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REVISED GROUNDWATER EVALUATION REPORT FOR RICHARDS GEBAUR AIR FORCE BASE KANSAS CITY MO

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U.S. ENVIRONMENTAL PROTECTION AGENCY

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY

REGIONS VI, VII, AND VIII

GROUNDWATER EVALUATION REPORT (REVISED)
RICHARDS-GEBAUR AIR FORCE BASE
KANSAS CITY, MISSOURI

EPA CONTRACT NO. 68-W8-0122
EPA WORK ASSIGNMENT NO. 66-74ZZ
EPA REGION VII

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OCTOBER 1995

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GROUNDWATER EVALUATION REPORT (REVISED)
RICHARDS-GEBAUR AIR FORCE BASE
KANSAS CITY, MISSOURI

OCTOBER 1995

1.0 INTRODUCTION

Jacobs Engineering Group Inc. (Jacobs) was tasked by the U.S. Environmental Protection Agency (EPA) to provide technical support for evaluation of the groundwater environment at the Richards-Gebaur Air Force Base (RGAFB), located in Jackson County, Missouri (Figure 1). These support activities were conducted for the EPA through the Alternative Remedial Contracting Strategy (ARCS) Program, Contract No. 68-W8-0122, Work Assignment No. 66-74ZZ.

The Base Realignment and Closure (BRAC) Cleanup Team for the RGAFB is a group composed of personnel from the Department of Defense (DoD), the Missouri Department of Natural Resources (MDNR), and the EPA. The BRAC Cleanup Team, through the BRAC Cleanup Plan (BCP) Report, has set forth a strategy for environmental cleanup at RGAFB. The recommendations in the BCP Report were considered by Jacobs when developing suggestions for additional groundwater characterization at areas of concern at the site.

This report represents a revision of the original Groundwater Evaluation Report prepared by Jacobs and submitted in May 1995. The revision has been performed in response to technical review comments generated by representatives of the Air Force (OL Q, AFBCA) and the U.S. Army Corps of Engineers (USACE) This document contains a summary of historical groundwater analytical data at RGAFB It also provides a summary of potential contamination at major areas of concern at the base, discusses the adequacy of the groundwater monitoring well network, and provides suggestions for actions concerning potential data gaps at the site Additional characterization at potentially contaminated areas at RGAFB which did not have any soil or groundwater data available were not included in this report. The Jacobs recommendations are designed to assure adequate characterization of the nature and extent of groundwater contamination; however, there was no attempt to assess likely future exposure scenarios within the context of this evaluation of groundwater at the site Future land use at the potentially contaminated areas and of the overall base should be considered prior to performing any of the additional characterization suggested in this report

2.0 SITE BACKGROUND

The RGAFB site was originally constructed as an auxiliary airport by the City of Kansas City in 1941 The Aerospace Defense Command leased the airport in 1952, and the property was transferred to the United States Government in 195? Throughout its operational history, the site has been under the control of various branches of the Air Force Beginning in 1979, control of many of the airport functions was transferred back to the City of Kansas City and a civilian contractor. Currently, most of the real property has been leased or sold

Primary operational activities throughout the history of the site have consisted of maintaining aircraft and ground support equipment Materials associated with these activities include petroleum-based fuels and lubricants, and various cleaners, solvents, and degreasers Wastes generated at the site have been disposed at two on-site landfills and through the services of off-site contractors

3.0 SITE DESCRIPTION

3.1 Physiography

The site is located in the Osage Plains of the central lowlands physiographic province The land surface elevation at RGAFB varies from 1,110 feet above mean sea level (msl) in the south to approximately 960 feet msl in the northwest. The major part of the RGAFB is situated on the crest of the King Dome, a geologic structure with over 40 feet of relief. The regional dip of the bedrock underlying the site is north-northeast at about 10 feet per mile toward the structural axis of the Forest City Basin in northwestern Missouri. The bedrock strata form hills and valleys in the vicinity of the site due to the many subtle bedrock anticline, syncline, dome, and basin structures in the area.

3.2 Geology

The following discussion of geology at the site is a compilation of descriptions provided in both site-specific documentation and regional geologic studies and technical papers In instances where all members of a given formation are not described below, reference to the individual members was not noted in site-specific documentation.

The uppermost bedrock unit underlying RGAFB is the Kansas City Group of the Pennsylvanian System Listed in descending order, the formations are: Wyandotte, Lane, Iola, Chanute, Drum, and Cherryvale (Table 1). No borings for monitoring wells have been drilled to a depth that penetrates all of the aforementioned formations at the site. The following information describes the bedrock stratigraphy underlying RGAFB

3.2.1 Wyandotte Formation

The Wyandotte Formation is locally approximately 40 feet thick The Argentine Limestone Member, which lies in the lower half of the Wyandotte Formation, forms topographic highs on the site where the runways, chapel, and former Air Force Communications Command Headquarters are located. The Argentine, which is the uppermost member of the Wyandotte Formation found at the site, is more than 30 feet thick It is a light gray limestone that weathers to a characteristic orange-brown. Chert is found in lenses and nodules throughout most of the unit and is white to bluish-gray, weathering to a reddish-brown. At the site, the upper part of the Argentine has been weathered to a silty clay residuum that covers the hilltops and the slopes. Two joint sets at nearly right angles to one another have formed in the Argentine Several solution-widened joints are present within the Argentine. Therefore, the Argentine Limestone is a potential water-bearing unit at the site Typically, underlying the Argentine Member in the Wyandotte Formation are the Quindaro Member (a calcareous shale about three feet thick) and the Frisbie Member (a single bed of gray limestone, also about three feet thick)

3.2.2 Lane Formation

The Lane Formation is 25 to 40 feet thick and consists predominately of soft bluish-gray shale that weathers tan to olive-gray. The Lane is present at or close to the surface near the Petroleum Oils and Lubricants (POL) Storage Area It was encountered in borings at the Fire Protection Training Area (FPTA) Site references indicate it is possible that the sh-l- beds of the Lane Formation form a semi-confining unit impeding the downward movement of groundwater. The Lane Formation consists of typical confining material (i.e., shale), however, if bedding planes and fracturing are present in the shale, it may allow vertical migration of groundwater/contamination

3.2.3 Iola Formation

The Raytown Limestone, the most prominent and uppermost member of the Iola Formation, has an average thickness of about six feet The top of the Raytown was encountered in boreholes for monitoring wells at the POL Storage Area at a depth of 13 feet below ground surface (bgs) The Raytown Limestone is a finely crystalline, dense limestone. Joints in the Raytown are tight and typically do not transmit fluids However, in areas where the joints have been widened by solution, groundwater may be transmitted Other members of the Iola Formation include the Muncie Creek Member (a gray-to-black fissile shale generally ranging from a few inches to two feet thick), which lies directly under the Raytown Member and the Paola Member (typically a single bed of gray, fossiliferous limestone with an average thickness of about one foot)

3.2.4 Chanute Formation

The Chanute Formation is 25 to 30 feet thick and forms the surface geology in the northeastern part of the base, along the Scope Creek Valley. The Chanute consists of maroon and green claystone and shale. Approximately 13 to 15 feet of the Chanute was penetrated in boreholes just east of the POL Storage Area during site investigations for the proposed Marine Corps Center. The composition of the Chanute (i.e., shales and claystones) form relatively impermeable layers which may impede the movement of groundwater; however, if bedding planes and fracturing are present, it may allow vertical migration of groundwater/contamination

3.2.5 Drum Formation

The Cement City Limestone Member, which is the only member of the Drum Formation to be recognized in Missouri, consists of finely crystalline, dense limestone with low permeability. At the Northeast Landfill, the unit forms a ledge along the south bank of Scope Creek. The Cement City Member of the Drum Formation is approximately four feet thick.

3.2.6 Cherryvale Formation

The Quivira Shale Member of the Cherryvale Formation is the oldest unit exposed on the base The Quivira, the uppermost unit of the Cherryvale Formation, is exposed along Scope Creek, just inside the base boundary It typically consists of a thin upper clay overlying fissile, dark gray shale, which in turn overlies a gray, locally tan shale. Logs of boreholes drilled for monitoring wells at the Northeast Landfill indicate approximately 15 feet of Quivira Shale underlie the Cement City Limestone.

3.3 Hydrogeology

Based on the Draft Hydrogeologic Analysis Report (Hydrogeologic Report) prepared for the site, groundwater present at the base is characteristically located in shallow, low-yield, perched zones of water encased in low permeability material It is typically high in salinity. The Hydrogeologic Report states that there are no water supply wells on the base and little groundwater use in surrounding areas from the Kansas City Group strata The Hydrogeologic Report states that there is a potential for localized recharge of joints and fractures in the limestone. Based on the Open File Report 82-1014 by the United States Department of the Interior Geological Survey (May 1983), it can be summarized that groundwater quality in Pennsylvanian aquifers is variable from place to place, but the water is generally not potable. Wells which penetrate clay and shale (which are predominant in the Pennsylvanian bedrock) generally obtain water with excessive dissolved solids A well survey was performed during the 1990 Remedial Investigation (RI) by O'Brien and Gere The well survey identified 12 wells within one mile of the site. Most of the wells were documented as being inactive or abandoned During the MDNR file review, it was not possible to '>^ a few of the wells identified by file review during the survey

Based on site file documents, the shallow groundwater flow direction at the site varies and is consistent with the local surface drainage and physiographic features. At the Northeast Landfill, the groundwater flow appears to be toward the southeast, toward Scope Creek At the POL Storage Yard, groundwater appears to flow generally to the south-southwest At the North Burn Pit, the groundwater flow is generally northeast Groundwater flow at the Leaking Underground Storage Tanks (LUST) is toward the southeast based on the topographic features in this area.

Slug tests were performed on wells located at the North Burn Pit Area and the POL Storage Yard Slug tests performed on monitoring wells at the North Burn Pit Area indicated that hydraulic conductivity values range from 2.2×10^{-4} to 5.8×10^{-6} cm/sec Slug tests performed at the POL Storage Area indicate that hydraulic conductivity values range from 1.2×10^{-4} to 2.63×10^{-8} cm/sec Monitoring wells at the North Burn Pit Area are screened in the Argentine Limestone Member of the Wyandotte Formation Monitoring wells at the POL Storage Area are screened in the Chanute and Iola Formations This information indicates the hydraulic conductivity of the Argentine Member of the Wyandotte Formation, and the Chanute and Iola Formations are moderate to low; however, slug test information only provides an estimate for hydraulic conductivity in the immediate vicinity around the well being tested and not an average hydraulic conductivity for the water-bearing unit.

4.0 MAJOR AREAS OF CONCERN AT RICHARDS-GEBAUR

There are a number of areas of concern (AOC) at the base. The status of these areas varies according to the stage to which they have been investigated or remediated. Provided below is a discussion of each of the AOCs. In each case, the AOC is described in terms of its physical description, its operational history, and its investigatory history. Following this description is a series of recommendations presented regarding the status of the groundwater investigation for each AOC.

Each AOC was examined individually, and available analytical data were reviewed in the interest of determining whether further groundwater characterization was warranted. If groundwater analytical data were available, they were organized and presented in Table 2. Table 2 lists any significant analytical detections or detection limits which were above the Adult Lifetime Health Advisory or regulatory thresholds. As indicated in Section 1.0, decisions regarding whether to suggest further groundwater characterization were based solely on the perceived need for further delineation of the nature and extent of contamination, without regard to the viability of the groundwater as a potential resource or the existence of current or future receptors.

