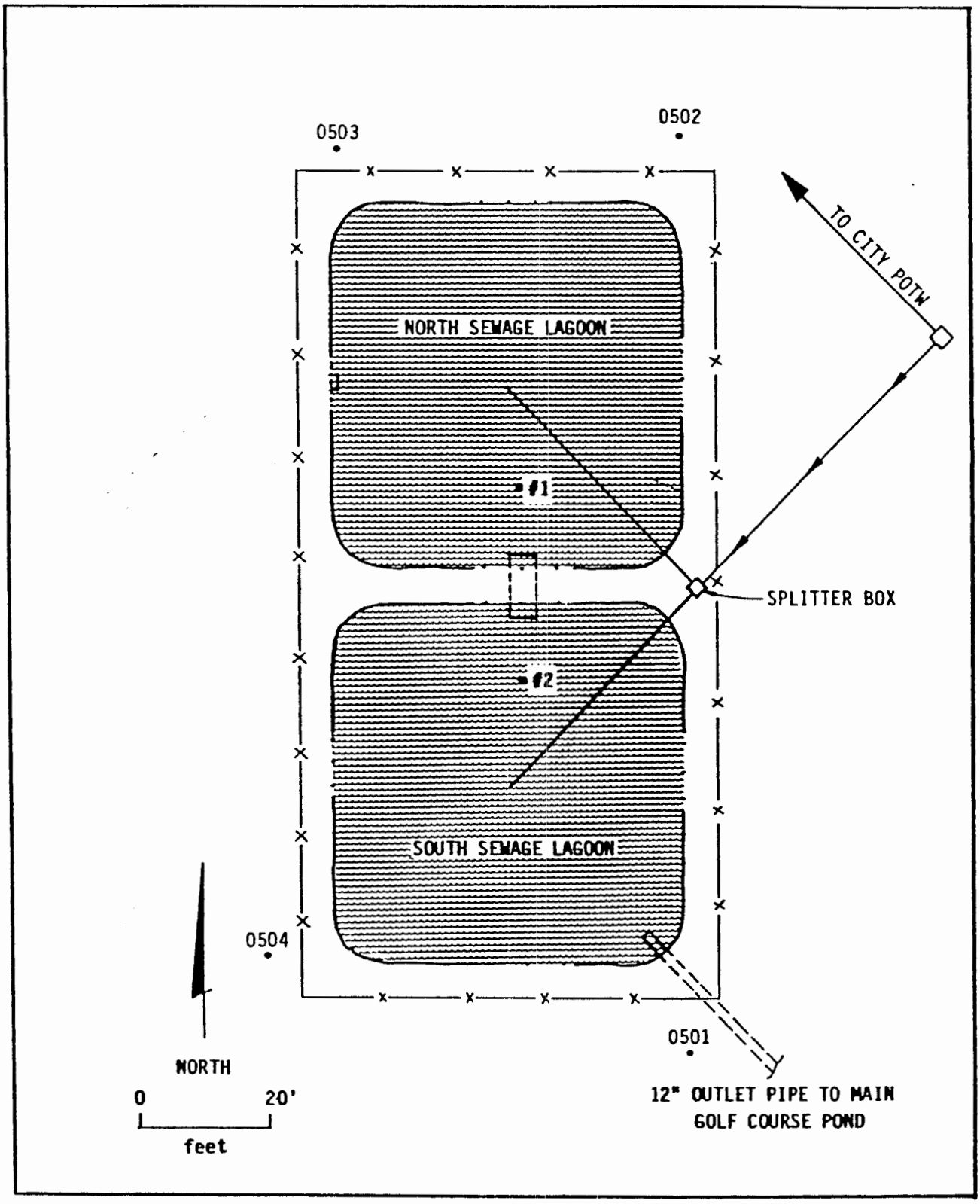