The rationale utilized in making recommendations is described below. If the only analytical data available were for soil and/or sediment matrices, these data were examined for significant detections of contaminants If such detections were observed, performance of groundwater sampling was indicated, with samples collected from the first water-bearing zone, including perched zones in the unconsolidated profile. In the instances when contamination was detected in groundwater samples collected from the first water-bearing stratigraphic unit at levels greater than either the Adult Lifetime Health Advisory or regulatory thresholds (e.g., Maximum Contaminant Levels [MCL]), a recommendation to investigate the groundwater in the next-shallowest (i.e., next transmissive zone) water-bearing stratigraphic unit was made. If groundwater analytical data were available, these data were reviewed to determine the potential for adverse effects on human health and the environment, as well as characterization at a given AOC. If detections above the Adult Lifetime Health Advisory or regulatory thresholds were noted among these data, it was recommended that further groundwater investigation be conducted. The above-mentioned decision process was designed to characterize the areal and vertical distribution of groundwater contamination at each AOC Figure 2 presents a graphic representation of the rationale employed in examining the possible need for further characterization at a given AOC The selection of parameters to be analyzed in the groundwater was based upon the historical activities and previous analytical detections at each AOC

In those instances where use of the Geoprobe™ has been recommended, care should be taken to limit possible sample turbidity. If high turbidity measurements occur during the collection of groundwater samples from a well point using the Geoprobe™, it may be possible to aggressively purge the well point to lower the sample turbidity A high flow rate vacuum pump can be used in these instances to minimize the agitation of the water column and the turbidity during groundwater sampling However, a peristaltic pump should not be used when collecting samples for volatile organic compound (VOC) analyses The peristaltic pump uses a vacuum to obtain groundwater samples; this has the potential to volatilize VOCs during groundwater sample collection In these instances, it is suggested that either an inertia sampling device or a micro-bailer be used to collect groundwater samples for VOC analysis If the turbidity of the groundwater remains high after the referenced procedures are utilized, it is recommended that both nonfiltered and field-filtered (i.e., using a 0 45-micron filter) groundwater samples be collected.

It should be noted that the suggestions contained herein are not in any way binding to the BRAC Cleanup Team, and that it is imperative that the BRAC Cleanup Team define its own rationale to be followed in determining the need for further characterization at a given AOC, especially with regard to deciding whether sampling of the next deeper water-bearing unit should be characterized. It should be further noted that the South Landfill, the Northeast Landfill, the South Burn Pit, and the Herbicide Burial Site, described in Sections 4.12 through 4.15, are not Air Force property. As such, they may not be affected by the decisions of the BRAC Cleanup Team without the concurrence of the USACE, which administers these as Formerly Used Defense Sites (FUDS). It should also noted that, in those cases where packer testing and geophysical testing have been recommended, such a recommendation is pertinent only for installation of bedrock monitoring wells.

Figures for the AOCs where information was available on the monitoring well lo-ations are included with the Groundwater Evaluation Report.

4.1 Site XO001, Belton Training Complex

The Air Force burned unusable ordnance at this site, located approximately four miles due south of the RGAFB (Figure 3). Waste left over from ordnance and munitions disposal operations are evident on the ground surface. According to documentation in the site file, one hundred ninety-seven ferro-magnetic anomalies have been detected and mapped at the site. Field screening techniques have identified traces of hexahydro-1,3,5-trinitro-1,3,5,-triazine (RDX) and 2,4,6-trinitrotoluene (TNT) in the soil.

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected. It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. If saturated conditions are not encountered in the overburden, groundwater samples should be obtained from the first transmissive zone in the uppermost bedrock aquifer. Since aspects of waste disposal activities are unknown at the site and no groundwater samples have been collected, it is suggested that groundwater samples be collected for VOCs, semi-volatile organic compounds (SVOC), explosive compounds, and metals analyses. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs, explosive compounds, and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, oxidation-reduction potential (ORP), and turbidity should also be performed

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above the appropriate risk-based standards or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient location should be sampled to determine if potential contamination in the groundwater is attributable to upgradient sources Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary (Section 5 0) section provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison

Miniwells (i.e., piezometers generally less than one inch in diameter constructed with PVC or flexible tubing) may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer tests and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive zone in the bedrock

Long-term monitoring may be necessary at the site if groundwater contamination is detected The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.2 Site FT002, North Burn Pit

The North Burn Pit area is located north of the flightline, just south of the northern boundary of RGAFB (Figure 4). It was constructed in 1965 and was used for fire department training until 1989. Oils fuels, metals, and possibly solvents are potentially associated with this area. The following contaminants and their highest observed concentration have been detected in soil: total petroleum hydrocarbons (TPH) (3.8 milligrams per kilogram [mg/kg]), arsenic (As) (6.8 mg/kg), barium (Ba) (270 mg/kg), cadmium (Cd) (2.3 mg/kg), chromium (Cr) (46 mg/kg), and lead (Pb) (510 mg/kg). Analytes detected in groundwater samples at this AOC include: chloroform (0.00061 milligrams per liter [mg/L]), trichloroethylene (TCE) (0.00071 mg/L), methylene chloride (0.037 mg/L), Pb (0.12 mg/L), Cr (0.29 mg/L), and Ba (0.8 mg/L) (Table 2).

Seven monitoring wells have been installed at the site. Three groundwater sampling events have been performed. Monitoring wells are located upgradient, crossgradient, and downgradient of the site based on the groundwater flow direction (which is to the northeast, according to site file documentation). The monitoring wells range in depth from 7.5 to 42 feet bgs (Table 3). These wells are probably screened in the Argentine Limestone Member of the Wyandotte Formation.

It is suggested that an additional round of groundwater sampling be performed at the site In addition, it is suggested that the vertical extent of groundwater contamination at the site be addressed. One monitoring well should be installed downgradient from the North Burn Pit, based on the groundwater flow direction, in a transmissive zone below the current lowest screened zone to characterize the vertical extent of contamination at the site. Packer testing and geophysical downhole testing should be considered to identify the transmissive zone in which to screen the monitoring well.

4.3 Site SS003, Oil Saturated Area

The Oil Saturated Area is located in the southwest corner of the Motor Pool Compound, south of 155th Street and east of Bales Avenue This maintenance and storage area has been in operation since the mid-1950s It is adjacent to a fuel-handling area and recreation fields. The area has been covered with gravel on several occasions, but there was evidence of recurring discharges of oil at the fenceline in this area Contaminants detected in soil at the site include Pb (343 mg/kg) and TPH (3800 mg/kg) Forty-four cubic yards of contaminated soil were excavated and removed at the site in April 1992. Prior to this action, there was evidence that soil was saturated with waste oil and possibly hydraulic fluids and solvents at the site

No groundwater monitoring system is present at the site, and no groundwater samples have been collected The BRAC Cleanup Team suggests that two monitoring wells or several Hydropunch™ points be advanced at the site and samples analyzed for VOCs and SVOCs It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above the appropriate risk-based standards or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. Monitoring wells may not be needed if the contaminant concentrations are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined. The Recommendations and Summary section (Section 5.0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison.

Miniwells may be used instead of monitoring wells to minimize installation costs and well development and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to identify the transmissive zone to screen the monitoring wells. An upgradient location should be sampled to determine if potential contamination in the groundwater is attributable to upgradient sources. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the next lower (bedrock) stratigraphic unit which is encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.4 Site SS004, Hazardous Waste Drum Storage

The Hazardous Waste Drum Storage Area was located at the southwest corner of Building 923, north of the intersection of Andrews Road and 155th Street. This fenced-in area was used for an undetermined number of years for storage of hazardous and nonhazardous drummed wastes prior to disposal The area is partially surfaced with asphalt and tarmac, but surface water run-off flows into a grassy drainage ditch to the west of the area Contaminants detected in soil at the site include: Pb (72 mg/kg), TPH (1,900 mg/kg), and methylene chloride (0.026 mg/kg). Nineteen cubic yards of contaminated soil were excavated and removed at the site in April 1992.

No groundwater monitoring system is present at the site, and no groundwater samples have been collected It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed.

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above the appropriate risk-based standards or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary section (Section 5.0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive zone in the bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.5 POL Storage Area

The POL Storage Area is a compound which contains several pump houses and four aboveground fuel storage tanks (AST). It is located east of the flightlines on the west side of Andrews Road, downgradient from a small man-made pond and upgradient from the sewage treatment facility. Seepage from surrounding hillsides feeds a marshy area directly northwest of the site and drains into a system of culverts. One major and several minor spills have been reported in the POL Storage Area. The ASTs are bermed, but the berms are weathered and cracked. Petroleum-related compounds have been detected in this area Benzene has been detected in monitoring well GW#1206 at a concentration of 0.007 mg/L Total metal concentrations of Ba, Cr and Pb were detected above the MCL. Barium levels ranged from 0.8 to 1.9 mg/L; Cr levels ranged from 0.07 to 0.37 mg/L; and Pb levels ranged from 0.07 to 0.29 mg/L (Table 2).

A total of nine monitoring wells are located around the POL Storage Area The depths of the monitoring wells range from 9.8 to 23 feet bgs (Figure 5) (Table 3). These monitoring wells are probably screened in the Chanute or Iola Formations (Table 1). The monitoring well network adequately characterizes the horizontal extent of contamination, with the exception of the presumed upgadient direction, in which benzene was detected in monitoring well GMW-1206 at a concentration greater than the MCL in the shallow water-bearing unit Monitoring wells are located upgradient, crossgradient, and downgradient from the site based on the groundwater flow direction (as determined from site file documentation). However, the vertical extent of contamination at the site has not been addressed. It is suggested that one monitoring well be installed downgradient from the POL Storage Area in a transmissive zone below the current deepest screened zone to characterize the vertical extent of contamination at the site. It is suggested that additional monitoring wells be installed in the first transmissive zone below the currently monitored groundwater zone if contamination is detected in this zone. The number and location of these deep monitoring wells should be based on contaminant type, concentrations, and location of previous sampling.

In addition, it is suggested that groundwater samples be collected in the uppermost water-bearing unit (further in the upgradient direction), which may be a perched zone in the unconsolidated profile It may be possible to utilize a Geoprobe™, or similar technique, to obtain these groundwater samples If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing profile. care should be taken to minimize the turbidity associated with sample collection. If it is necessary to penetrate the bedrock profile, packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed

Long-term monitoring may be necessary at the site if groundwater contamination is detected The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.6 Site SS006, Hazardous Material Storage

Drums containing motor oil, hydraulic fluids, machining lubricants, and solvents were stored at the Hazardous Material Storage area until needed. This AOC is located on the east side of Hangar Road, north of 155th Street. Contaminants detected in the soil at this AOC include: phenanthrene (7.1 mg/kg), fluoranthrene (11 mg/kg), pyrene (6.8 mg/kg), chrysene (4.2 mg/kg), As (8.3 mg/kg), Ba (300 mg/kg), Cd (1.4 mg/kg), Cr (50 mg/kg), and Pb (120 mg/kg). This AOC has undergone an Interim Remedial Action, during which forty-six cubic yards of contaminated soil were removed and excavated in September 1993.

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected. The BRAC Cleanup Team suggests installing two monitoring wells or several Hydropunch™ points to collect groundwater samples to be analyzed for VOCs, SVOCs, and metals. It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed.

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources. Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary section (Section 5.0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison.

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive unit encountered

Long-term monitoring may be necessary at the site if groundwater contamination is detected The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.7 Site ST007, Leaking Underground Storage Tanks (LUST)

Aviation fuel was stored in four large LUSTs for use in military aircraft at this AOC, located west of Hangar Road and north of 155th Street. These LUSTs have been removed, and site documentation indicates that a cleanup system was installed, however, no information was available to document the type of remediation technique used Kerosene-grade jet fuel contamination may be associated with the site Hydrocarbon contamination in the soil has been documented Confirmation samples to determine the effectiveness of cleanup of this AOC have not been collected

Contaminants detected in the soil at the site include: TPH (1618 mg/kg), ethylbenzene (1.4 mg/kg), xylene (1.8 mg/kg), As (14.9 mg/kg), Ba (462 mg/kg), Cd (9.9 mg/kg), Cr (62 mg/kg), and Pb (46 mg/kg). Three monitoring wells have been installed at the site (Figure 6). One round of groundwater samples has been collected. Contamination in groundwater at the site includes: xylene (0.24 mg/L), Cd (0.005 mg/L), and Ba (0.51 mg/L) (Table 2).

The BRAC Cleanup Team suggests that several confirmatory soil borings be advanced at the site, and two rounds of seasonal groundwater samples be collected. It is recommended that these confirmatory soil borings be advanced, and two rounds of seasonal (two quarterly events) groundwater sampling be collected.

The monitoring wells are located upgradient, crossgradient, and downgradient based on the groundwater flow direction (Figure 6). They adequately characterize the areal extent of contamination present in the groundwater in the shallow bedrock at the site. The monitoring wells are probably screened in the Wyandotte or Lane Formations, ranging in depth from 12 to 17 bgs (Table 3). However, the vertical extent of contamination at the site has not been adequately characterized. It is suggested that one monitoring well be installed downgradient from the LUSTs in the first transmissive zone below the currently monitored groundwater zone to characterize the vertical extent of contamination at the site. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring well. It is suggested that additional deep monitoring wells be installed in the first transmissive zone below the currently monitored groundwater zone if contamination is detected in this shallower zone. The number and location of these deep monitoring wells should be based on the contaminant type, concentration, and location of the previous sampling.

4.8 Site SS008, Test Cell Area

Aircraft were washed near this AOC, on the east side of Hangar Road, west of the POL Storage Yard Small spills of fuel are suspected. Contaminants detected in the soil at the site include TPH (33 mg/kg), 2-butanone (0.047 mg/kg), benzene (0.017 mg/kg), ethylbenzene (0.01 mg/kg), TCE (0.014 mg/kg), and carbon disulfide (0.006 mg/kg)

No groundwater monitoring system is present at the site, and no groundwater samples have been collected The BRAC Cleanup Team suggests collecting multiple surface soil samples and installing a monitoring well if soil is found to be contaminated. Although soil contamination has already been detected at the Test Cell Area, additional soil characterization could provide valuable information regarding the distribution of contamination in soil at this AOC.

It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sample locations should be situated up- and downgradient from the site based on the groundwater flow direction It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary section (Section 5 0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered in order to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.9 Site SS009, Fire Valve Area

Activities conducted in the small maintenance shops are suspected of storing/spilling motor oils or fuel along the fence at the Fire Valve Area, just north of the Hazardous Waste Storage Area. Petroleum compounds, VOCs, and polynuclear aromatic hydrocarbon (PAH) contamination have been detected in soil samples from the site. TPH has been detected at concentrations up to 28,000 mg/kg in soil. The MDNR action level for TPH is 100 mg/kg. Approximately 10 cubic yards of contaminated soil have been removed and excavated from the site.

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected. It is suggested that groundwater samples be collected in the uppermost water- bearing zone, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed.

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above health-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources. Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined. The Recommendations and Summary section (Section 5.0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination, however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected

4.10 Drainage Pond

This AOC is a stormwater drainage pond located just west of the POL Storage Yard and northeast of the Test Cell Area. This pond collects rainwater around some of the hangars. Low levels of PCBs, PAHs, and TPH have been detected in sediment at the site. Arsenic has been detected at 0.007 mg/L in groundwater at the site, while aluminum, iron, and manganese were detected at levels greater than the MCL (Table 2).

One monitoring well is present at the Drainage Pond. Monitoring well DPGW#1 is probably screened in the Lane Formation at 18.5 to 28.5 feet bgs (Table 3). Monitoring well DPGW#1 is located inside the drainage pond.

There appears to be low-level metals contamination in groundwater at the site. Additional characterization of the groundwater at the site should be performed. It is recommended that another round of groundwater sampling be conducted. This would serve as verification of the initial groundwater sampling effort. Groundwater samples should be collected and analyzed for VOCs, SVOCs, PAHs, PCBs, and metals. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs, PAHs, PCBs, and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed.

The potential contaminants present at the site (i.e., PCBs, PAHs, and metals) are not overly mobile/water soluble compounds, with the exception of some metals in the appropriate geochemical environment (e.g., reducing conditions). Therefore, a deep monitoring well installed at the site is probably not necessary for vertical extent characterization.

4.11 Central Drainage Area

Stormwater collected around the western hangars runs through this AOC It is located on the east side of Hangar Road, northwest of the Fire Valve Area Lead and organic compounds have been detected in sediments at the site.

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected. The BRAC Cleanup Team suggests that several surface soil samples be collected at the site to characterize the nature and extent of any contamination present. Soil contamination has been detected at this AOC. Additional soil characterization would provide valuable information regarding the distribution of contamination in soil at the site. It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary section (Section 5 0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison.

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.12 South Landfill

The South Landfill is located in the south-central part of RGAFB, near the nondestructive inspection (NDI) laboratory and adjacent to Scope Creek. Between 1954 and 1956, this site was the main sanitary landfill for RGAFB. In 1956, contract off-base disposal of most common refuse began, although some wastes, including building rubble, yard debris, and waste from some industrial shop areas, were disposed at the site until about 1961. Materials which may have been disposed at the site include small quantities of waste paints, thinners, strippers, solvents, and oils.

No groundwater monitoring system is present at the site, and no groundwater samples have been collected It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present. Field measurements for temperature, pH. specific conductance, ORP, and turbidity should also be performed.

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources. Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations However, currently the background concentrations for the site have not been adequately determined. The Recommendations and Summary section (Section 5 0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison.

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered

Long-term monitoring may be necessary at the site if groundwater contamination is detected The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.13 Northeast Landfill

The Northeast Landfill is located in the northeasternmost portion of the base adjacent to Scope Creek. The site was used between 1961 and 1972 for the disposal of miscellaneous wastes, including building rubble, yard debris, and waste from some industrial shop areas. Waste paints and paint thinners were disposed at this site as well. Contaminants detected in the groundwater in significant concentrations include: sulfate (280 mg/L), zinc (Zn) (6.0 mg/L), and Pb (0.033 mg/L) (Table 2).

Six monitoring wells are located at this AOC (Figure 7). These monitoring wells are probably screened in the Drum and Cherryvale Formations and range in depth from 11.1 to 25.75 feet bgs (Table 3). Monitoring wells are located upgradient, crossgradient, and downgradient of the landfill, based on the groundwater flow direction (as determined through review of file documentation). The monitoring well network screened in the shallow bedrock adequately characterizes this zone. The vertical extent of contamination has not been adequately characterized; however, due to the type and mobility of the contaminants and the relatively low level of contamination detected in the groundwater, it is not recommended that characterization of deeper groundwater be conducted.

4.14 South Burn Pit

The South Burn Pit is located just west of the South Landfill. It was used for fire department training between 1955 and 1965. Contaminants potentially associated with the site include waste oils, solvents, metals, and fuels. The burn pit was unlined and had no oil/water separator Small quantities of hazardous materials have been reported to have been used at the site based on site documents

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected It is suggested that groundwater samples be collected in the uppermost water-bearing horizon, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for VOCs, SVOCs, and metals. Dissolved (filtered) groundwater samples should be collected and analyzed for SVOCs and metals in the instances when high turbidity is present Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined The Recommendations and Summary section (Section 5.0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells. If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected.

4.15 Herbicide Burial Site

In 1971, about four cases of herbicide, reputedly containing mercury, in plastic pint-sized bottles were reportedly buried in a trench near the south end of the runway.

No groundwater monitoring system is present at this AOC, and no groundwater samples have been collected. It is suggested that groundwater samples be collected in the uppermost water-bearing zone, which may be a perched zone in the unconsolidated profile. Groundwater sampling locations should be situated up- and downgradient from the site based on the groundwater flow direction. It may be possible to utilize a Geoprobe™, or similar technique, to obtain the groundwater samples. If the Geoprobe™, or similar technique, is used to obtain groundwater samples in the unconsolidated water-bearing zone, care should be taken to minimize the turbidity associated with sample collection. Groundwater samples should be collected and analyzed for herbicides, VOCs, SVOCs, and metals (including mercury). Dissolved (filtered) groundwater samples should be collected and analyzed for herbicides, SVOCs and metals (including mercury) in the instances when high turbidity is present. Field measurements for temperature, pH, specific conductance, ORP, and turbidity should also be performed.

If groundwater is encountered in the overburden at this AOC, and if contamination is detected above risk-based or regulatory thresholds in the unconsolidated water-bearing zone, it is recommended that two downgradient monitoring wells and one upgradient monitoring well be installed in the first transmissive zone in the bedrock at the site. The upgradient monitoring well should be installed to determine if potential contamination in the groundwater is attributable to upgradient sources. Monitoring wells may not be needed if the contaminant concentrations in the shallower groundwater samples are within the range statistically determined to be typical of site background concentrations. However, currently the background concentrations for the site have not been adequately determined. The Recommendations and Summary section (Section 5 0) provides a statistical approach for determining site background concentrations and subsequent site-related contaminant concentration comparison.

Miniwells may be used instead of monitoring wells to minimize installation costs and well development, and purge water containerization and disposal. Packer testing and geophysical downhole testing should be considered to determine the transmissive zone in which to screen the monitoring wells If no groundwater is encountered in the overburden at this AOC, sampling should be conducted from the first transmissive bedrock unit encountered.

Long-term monitoring may be necessary at the site if groundwater contamination is detected. The BRAC Cleanup Team suggests collecting Hydropunch™ groundwater samples to characterize potential groundwater contamination; however, Hydropunch™ groundwater samples would probably not satisfy long-term monitoring requirements if groundwater contamination is detected

5.0 RECOMMENDATIONS AND SUMMARY

A. Background concentrations need to be established for all media of concern (i.e., soil, sediment, surface water, and groundwater) at the site. Samples used to establish background concentrations should be collected from media similar to those sampled at each AOC. It is suggested that general groundwater quality parameters be collected from background monitoring wells and compared to on-site monitoring well data. In general, only analytical data from similar water quality types should be compared. In addition, seasonality should be established during groundwater sampling. Generally, four observations during different times of the year are necessary to establish seasonal effects on groundwater chemistry and contaminant concentrations. At a minimum, samples should be collected during the wet and dry seasons.

Because it is apparent that the direction of groundwater flow at RGAFB is variable throughout the site, the location of an upgradient background groundwater sample collection point is complicated. However, it appears that, in general, groundwater flow direction in the vicinity of the site is at least partially controlled by the local topography. Based on this observation, as well as the observed groundwater elevations from monitoring wells at the AOCs, it is recommended that background groundwater sample collection be conducted in the northwest portion of the site. Specifically, the topographically high area east of the Kansas City Southern Railroad tracks, in the eastern half of the northwest 1/4 of Section 34, Township 47 North, Range 33 West appears promising with regard to collection of upgradient groundwater samples. Although the Blue River, which runs approximately two miles to the west of RGAFB, may regionally influence the groundwater flow direction, the observed flow direction at the AOCs with monitoring wells in place indicates that the topographic ridge to the west of the site acts as a shallow groundwater divide.