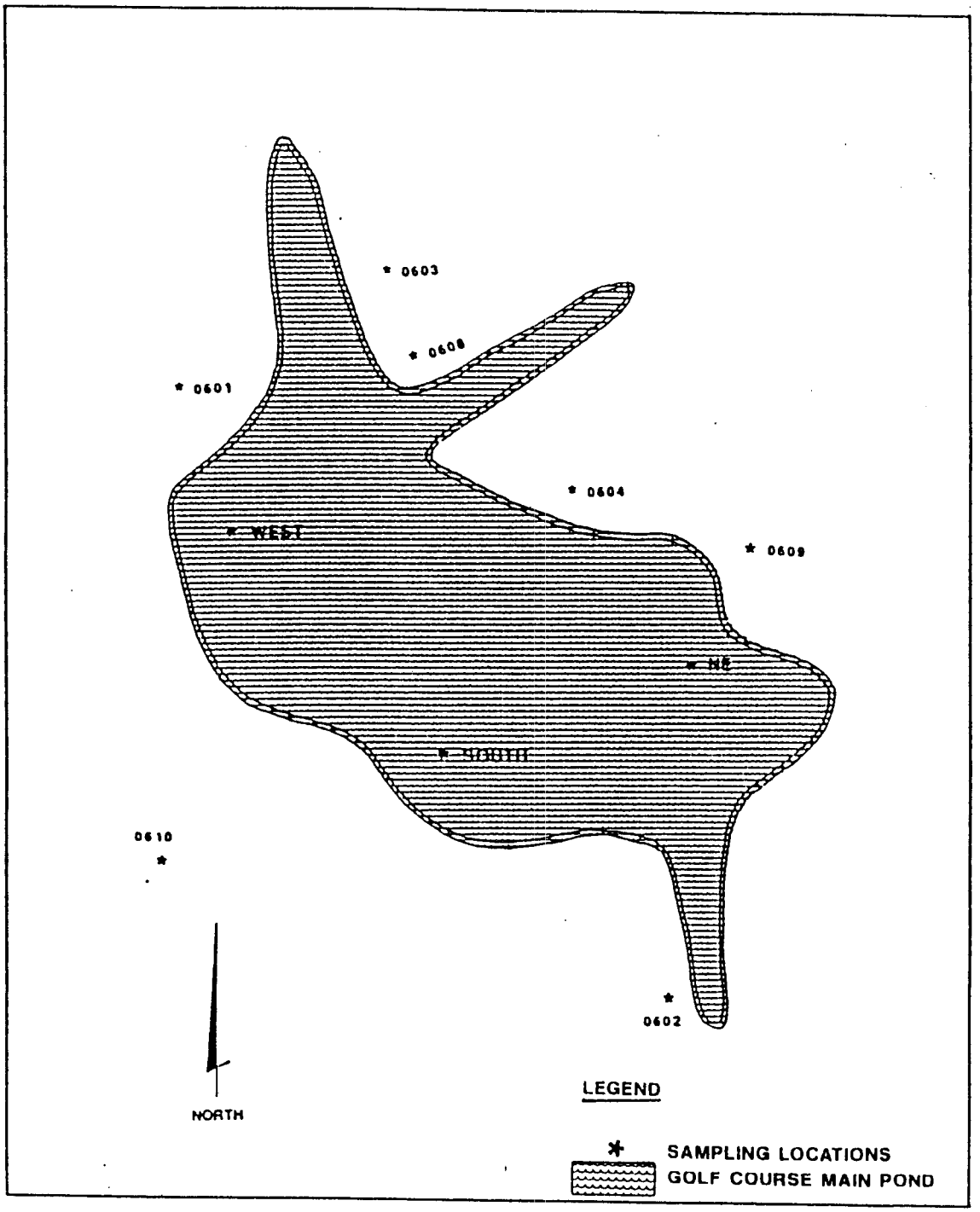