It is suggested that a statistical comparison be performed to determine if on-site analytical concentrations fall within the observed concentration range in background samples Samples from an adequate number of observation points should be collected to statistically determine the background concentration ranges for contaminants of concern at the site. The following EPA guidance documents can be used to develop a statistically defensible approach for comparing background concentrations with on-site concentrations

- Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media, EPA 230/02-89-042, February 1, 1989.
- Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance, July 1992

B. There are a number of AOCs at the site, including Installation Restoration Program (IRP) sites, which do not have groundwater monitoring networks. Potential impacts to groundwater should be assessed at each AOC. It may be possible to use Geoprobe™ groundwater samples as a screening tool to determine if additional characterization and monitoring of the groundwater is necessary at each AOC However, the Geoprobe™ is limited to collecting samples from only unconsolidated material Characterization of bedrock aquifers should be performed in instances when groundwater is encountered in the unconsolidated profile and contamination is detected, or when soils are contaminated and groundwater was not encountered in the AOC unconsolidated profile. Monitoring wells or miniwells should be installed in the uppermost bedrock aquifer when groundwater contamination is detected in the unconsolidated water-bearing zones

It is suggested that, at a number of the AOCs, monitoring wells be screened in the first transmissive zone below the present screened interval (e.g., the first transmissive zone in the bedrock) if contamination is detected in the overburden water-bearing zone, to characterize the vertical extent of contamination It has also been suggested at a number of AOCs that deeper monitoring wells be installed in areas where an observed release to the groundwater has occurred in the shallow bedrock water-bearing zone These monitoring wells should be installed in a manner which prevents potential cross-contamination of separate and distinct water-bearing zones

C. Shallow groundwater at the site may discharge to surface water (e.g., seeps), which potentially poses a risk to future residents, industrial workers, and ecological receptors. It is suggested that additional seep samples be collected in areas where potential contamination exists at the site (e.g., the IRP sites). Seep samples should be collected during wet periods, when seeps appear near potentially contaminated areas. This information will help address the threat of potentially contaminated groundwater discharging to the surface water and possibly adversely affecting human health and the environment.

D. Future groundwater sampling results should have adequately low detections limits so that the data can be compared to MCLs, risk-based standards, and Ambient Water Quality Criteria (AWQC) Based on the review of the groundwater data, there are a number of instances where the detection limits were above a MCL or Adult Lifetime Health Advisory standard. The appropriate analytical method should be used to achieve suitable detection limits, and any potential interferences causing elevated detection limits should be identified.

E. A survey of private groundwater wells located within one mile of the site was conducted during the 1990 RI. It is suggested that a well canvass be performed within the four-mile Hazard Ranking System (HRS) target distance limit to verify the use of groundwater in the area. This report only considers the areal and vertical extent of characterization at the AOCs at the site; however, well canvass information will help the BRAC Cleanup Team define the rationale to be used to determine whether additional characterization should be performed at each AOC.

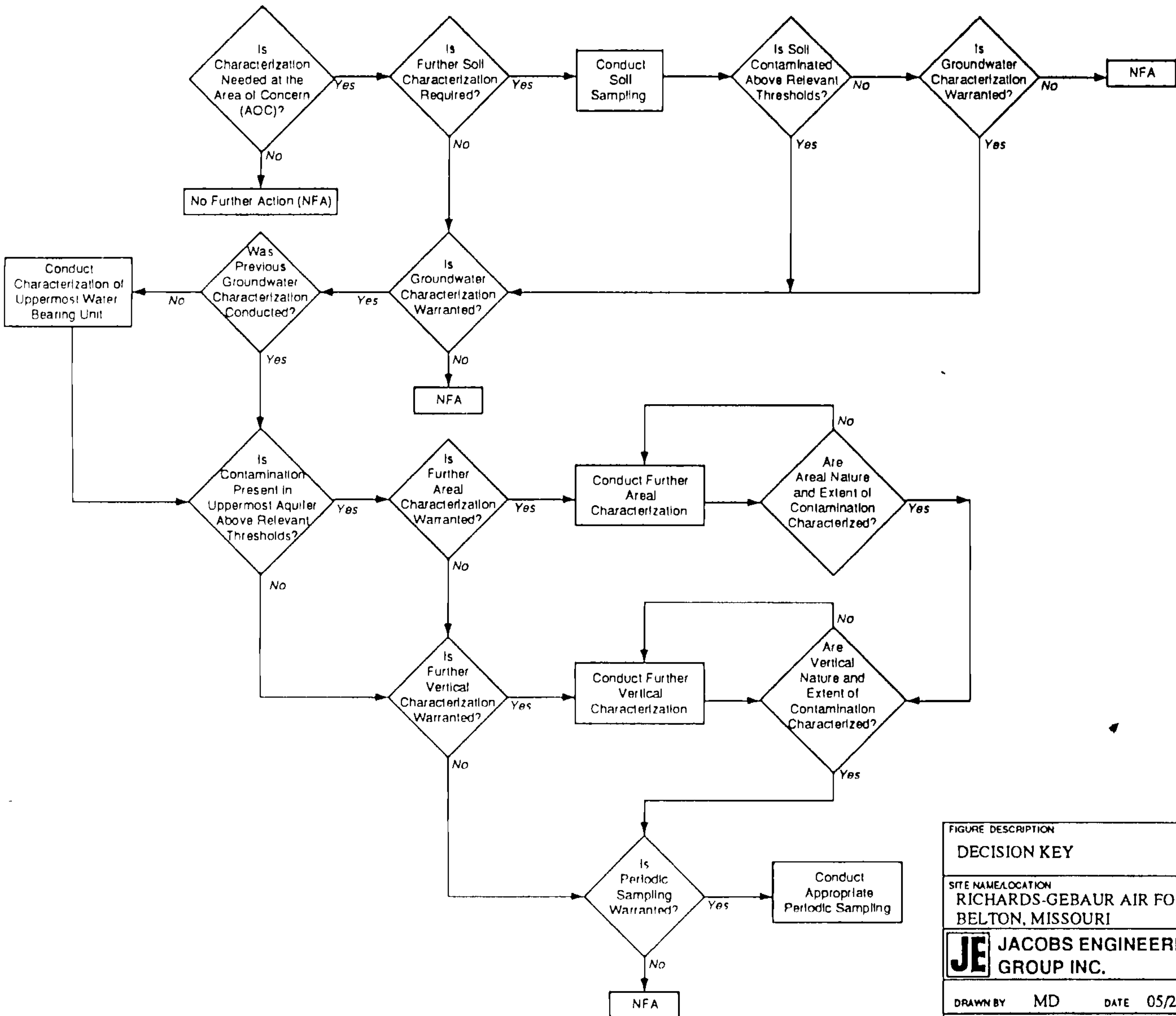
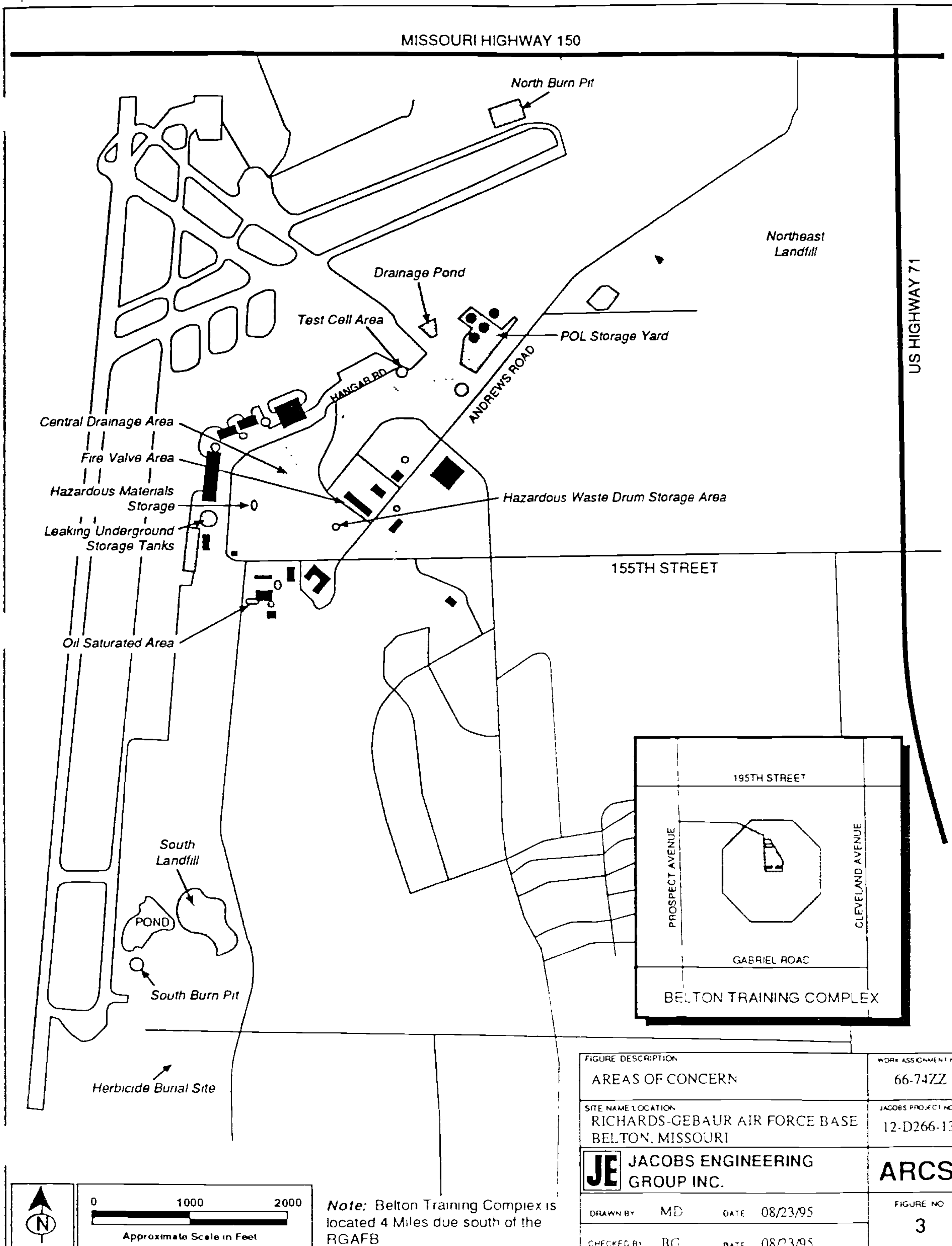
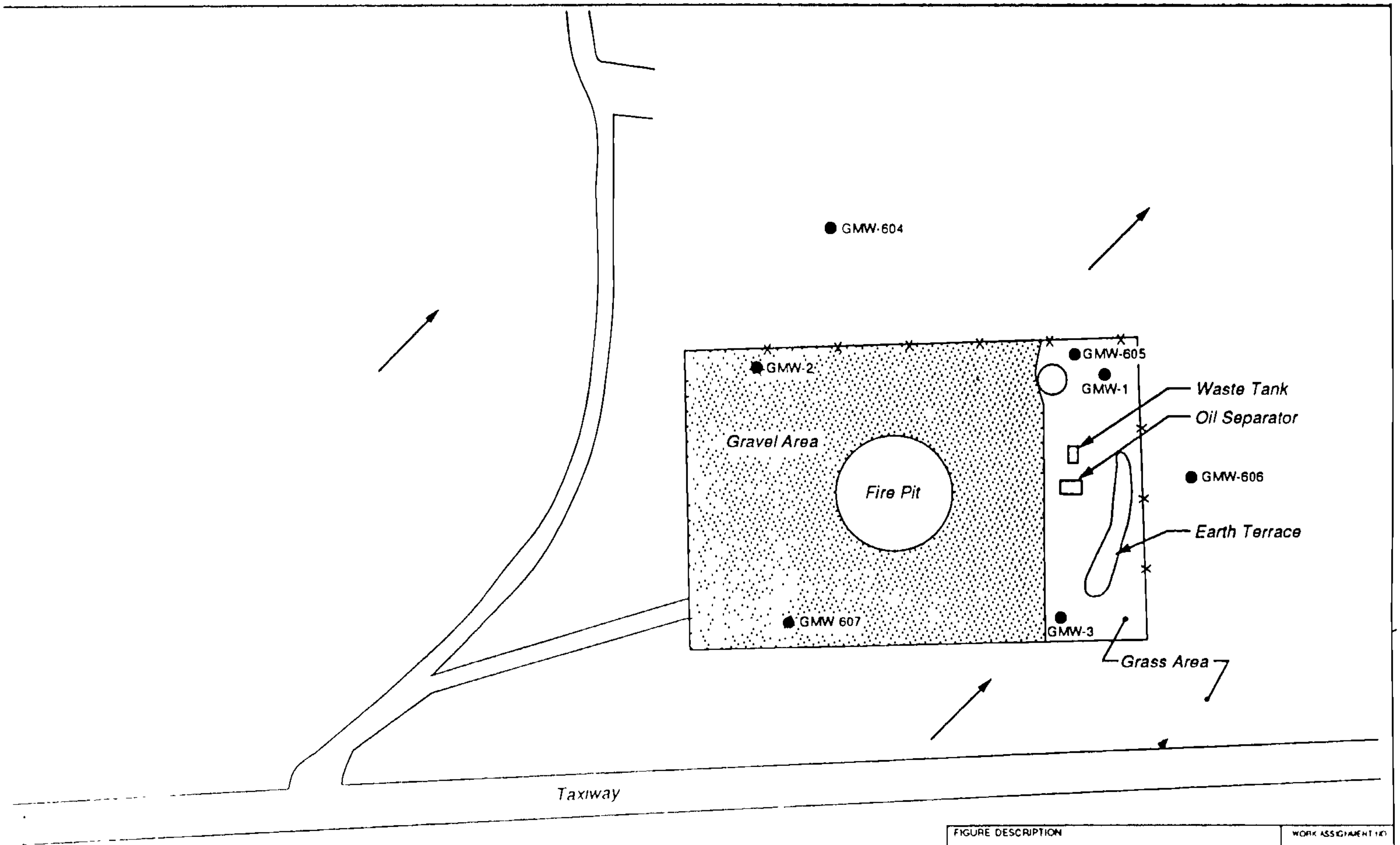


FIGURE DESCRIPTION DECISION KEY	WORK ASSIGNMENT NO 66-74ZZ
SITE NAME/LOCATION RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI	JACOBS PROJECT NO 12-D266-13
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY MD DATE 05/25/95	FIGURE NO 2
CHECKED BY BG DATE 05/25/95	



Note: Belton Training Complex is located 4 Miles due south of the RGAFB

FIGURE DESCRIPTION AREAS OF CONCERN	WORK ASSIGNMENT NO 66-74ZZ
SITE NAME LOCATION RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI	JACOBS PROJECT NO 12-D266-13
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY MD DATE 08/23/95 CHECKED BY BC DATE 08/23/95	FIGURE NO 3



Source: Burns & McDonnell, Remedial Investigation, April 1992

LEGEND

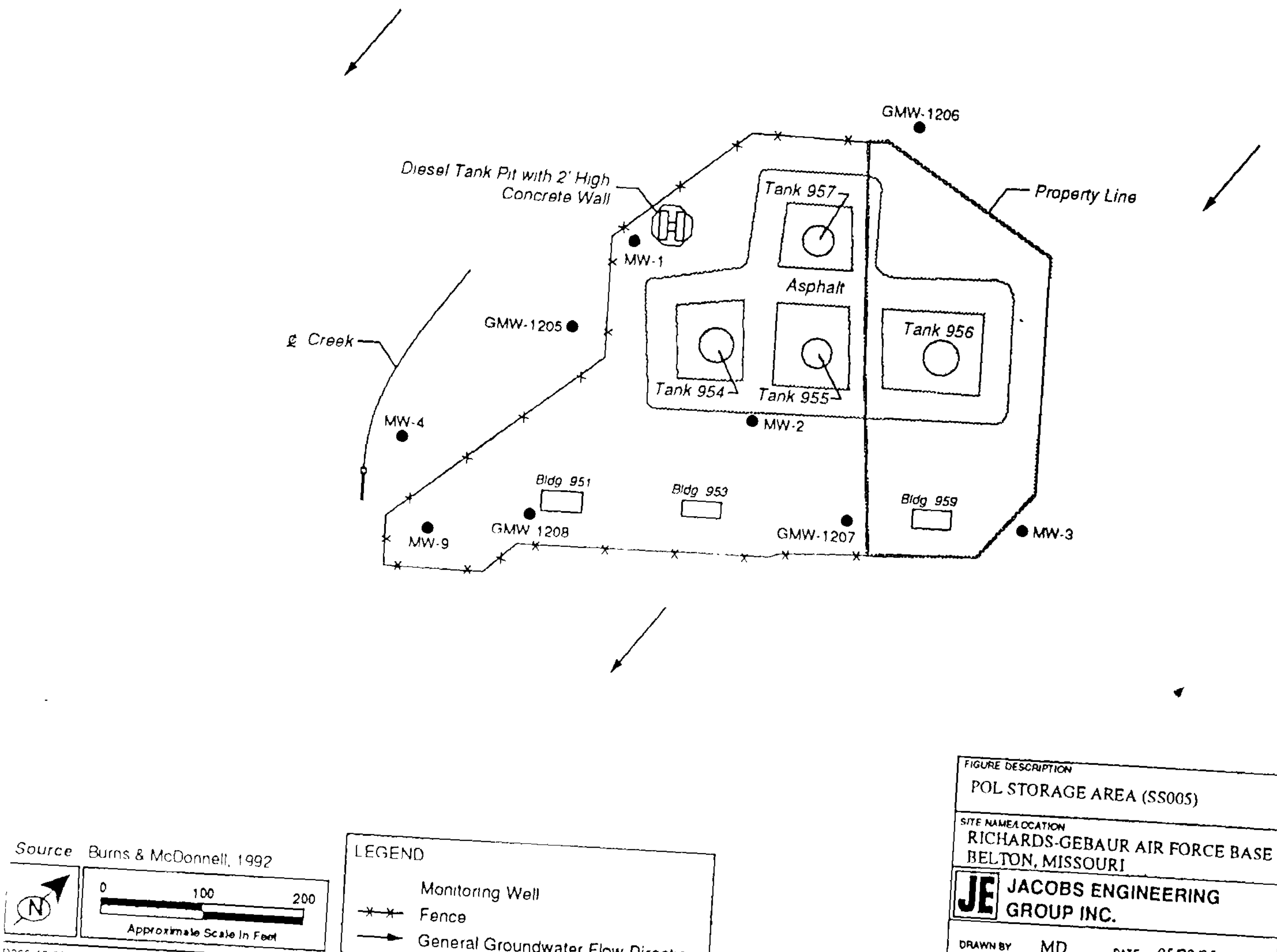
Monitoring Well

Fence

General Groundwater Flow Direction

FIGURE DESCRIPTION	WORK ASSIGNMENT NO
NORTH BURN PIT (FT002)	66-74ZZ
SITE NAME/LOCATION RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI	JACOBS PROJECT NO 12-D266-13
JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY MD DATE 05/25/95	FIGURE NO 4
CHECKED BY BG DATE 05/25/95	

D266 13 004



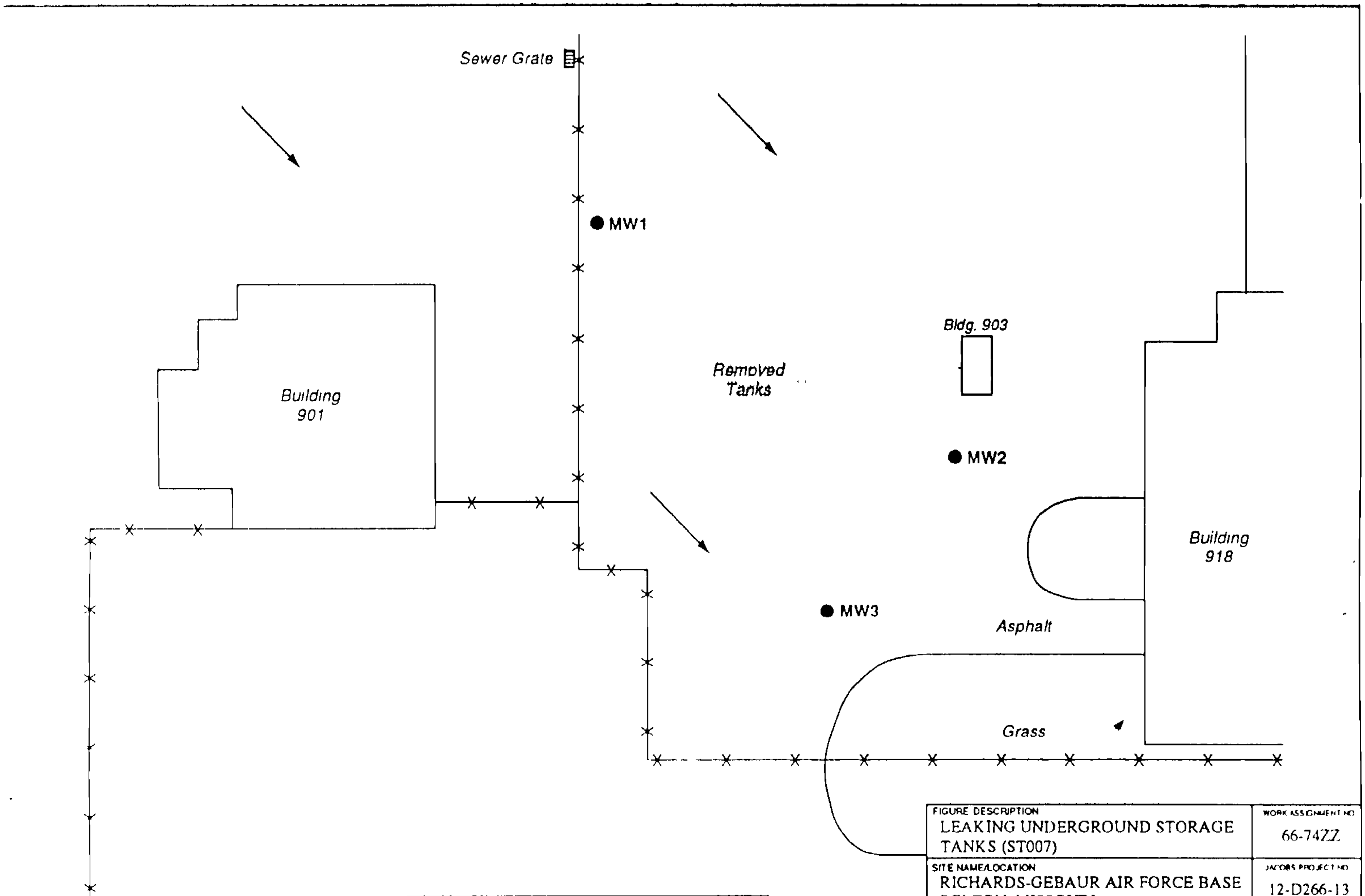
Source Burns & McDonnell, 1992

LEGEND

- ● Monitoring Well
- —×—×— Fence
- ——→ General Groundwater Flow Direction

FIGURE DESCRIPTION POL STORAGE AREA (SS005)	WORK ASSIGNMENT NO 66-7477
SITE NAME/LOCATION RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI	JACOBS PROJECT NO 12-D266-13
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY MD DATE 05/22/95 CHECKED BY BG DATE 05/22/95	FIGURE NO 5

D266 13 003



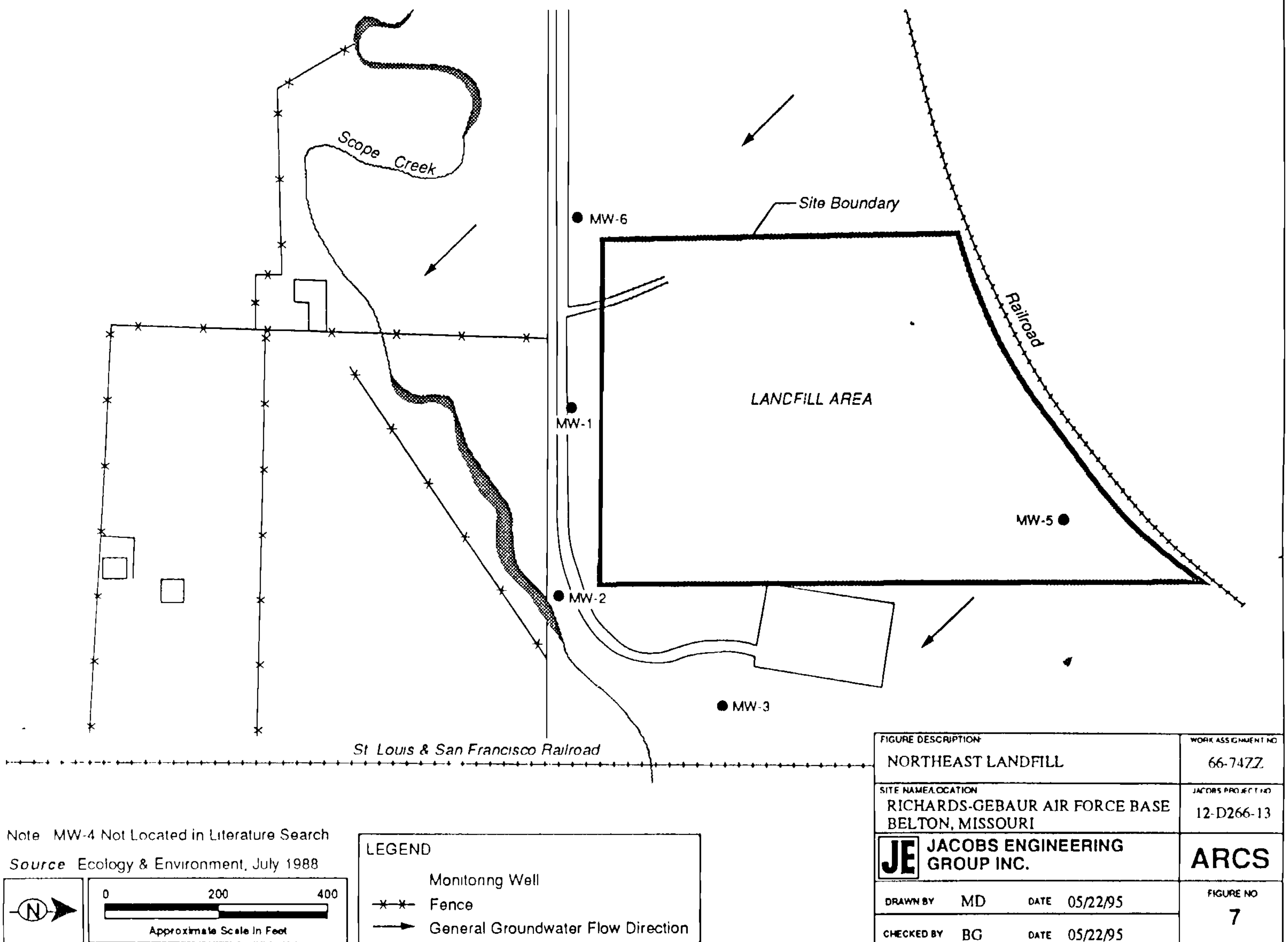
Source: Geraghty & Miller, Inc , 1991

LEGEND

- ● Monitoring Well
- —x—x— Fence
- → General Groundwater Flow Direction Based on Topographic Features

FIGURE DESCRIPTION: LEAKING UNDERGROUND STORAGE TANKS (ST007)				WORK ASSIGNMENT NO: 66-7477
SITE NAME/LOCATION: RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI				JACOBS PROJECT NO: 12-D266-13
JE JACOBS ENGINEERING GROUP INC.				ARCS
DRAWN BY	MD	DATE	05/22/95	FIGURE NO 6
CHECKED BY	BG	DATE	05/22/95	

D266 13 002



Note MW-4 Not Located in Literature Search

Source Ecology & Environment, July 1988

FIGURE DESCRIPTION: NORTHEAST LANDFILL	WORK ASSIGNMENT NO: 66-7477
SITE NAME/LOCATION: RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI	JACOBS PROJECT NO: 12-D266-13
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY MD DATE 05/22/95	FIGURE NO 7
CHECKED BY BG DATE 05/22/95	

D266 13 005

TABLES

TABLE 1

GENERALIZED GEOLOGIC SECTION
AT RICHARDS-GEBAUR AFB

System	Group	Formation	Thickness (Approx.) In Feet	Physical Characteristics
Quaternary	Alluvium	--	50	
	Loess	--	2	
Pennsylvanian	Kansas City			
	(Exposed as outcrop or at surface at the site)	Wyandotte	40	Limestone (Argentine)
		Lane	25-40	Shale
		Iola	6-10	Limestone (Raytown)
		Chanute	25-30	Shale
		Drum	4	Limestone
		Cherryvale	15-20	Shale
		Dennis	15	Limestone (Winterset)
		Galesburg	3	Shale
		Swope	22	Limestone (Bethany Falls)
		Ladore	4	Shale
		Hertha	15	Limestone
	Pleasanton	--	150	Shale, Siltstone, and Sandstone, Gas-bearing, lower unit
	Mermaton	--	125	Shale, sandstone, limestone, coal, and clay, Gas-bearing
	Cherokee	--	520	Sandstone, shale, limestone, siltstone, coal, and clay; Gas-bearing, upper units
Mississippian	Keokuk-Burlington	--	330	Limestone
	Chouteau (Kinderhook)	--	115	Siltstone, limestone, shale
Ordovician	--	Joachim	60	Dolomite (limestone)
	--	St Peter	65	Sandstone
	--	Jefferson City	320	Dolomite (limestone)
	--	Roubidoux	20	Sandstone
	--	Gasconade	450	Dolomite (limestone), sandstone
Cambrian	Undifferentiated	--	150	Dolomite (limestone), shale
	--	Lamotte	100	Sandstone
Precambrian	Undifferentiated	--	--	Granite (igneous rocks)

TABLE 2

GROUNDWATER ANALYTICAL DETECTIONS AT RICHARDS-GEBAUR AFB

Well No.	Site Location	Sample Number/ Indentifier	Date Sampled	Contaminant	Conc. (mg/L)	Adult Lifetime Health Advisory (mg/L) (May 1994)	Maximum Contamination Level (MCL) (mg/L (May 1994)
GMW # 604	North Burn Pit	NA	Sept.-89	Lead	0.12	NA	0.015*
GMW # 604	North Burn Pit	NA	Sept.-89	Bis (2-ethylhexyl) phthalate	0.021	NA	NA
GMW # 604	North Burn Pit	NA	Sept.-89	Barium	0.7	2	2
GMW # 604	North Burn Pit	NA	Sept.-89	Cadmium	< 0.01	0.005	0.005
GMW # 604	North Burn Pit	NA	Sept.-89	Chromium	0.18	0.1	0.1
GMW # 605	North Burn Pit	NA	Sept.-89	Barium	0.8	2	2
GMW # 605	North Burn Pit	NA	Sept.-89	Cadmium	< 0.01	0.005	0.005
GMW # 605	North Burn Pit	NA	Sept.-89	Lead	< 0.05	NA	0 015*
GMW # 606	North Burn Pit	NA	Sept.-89	Banum	0.8	2	2
GMW # 606	North Burn Pit	NA	Sept.-89	Bis (2-ethylhexyl) phthalate	0 1	NA	NA
GMW # 606	North Burn Pit	NA	Sept.-89	Cadmium	< 0.01	0 005	0.005
GMW # 606	North Burn Pit	NA	Sept.-89	Chromium	0.29	0.1	0.1
GMW # 606	North Burn Pit	NA	Sept.-89	Lead	0.2	NA	0.015*
GMW # 607	North Burn Pit	NA	Sept.-89	Banum	0 4	2	2
GMW # 607	North Burn Pit	NA	Sept.-89	Bis (2-ethylhexyl) phthalate	0.011	NA	NA
GMW # 607	North Burn Pit	NA	Sept -89	Cadmium	< 0.01	0 005	0.005
GMW # 607	North Burn Pit	NA	Sept -89	Chromium	0.11	0 1	0 1
GWM-1	North Burn Pit	DF4058	Oct -91	Methylene Chlonde	0.037	NA	0.008
GWM-2	North Burn Pit	DF4057	Oct -91	Chloroform	0.0005	NA	0.1
GWM-2	North Burn Pit	DF4057	Oct.-91	Tetrachloro-ethylene	0.00071	NA	0.005
GWM-3	North Burn Pit	DF4059	Oct.-91	Chloroform	0.00061	NA	0 1
GWM-3	North Burn Pit	DF4059	Oct.-91	Tetrachloro-ethylene	0.00041	NA	0 005
MW # 1	POL StorageYard	NA	12/13/91	Manganese	0.252	NA	0 05**
MW # 1	POL StorageYard	NA	12/13/91	Total Dissolved Solids	455	NA	500
MW # 1	POL StorageYard	NA	12/13/91	Zinc	0 014	2	5**
MW # 1	POL StorageYard	NA	12/13/91	Toluene	0.0055	1	1
MW # 1	POL StorageYard	MW-1D	12/13/91	Manganese	0.246	NA	0 05**
MW # 1	POL StorageYard	MW-1D	12/13/91	Cadmium	< 0.01	0 005	0 005
MW # 1	POL StorageYard	MW-1D	12/13/91	Lead	< 0.05	NA	0 015*
MW # 1	POL StorageYard	MW-1D	12/13/91	Zinc	0.0152	2	5**
MW # 1	POL StorageYard	MW-1D	12/13/91	Toluene	0 0048	NA	1
MW # 2	POL StorageYard	NA	12/13/91	Copper	0 0125	1	1 8*, 1 0**
MW # 2	POL StorageYard	NA	12/13/91	Zinc	0 0257	2	5**
MW # 2	POL StorageYard	NA	1/15/92	Chloroform	0 0018	NA	0 1
MW # 2	POL StorageYard	NA	4/29/92	Total Dissolved Solids	463	NA	500

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GROUNDWATER ANALYTICAL DETECTIONS
AT RICHARDS-GEBAUR AFB

Well No.	Site Location	Sample Number/ Indentifier	Date Sampled	Contaminant	Conc. (mg/L)	Adult Lifetime Health Advisory (mg/L) (May 1994)	Maximum Contamination Level (MCL) (mg/L) (May 1994)
MW # 3	POL StorageYard	NA	1/15/92	Bromo-dichloromethane	0.0007	NA	0.1
MW # 3	POL StorageYard	NA	1/15/92	Chloroform	0.0024	NA	0.1
MW # 3	POL StorageYard	NA	1/15/92	Tnchlorofluoro-methane	0.0518	2	NA
MW # 3	POL StorageYard	NA	1/15/92	Tnchloroethene	0.0444	NA	0.005
MW # 3	POL StorageYard	NA	4/29/92	Total Dissoved Solids	549	NA	500
MW # 4	POL StorageYard	NA	12/13/91	Copper	0.0103	NA	1.8*, 1.0**
MW # 4	POL StorageYard	NA	12/13/91	Manganese	0.57	NA	0.05**
MW # 4	POL StorageYard	NA	12/13/91	Potassium	0.738	NA	NA
MW # 4	POL StorageYard	NA	12/13/91	Sodium	37.2	NA	NA
MW # 4	POL StorageYard	NA	12/13/91	Zinc	0.0105	2	5**
MW # 4	POL StorageYard	NA	4/29/92	Total Dissolved Solids	550	NA	500
GMW #1205	POL StorageYard	NA	Sep-89	Barium	1.3	2	2
GMW #1205	POL StorageYard	NA	Sep-89	Cadmium	< 0.01	0 005	0 005
GMW #1205	POL StorageYard	NA	Sep-89	Chromium	0.09	0.1	0.1
GMW #1205	POL StorageYard	NA	Sep-89	Lead	0.13	NA	0 015*
GMW #1205	POL StorageYard	NA	12/13/91	Iron	2.48	NA	0.3**
GMW #1205	POL StorageYard	NA	12/13/91	Manganese	4.06	NA	0 05**
GMW #1205	POL StorageYard	NA	12/13/91	Total Dissolved Solids	580	NA	500
GMW #1205	POL StorageYard	NA	12/13/91	Copper	0.0126	NA	1.8*, 1 0**
GMW #1205	POL StorageYard	NA	12/13/91	Toluene	0.0215	1	1
GMW #1206	POL StorageYard	NA	Sept -89	Benzene	0.007	NA	0.005
GMW #1206	POL StorageYard	NA	Sept -89	Cadmium	< 0.01	0 005	0.005
GMW #1206	POL StorageYard	NA	Sept.-89	Lead	0.07	NA	0 015*
GMW #1206	POL StorageYard	NA	Sept.-89	Selenium	< 0.05	NA	0.05
GMW #1206	POL StorageYard	NA	12/13/91	Banum	0.8	2	2
GMW #1206	POL StorageYard	NA	12/13/91	Chromium	0.07	0 1	0 1
GMW #1206	POL StorageYard	NA	12/13/91	Manganese	0 187	NA	0 05**
GMW #1206	POL StorageYard	NA	4/29/92	Total Dissolved Solids	495	NA	500
GMW #1207	POL StorageYard	NA	Sept -89	Cadmium	< 0.01	0 005	0 005
GMW #1207	POL StorageYard	NA	Sept -89	Chromium	0.24	[illegible]	[illegible]
GMW #1207	POL StorageYard	NA	Sept -89	Lead	0 26	NA	[illegible]
GMW #1207	POL StorageYard	NA	12 13 91	Nitrate	39	NA	[illegible]
GMW #1207	POL StorageYard	NA	12/31/91	Zinc	0 0258	2	5**
GMW #1207	POL StorageYard	NA	4 29 92	Total Dissolved Solids	649	NA	[illegible]
GMW #1207	POL StorageYard	NA	NA	Arsenic	0 006	NA	0 05
GMW #1207	POL StorageYard	NA	NA	Banum	1 3	NA	2
GMW #1208	POL StorageYard	NA	Sept -89	Banum	1 9	NA	2

TABLE 2

GROUNDWATER ANALYTICAL DETECTIONS
AT RICHARDS-GEBAUR AFB

Well No.	Site Location	Sample Number/ Indentifier	Date Sampled	Contaminant	Conc. (mg/L)	Adult Lifetime Health Advisory (mg/L) (May 1994)	Maximum Contamination Level (MCL) (mg/L) (May 1994)
GMW #1208	POL StorageYard	NA	Sept.-89	Cadmium	< 0.01	0.005	0.005
GMW #1208	POL StorageYard	NA	Sept -89	Chromium	0.37	0.1	0.1
GMW #1208	POL StorageYard	NA	Sept.-89	Lead	0.29	NA	0.015*
GMW #1208	POL StorageYard	NA	12/13/91	Iron	0.403	NA	0.3**
GMW #1208	POL StorageYard	NA	12/13/91	Manganese	1.62	NA	0.05**
GMW #1208	POL StorageYard	NA	12/13/91	Total Dissolved Solids	372	NA	500
GMW #1208	POL StorageYard	NA	12/13/91	Nickel	0.0174	NA	0.1
GMW #1208	POL StorageYard	NA	12/13/91	Zinc	0.0132	2	5**
MW # 9	POL StorageYard	NA	12/13/91	Manganese	1.33	NA	0.05**
MW # 9	POL StorageYard	NA	12/13/91	Bis (2-ethylhexyl) phthalate	0.023	NA	NA
MW # 9	POL StorageYard	NA	12/13/91	Copper	0.0182	NA	1.8*, 1.0**
MW # 9	POL StorageYard	NA	12/13/91	Nickel	0 0194	NA	0.1
MW # 9	POL StorageYard	NA	12/13/91	Zinc	0.0867	2	5**
MW # 9	POL StorageYard	NA	12/13/91	Cadmium	< 0.01	0 005	0.005
MW # 9	POL StorageYard	NA	12/13/91	Chromium	0.35	[illegible]	0.1
MW # 9	POL StorageYard	NA	12/13/91	Lead	0.28	NA	0.015*
MW # 9	POL StorageYard	NA	1/15/92	Chloroform	0.0006	NA	0 1
MW # 9	POL StorageYard	NA	4/29/92	Total Dissolved Solids	839	NA	500
MW # 1	Northeast Landfill	NA	5/1/83	Lead	0.033	NA	0.015*
MW # 1	Northeast Landfill	NA	5/1/83	Nickel	0 009	NA	0.1
MW # 1	Northeast Landfill	NA	5/27/88	Aluminum	0.689	NA	0 05 to 0.2**
MW # 1	Northeast Landfill	NA	5/27/88	Antimony	< 0.06	0 003	0 006
MW # 1	Northeast Landfill	NA	5/27/88	Iron	1.89	NA	0 3**
MW # 1	Northeast Landfill	NA	5/27/88	Manganese	0.493	NA	0.05**
MW # 1	Northeast Landfill	NA	5/27/88	Thallium	< 0.005	0 0004	0.002
MW # 1	Northeast Landfill	NA	5/27/88	Zinc	0 013	2	5**
MW # 1	Northeast Landfill	DF4063	10/21/91	Total Dissolved Solids	949	NA	500
MW # 1	Northeast Landfill	DF4063	10/21/91	Sulfate	200	NA	250**
MW # 1	Northeast Landfill	DF4063	10/21/91	Lead	0 005	NA	0 015*
MW # 1	Northeast Landfill	DF4063	10/21/91	Zinc	0 062	2	5**
MW # 1	Northeast Landfill	DF4063	10/21/91	Antimony	< 0 015	0 003	0 006
MW # 1	Northeast Landfill	DF4063	10/21/91	Cadmium	< 0 01	0 005	0.005
MW # 1	Northeast Landfill	DF4063	10/21/91	Thallium	< 0.005	0 0004	0 002
MW # 2	Northeast Landfill	NA	5/1/83	Nickel	0.01	NA	1
MW # 2	Northeast Landfill	NA	5/27/88	Aluminum	2.83	NA	0 05 to 0 2**
MW # 2	Northeast Landfill	NA	5/27/88	Antimony	< 0 06	0 003	0 006
MW # 2	Northeast Landfill	NA	5/27/88	Iron	1.94	NA	0 3**
MW # 2	Northeast Landfill	NA	5/27/88	Manganese	1.17	NA	0 05**
MW # 2	Northeast Landfill	NA	5/27/88	Thallium	< 0 005	0 0004	0 002
MW # 2	Northeast Landfill	NA	5/27/88	Zinc	6	2	5**

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GROUNDWATER ANALYTICAL DETECTIONS AT RICHARDS-GEBAUR AFB

Well No.	Site Location	Sample Number/ Indentifier	Date Sampled	Contaminant	Conc. (mg/L)	Adult Lifetime Health Advisory (mg/L) (May 1994)	Maximum Contamination Level (MCL) (mg/L) (May 1994)
MW # 2	Northeast Landfill	DF4064	10/21/91	Total Dissolved Solids	380	NA	500
MW # 2	Northeast Landfill	DF4064	10/21/91	Antimony	< 0.15	0.003	0.006
MW # 2	Northeast Landfill	DF4064	10/21/91	Cadmium	< 0.01	0.005	0.005
MW # 2	Northeast Landfill	DF4064	10/21/91	Nitrate	2.2	NA	10
MW # 2	Northeast Landfill	DF4064	10/21/91	Sulfate	61	NA	250**
MW # 2	Northeast Landfill	DF4064	10/21/91	Lead	0.008	NA	0.015*
MW # 2	Northeast Landfill	DF4064	10/21/91	Thallium	< 0.005	0.0004	0.002
MW # 3	Northeast Landfill	NA	5/1/83	Nickel	0 006	NA	1
MW # 3	Northeast Landfill	NA	5/27/88	Aluminum	0.57	NA	0.05 to 0.2**
MW # 3	Northeast Landfill	NA	5/27/88	Antimony	< 0.06	0 003	0.006
MW # 3	Northeast Landfill	NA	5/27/88	Iron	0.609	NA	0.3**
MW # 3	Northeast Landfill	NA	5/27/88	Thallium	< 0.005	0 0004	0 002
MW # 3	Northeast Landfill	NA	5/27/88	Zinc	0.056	2	5**
MW # 3	Northeast Landfill	DF4065	10/21/91	Antimony	< 0.15	0.003	0.006
MW # 3	Northeast Landfill	DF4065	10/21/91	Cadmium	< 0.01	0 005	0.005
MW # 3	Northeast Landfill	DF4065	10/21/91	Thallium	< 0.005	0.0004	0.002
MW # 4	Northeast Landfill	DF4062	10/21/91	Antimony	< 0 15	0 003	0.006
MW # 4	Northeast Landfill	DF4062	10/21/91	Cadmium	< 0.01	0 005	0.005
MW # 4	Northeast Landfill	DF4062	10/21/91	Lead	0 005	NA	0 015*
MW # 4	Northeast Landfill	DF4062	10/21/91	Thallium	< 0.005	0 0004	0.002
MW # 5	Northeast Landfill	NA	5/27/88	Aluminum	56.7	NA	0.05 to 0.2**
MW # 5	Northeast Landfill	NA	5/27/88	Antimony	< 0.06	0 003	0.006
MW # 5	Northeast Landfill	NA	5 27 88	Iron	34 3	NA	0.3**
MW # 5	Northeast Landfill	NA	5 27 88	Manganese	3.2	NA	0 05**
MW # 5	Northeast Landfill	NA	5/27/88	Thallium	< 0.005	0 0004	0 002
MW # 5	Northeast Landfill	NA	5/27/88	Vanadium	0 087	NA	NA
MW # 5	Northeast Landfill	NA	5/27/88	Zinc	0 232	2	5**
MW # 5	Northeast Landfill	DF4061	10/21/91	Antimony	< 0.15	0.003	0.006
MW # 5	Northeast Landfill	DF4061	10/21/91	Cadmium	< 0.01	0.005	0 005
MW # 5	Northeast Landfill	DF4061	10/21/91	Lead	0 008	NA	0 015*
MW # 5	Northeast Landfill	DF4061	10/21/91	Thallium	< 0 005	0 0004	0 002
MW # 6	Northeast Landfill	NA	5/27/88	Aluminum	1.32	NA	0 05 to 0 2**
MW # 6	Northeast Landfill	NA	5/27/88	Antimony	< 0.06	0.003	0 006
MW # 6	Northeast Landfill	NA	5/27/88	Iron	1.94	NA	0.3**
MW # 6	Northeast Landfill	NA	5 27 88	Manganese	0 256	NA	0.05**
MW # 6	Northeast Landfill	NA	5/27/88	Thallium	< 0.005	0.0004	0 002
MW # 6	Northeast Landfill	NA	5/27/88	Zinc	0 036	2	5**
DPGW # 1	Drainage Pond	NA	4/7/94	Aluminum	0.26	NA	0 05 to 0 2**
DPGW # 1	Drainage Pond	NA	4/7/94	Antimony	< 0 01	0 003	0 006
DPGW # 1	Drainage Pond	NA	4/7/94	Arsenic	0 007	NA	0 05
DPGW # 1	Drainage Pond	NA	4/7/94	Copper	0 01	NA	1 8*, 1 0**
DPGW # 1	Drainage Pond	NA	4/7/94	Molybdenum	< 0 1	0 04	NA
DPGW # 1	Drainage Pond	NA	4/7/94	Aluminum	0 3	NA	[illegible]