Figure 5-1

Sample Location Map – Golf Course Main Pond



Y soil borings? **SEE UNIT CLOSURE PLANS FOR SEWAGE LAGOONS (FIGURE 3-1) AND GOLF COURSE POND, (FIGURE 5-1). NOTE THAT FOR GOLF COURSE POND, BOREHOLES 0610, 0602, 0609 AND 0608 WERE FINISHED AS MONITORING WELLS, AND THAT BOREHOLES 0601, 0603 AND 0604 WERE FINISHED AS LOGGED 100 FOOT BOREHOLES. FOR SEWAGE LAGOONS, ALL BOREHOLES WERE LOGGED TO 100 FEET AND FINISHED AS MONITORING WELLS (0503, 0502, 0504, AND 0501).**

N test pits?

N d. Ownership of adjacent land?

B. Soil boring/test pit program

Was a separate soil boring/test pit program conducted independently of the installation of monitor wells?

If yes, **the following responses pertain only to borings made in this program, not to borings made during installation of RCRA monitoring wells**:

Y 1. Were the soil borings/test pits performed under the supervision of a qualified professional? (professional geologist, soil scientist or geotechnical engineer)

N 2. Did the owner/operator provide documentation for selecting the spacing for borings?

N 3. Did the soil borings encounter any saturated zones above the presumed groundwater elevation or potentiometric surface?

4. Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock? If so, which ones:

SEE 2c, IMMEDIATELY ABOVE. WELLS COMPLETED AS MONITORING WELLS WERE DRILLED TO BELOW THE UPPERMOST SATURATED ZONE.

5. What drilling method(s) were used for the boreholes?

FIRST 100 FEET WITH HOLLOW STEM AUGAR, THEN TO WELL-COMPLETION DEPTH WITH MUD ROTARY.

6. Were the cuttings or cores analyzed to determine the presence of any hazardous constituents? If yes,

List the analyses performed:

APPENDIX IX RUN ON SAMPLES FROM 5, 20, 50 AND 100 FEET IN ALL BOREHOLES.

List the contaminants identified and the depths at which they occurred:
NO CONTAMINANTS IDENTIFIED ABOVE BACKGROUND.

Y 7. Were the drilling methods appropriate for the collection of adequate data?

N 8. Is there a significant possibility that the drilling could have provided communication between flow zones or aquifers?

Y 9. Were an adequate number of borings drilled to generally characterize the subsurface geology of the vadose zone and uppermost aquifer?

10. How many borings were drilled? **8**

Y 11. Were the cores or cuttings logged by a qualified professional in geology?

Y 12. Were the borings plugged?

Y 13. Were the plugs appropriate for the site conditions and ensure an adequate seal and do not adversely affect groundwater chemistry? (e.g., cement was not used in the saturated zone, backfill was not used, bentonite grout was used in the saturated zone, etc)

BACKFILL WAS USED, AS THERE IS NOT CONFINED ZONE AND NO GROUNDWATER OR SOIL CONTAMINANTS DETECTED ABOVE BACKGROUND.

C. <u>Site hydrogeological characterization</u>

Note: Drilling and well logging in this section refer to the installation of RCRA monitoring wells only.

Y 1. Did the owner/operator document the procedure for establishing the potentiometric surface?

Y 2. Are the static water level measurements valid, i.e.:

Y a. Are all elevation measurements made within a 24-hr period?

Y b. Are all elevations measured to the 0.01 foot?

Y 3. Has the owner/operator included potentiometric contour

maps? If yes,

Y a. Has the office evaluation confirmed that the potentiometric contours appear to be reasonable based on topography and presented data?

Y b. Do the maps include dates of measurement with the elevations?

Y c. Are the depicted elevations concurrent for all wells?

N 4. Have the horizontal and vertical components of groundwater flow been adequately characterized?

THE HORIZONTAL COMPONENT HAS BEEN ADEQUATELY CHARACTERIZED. NMED HAS NOT REQUIRED A VERTICAL COMPONENT CHARACTERIZATION DUE TO LACK OF CONTAMINATION OF THE UPPERMOST AQUIFER WITH HAZARDOUS CONSTITUENTS.

U 5. Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone?

6. How many wells were used to determine the vertical flow component? 0

N/A 7. If vertical gradients are suspected, has the office review concluded that flow nets should be constructed?

N/A 8. If yes, did the owner/operator develop flow nets?

If yes, do the owner/operator's flow nets include:

N/A (1) monitor well or piezometer locations?

N/A (2) depth of screens?

N/A (3) length of screens?

N/A (4) concurrent measurements of water levels from all wells and piezometers?

N/A (5) equipotential lines?

N/A (6) flow lines?

N 9. Do water level fluctuations alter the general groundwater gradients and flow directions?

N 10. If yes, did the owner/operator adequately consider the seasonal and temporal effects on the groundwater?

N 11. Did the owner/operator implement means for gauging long term effects on water movement that may result from on-site or off-site construction or changes in land use patterns?

N/A 12. Is the owner/operator's slug or pump test data consistent with existing geologic information (e.g. boring logs)?

NMED HAS NOT REQUIRED AQUIFER TESTING DUE TO LACK OF HAZARDOUS CONSTITUENTS IN THE GROUNDWATER AT THE POINT OF COMPLIANCE.

N/A 13. Were the aquifer test procedures, equations, assumptions, raw data, and all calculations of hydraulic conductivity, etc. fully described?

N/A 14. Was the hydraulic conductivity determined adequately using appropriate tests?

N 15. Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined?

THE AQUIFER UPPER SURFACE ELEVATION IS AT ABOUT 400 FEET BELOW SURFACE LEVEL. IT IS ASSUMED THIS IS THE UPPER SURFACE OF AN EXTREMELY DEEP BOLSON TYPE AQUIFER.

N 16. Is a confining unit present? If yes,

N/A 17. Does the confining layer appear to be laterally continuous across the entire site?

N/A 18. If yes, what data supports this continuity?

U 19. What is the hydraulic conductivity of the confining unit (if available)?

N/A 20. Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units?

Y 21. Is the uppermost aquifer hydraulically connected with deeper aquifers?

If yes, what data supports this interrconnection:

SEE RESPONSE TO C.15, ABOVE.

22. Describe the following:

Site stratigraphy: **INTERBEDDED SANDS, SILTS AND CLAYS TYPICAL OF ALLUVIAL FAN**

Uppermost aquifer: **AT APPROXIMATELY 400 FEET, UNCONFINED, IN SANTA FE FORMATION, EXTREMELY DEEP, GLACIAL MELT WATER**

Saturated thickness: **AS ABOVE**

Confined/unconfined: **AS ABOVE**

Horizontal gradient: 0.002 FT/FT

Seepage Velocity (facility and evaluator calculated): **UNKNOWN - NMED HAS NOT REQUIRED KAFB TO DETERMINE AS THERE IS NO EVIDENCE OF CONTAMINATION**

Vertical Gradient: **UNKNOWN - AS THERE IS NO SITE CONTAMINATION, NMED HAS NOT REQUIRED KAFB TO DETERMINE**

Y 23. Has the owner/operator adequately identified the uppermost aquifer?

Y 24. Were formation samples collected initially during drilling?

N 25. Were continuous sample corings taken?

N/A If YES, at what intervals:

Y 26. Were non-continuous sample corings taken?

If YES, at what intervals: **5, 20, 50 AND 100 FEET**

Y 27. Were cuttings collected and analyzed?

If YES, at what intervals? **AS ABOVE**

Y 28. Were the sample corings logged by a qualified professional in geology?

29. What drilling methods were used for each monitor well?

FIRST 100 FEET, HOLLOW STEM AUGAR, MUD ROTARY THEREAFTER

Y 30. Were drilling methods used that prevented communication between flow zones or aquifers during drilling and construction operations?

31. Specify the diameter of the borehole **10 INCHES**

Y 32. Have sufficient data been collected to adequately define the geology of the subsurface?

33. Regional Geology: Formation **SANTA FE FORMATION**

Lithology **INTERBEDDED ALLUVIAL SEDIMENTS**

Regional Gradient **WITHOUT PRODUCTION WELL INFLUENCE, WOULD BE A SE GRADIENT.**

Site Geology: Formation **SANTA FE FORMATION**

Lithology **INTERBEDDED ALLUVIAL SEDIMENTS**

Local Gradient **PRODUCTION WELLS TO THE NORTHEAST RESULT IN A NNE GRADENT**

N 34. Has the office evaluation confirmed that geologic cross sections of the site are necessary for an adequate characterization of this site? If yes:

N 35. Has the owner/operator supplied cross sections? If yes:

N/A 36. Do the cross sections lead to any significant conclusions? If so, explain:

D. Office evaluation of groundwater monitoring system

(These questions should be answered for each different RCRA well design present at the facility. If the system consists of more than one well design, list the well numbers to which each response applies.)