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GROUNDWATER ANALYTICAL DETECTIONS
AT RICHARDS-GEBAUR AFB

Well No.	Site Location	Sample Number/ Indentifier	Date Sampled	Contaminant	Conc. (mg/L)	Adult Lifetime Health Advisory (mg/L) (May 1994)	Maximum Contamination Level (MCL) (mg/L (May 1994)
DPGW # 1	Drainage Pond	NA	4/7/94	Barium	0.304	2	2
DPGW # 1	Drainage Pond	NA	4/7/94	Iron	0.427	NA	0.3**
DPGW # 1	Drainage Pond	NA	4/7/94	Manganese	3.31	NA	0 05**
DPGW # 1	Drainage Pond	NA	4/7/94	Zinc	0.03	2	5**
MW # 1	Leaking UST	NA	6/13/91	Barium	0 196	2	2
MW # 1	Leaking UST	NA	6/13/91	Cadmium	0.005	0.005	0.005
MW # 1	Leaking UST	NA	6/13/91	Xylenes (total)	0.24	10	10
MW # 2	Leaking UST	NA	6/13/91	Barium	0 511	2	2
MW # 3	Leaking UST	NA	6/13/91	Barium	0.273	2	2
MW # 3	Leaking UST	NA	6/13/91	Cadmium	0 002	0 005	0 005

(shaded) - Contaminant detected above MCL or Health-based Advisory
(box) - Method detection limit above MCL or Health-based Advisory
NA - Not Available
* - Action Level
** - Secondary Level or MCL Goal

TABLE 3

MONITORING WELL CONSTRUCTION DETAILS

Well Number	Site Location	Date Installed	Diameter of Well (inches)	Total Depth of Boring (feet bgs)	Screened Interval (feet bgs)	Construction Material
MW # 1	Northeast Landfill	5/25/83	4	20.5	6.28 - 20.5	PVC Sch 40
MW # 2	Northeast Landfill	5/24/83	4	19.5	5.31 - 19.5	PVC Sch 40
MW # 3	Northeast Landfill	5/23/83	4	25.75	6.91 - 25.75	PVC Sch 40
MW # 4	Northeast Landfill	NA	NA	NA	NA	NA
MW # 5	Northeast Landfill	10/16/86	2	17.1	7.1 - 17.1	PVC Sch 40
MW # 6	Northeast Landfill	10/16/86	2	13.1	6.1 - 11.1	PVC Sch 40
GMW # 1	North Burn Pit	10/16/86	2	20.0	10 - 20	PVC Sch 40
GMW # 2	North Burn Pit	10/16/86	2	10.5	6.5 - 10.5	PVC Sch 40
GMW # 3	North Burn Pit	10/16/86	2	7.5	5 - 7.5	PVC Sch 40
GMW # 604	North Burn Pit	8/23/89	2	33	15 - 30	PVC Sch 40
GMW # 605	North Burn Pit	8/18/89	2	37.9	20 - 30	PVC Sch 40
GMW # 606	North Burn Pit	8/23/89	2	33	14 - 29	PVC Sch 40
GMW # 607	North Burn Pit	8/23/89	2	42	17 - 32	PVC Sch 40
MW # 1	POL Storage Yard	12/9/91	2	20.59	10*	PVC Sch 40
MW # 2	POL Storage Yard	12/10/91	2	16 67	7.5*	PVC Sch 40
MW # 3	POL Storage Yard	12/10/91	2	14.25	7.5*	PVC Sch 40
MW # 4	POL Storage Yard	NA	2	9 8	5 8 - 9.8	PVC Sch 40
GMW # 1205	POL Storage Yard	8/14/89	2	18.5	4.5 - 14.5	PVC Sch 40
GMW # 1206	POL Storage Yard	8/11/89	2	23	11.8 - 21 8	PVC Sch 40
GMW # 1207	POL Storage Yard	8/14/89	2	23	5 - 15	PVC Sch 40
GMW # 1208	POL Storage Yard	8/15/89	2	16	5 - 15	PVC Sch 40
MW # 9	POL Storage Yard	12/9/91	2	13.66	3 66 - 13 66	PVC Sch 40
MW # 1	Leaking UST	6/4/91	2	12	7 - 12	PVC Sch 40
MW # 2	Leaking UST	5/29/91	2	17	7 - 17	PVC Sch 40
MW # 3	Leaking UST	5/30/91	2	12.5	7.5 - 12 5	PVC Sch 40
DPGW # 1	Drainage Pond	3/23/94	4	29	18 5 - 28.5	PVC Sch 40
DPGW # 2	Drainage Pond	NA	NA	NA	NA	NA

Note NA - Not available
* - Length of screened interval (range for screened interval not available
bgs - below ground surface

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4. Ecology and Environment, Inc., September 1986. Installation Restoration Program-Phase II Technical Operations Plan/Confirmation/Quantification Study Report-Stage 2.

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7. O'Brien and Gere Engineers, July 1990. Remedial Investigation Report for Site 6, Site 9, Site 10, the Drum Storage Area, and Site 12.

8. O'Brien and Gere Engineers, October 1991. Remedial Investigation Report for North Burn Pit, Site FT002; Oil Saturated Area, Site SS003; Hazardous Waste Drum Storage, Site SS004; POL Storage Yard, Site ST005

9. Geraghty and Miller, Inc, Environmental Services, November 1991 Site Inspection Report, ST007 Leaking Underground Storage Tank (LUST) Building 902

10. Burns and McDonnell, April 1992. Supplemental Remedial Investigation Report, FT002 North Burn Pit.

11. Burns and McDonnell, November 1992 Installation Restoration Program-Remedial Investigation Report, ST005 POL Storage Yard.

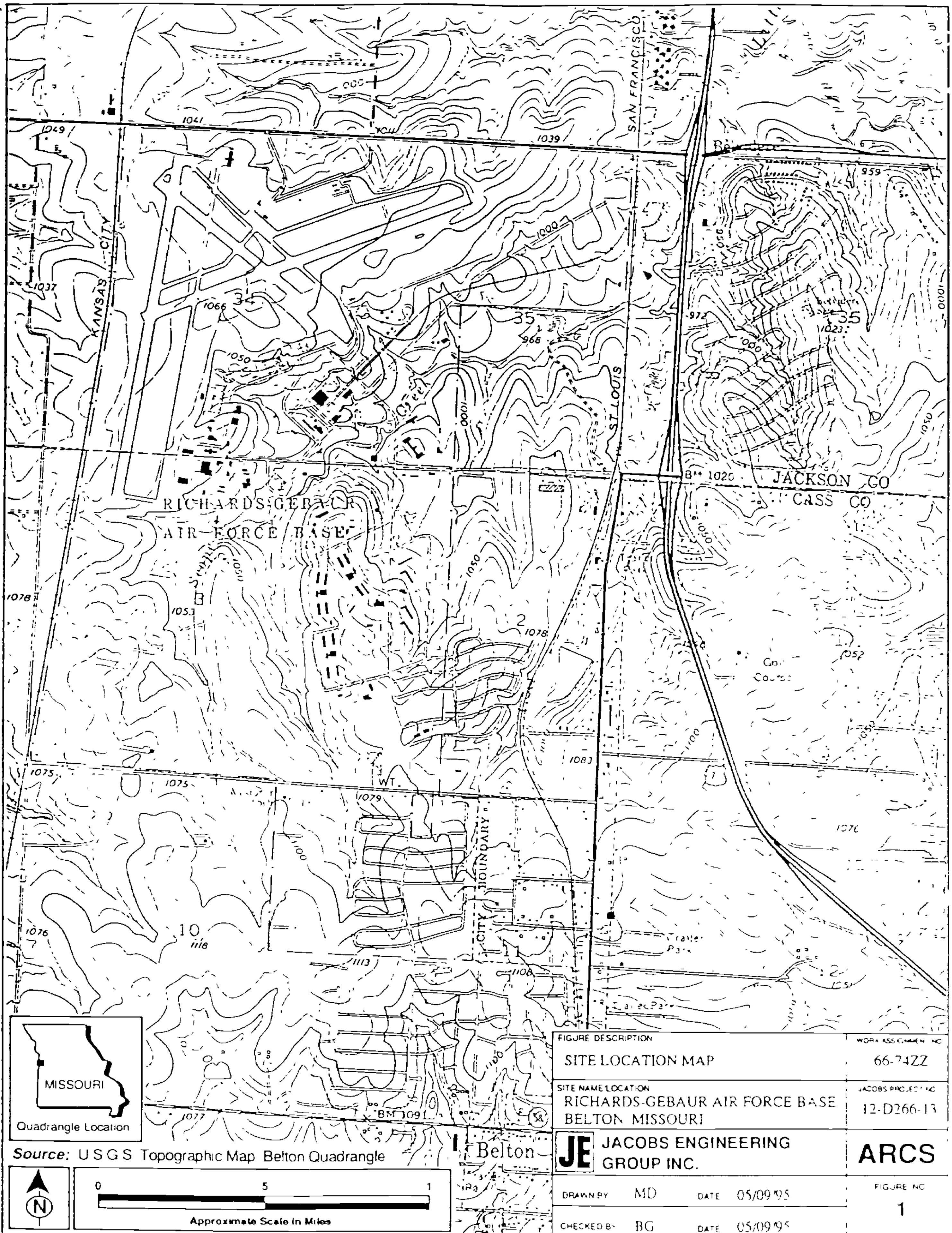
12. Department of the Air Force, December 1993 Environmental Baseline Survey, Richards-Gebaur AFB, Missouri

13. Wyatt, Lieutenant Colonel Dan, Richard J. Gentile, and P. Mark Esch, (no date listed) Draft Hydrogeologic Analysis of Richards-Gebaur AFB, Missouri

14. BRAC Cleanup Plan, RGAFB, Kansas City, Missouri, March 15, 1994

15. BRAC Cleanup Team Meeting Materials, March 8, 1995

FIGURES



Source: U S G S Topographic Map Belton Quadrangle

FIGURE DESCRIPTION: SITE LOCATION MAP	WORK ASSIGNMENT NO: 66-7422
SITE NAME/LOCATION: RICHARDS-GEBAUR AIR FORCE BASE, BELTON MISSOURI	JACOBS PROJECT NO: 12-D266-13
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY: MD DATE: 05/09/95	FIGURE NO
CHECKED BY: BG DATE: 05/09/95	1