Y 1. Did the owner/operator provide as-built construction schematic for each well?

If yes, include a copy of each here. Do the as-built schematics include the following information:

SCHEMATICS DO NOT INCLUDE ELEVATIONS, BUT DO INCLUDE DEPTHS BELOW SURFACE. WELL DATA IS FROM "INSTALLATION RESTORATION PROGRAM - STAGE 2 - INTERIM TECHNICAL INFORMATION REPORT, SEPTEMBER 1990. ELEVATION OF TOP OF CASING IS GIVEN IN DRILLING LOGS, PAGES G-1538-1548. ELEVATIONS OF LAND SURFACE TO NEAREST FOOT GIVEN IN 100 FOOT BORING LOGS PAGES G-1515 - 1537.

WELL DETAILS GIVEN IN DEPTHS BELOW SURFACE. SEE NEXT 8 PAGES FOR WELL DETAILS. NOTE I HAVE INDICATED THE WATER LEVEL ON EACH DIAGRAM BY 1) SUBTRACTING WATER ELEVATIONS FROM TOP OF CASING ELEVATIONS AS INDICATED ON THE REFERENCED BORING LOGS, 2) ESTIMATED 3 FEET FOR STICKUP HEIGHT 3) SUBTRACTED 3 FEET FROM DIFFERENCE IN NUMBER 1 FOR TOTAL DEPTH BELOW SURFACE OF THE SATURATED ZONE.

Y 2. Has the facility been granted an alternate groundwater monitoring program, a partial or a full groundwater monitoring waiver? If any are "yes", explain:

KAFB HAS BEEN GRANTED AN ALTERNATE GROUNDWATER MONITORING SYSTEM FOR BOTH THE GOLF COURSE POND AND SEWAGE LAGOON SYSTEMS BASED ON THE FOLLOWING RATIONALE:

A. THE SEWAGE LAGOONS HAVE MONITORING WELLS AT EACH OF THE FOUR CORNERS OF THE WASTE MANAGEMENT UNIT. THE TWO NORTHERNMOST WELLS ARE DOWNGRADIENT WELLS AND CONSTITUTE THE ONLY DOWNGRADIENT WELLS IN THIS RCRA MONITORING SYSTEM. SINCE THESE WELLS ARE DOWNGRADIENT OF THE UPPERMOST (MOST CONTAMINATED) LAGOON, AND SINCE THE SURFACE IMPOUNDMENT PROVIDES A GENERALLY HOMOGENEOUS AND HORIZONTALLY WIDE POTENTIAL CONTAMINANT SOURCE, IT WAS CONCLUDED THAT THESE WELLS WOULD IMMEDIATELY DETECT ANY RELEASE FROM THE UNIT.

B. THE BOREHOLES ANALYZED AT 5, 20, 50 AND 100 FEET WERE ALL FREE OF CONTAMINANTS ABOVE BACKGROUND LEVELS.

C. THE SOIL SAMPLES TAKEN BELOW THE SLUDGE LAYER (FIGURE 5-1, SEWAGE LAGOON CLOSURE PLAN) WERE ALL FREE OF APPENDIX IX HAZARDOUS CONSTITUENTS.

D. THE GOLF COURSE

3. What length screen has the owner/operator employed in the background monitoring well(s)? (Please include well number.)

SEWAGE LAGOONS: 0504 (20), 0501(20)
GOLF COURSE POND: 0610 (20), 0602(20)

4. What length screen has the owner/operator employed in the downgradient monitoring wells? (Please include well numbers) **ALL ARE 20 FOOT SCREENS**

N 5. Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster?