M67386.AR.000189
MCRCO KANSAS CITY
5090.3a

MEMORANDUM AND U S AIR FORCE RESPONSE TO MISSOURI DEPARTMENT OF NATURAL RESOURCES COMMENTS REGARDING DRAFT GROUNDWATER ASSESSMENT KANSAS CITY MO
11/14/1996
VERSAR

290 1 File: 17-A-41 P.C. 290

14 November 1996

MEMORANDUM FOR: AFCEE/ERB/Mr. Fred Waterman
Building. 627
3207 North Road
Brooks AFB, TX 78235-5353

FROM: Michael E. Dorman
Versar, Inc.
6850 Versar Center
Springfield, VA 22151

SUBJECT: Response to Comments on the Draft Groundwater Assessment, Delivery Order 0016, Contract Number F41624-94-D-8051, Richards-Gebaur AFB, Missouri

Comments received from the Missouri Department of Natural Resources (MDNR) on the Draft Groundwater Assessment, Oil Saturated Area (SS003), Hazardous Waste Storage Area (SS004), Hazardous Material Storage (SS006), and Fire Valve Area (SS009), Operating Location Q, Missouri (Richards-Gebaur Air Force Base) at the Richards-Gebaur AFB, Missouri.

RESPONSE TO COMMENTS FROM MDNR (GUY FRAZIER)

General Comments:

1. Comment: The hydrogeology of the four sites included in this groundwater assessment is not well understood. Although the boring logs lack sufficient detail for thorough comparisons, they do seem to indicate the presence of similar geologic materials across each of the sites. However, shallow groundwater was reportedly encountered at various depths, ranging from several feet to 30 feet below ground surface. Versar was unable to locate uniform water-bearing zones and, therefore, has concluded that shallow groundwater appears to be "perched" in the unconsolidated and weathered bedrock overlying competent bedrock. Because Versar was unable to locate uniform water-bearing zones beneath the sites, groundwater flow directions were not determined.

   Many of the wells installed during this investigation contain several feet of water. However, based upon the boring logs and well construction diagrams provided in Appendix A, the majority of wells do not appear to screen substantial saturated zones directly above the bedrock. For example, the materials surrounding the bottom 9.5 feet of the screened interval in SS004-MW-01 are described as "dry" shale and claystone; yet, the well contains approximately 15 feet of water. Furthermore, the materials surrounding the bottom 13 feet of the screened interval in SS004-MW-02 are described as dry shale-claystone and limestone; however, the well contains about four feet of water. It is possible that the upper portions of the screen and/or filter pack

intervals may intercept thin zones of perched water, which are draining into the wells. The sources of water in the monitoring wells should be identified and targeted for further hydrogeologic investigation.

Response: The source of water in the wells is believed to be saturated weathered bedrock units (designated by the term "moist" and "wet" on the boring logs) and microfractures and bedding planes in weathered bedrock units (shale and claystone) in which saturated conditions were not encountered. Because of the lack of saturated units at most of the drilling locations, the weathered bedrock encountered above competent bedrock was treated as one water bearing unit. The groundwater wells were constructed to intercept groundwater present in both the saturated and unsaturated zones. All of the wells were installed to as shallow a depth as possible, in an effort to target groundwater most likely to have been impacted by contaminated soil formerly located at the Sites.

Groundwater contour maps based on well measurements collected before sampling, were prepared for Sites SS003 and SS004. Based on the maps, groundwater flow beneath Site SS003 appears to be southeast and groundwater flow beneath Site SS004 appears to be east. Generally, groundwater flow beneath both of these Sites appears to be towards Scope Creek located to the southeast. Based on depth to bedrock beneath Site SS004, shallow groundwater also appears to be influenced by bedrock topography (bedrock is encountered at greater depths in an easterly direction).

2. Comment: Because Versar was unable to locate uniform water-bearing zones beneath the sites, groundwater flow directions were not determined. However, based on the close proximity of Scope Creek to the sites, regional flow within the shallow groundwater zone was presumed to be toward the Creek. Additional hydrogeologic investigation is necessary in order to determine actual local groundwater flow directions within the uppermost water-bearing unit at each of the sites. It should be noted that "perched" water would be expected to flow in response to the orientation of the underlying semi-impermeable zone and may not necessarily mimic surface topography or be related to surface drainage, especially in cases such as this, where surface drainages are intermittent.

Response: See above and below answer to comments

3. Comment: The purpose of this project was to "perform a groundwater assessment at the four sites to determine the presence or absence of groundwater contamination." The presence or absence of groundwater contamination cannot be confirmed until it can be shown that groundwater samples have been collected from locations hydraulically downgradient of the sites.

Response: Based on groundwater contour maps prepared for Sites SS003 and SS004, groundwater flow beneath Site SS003 appears to be southeast and groundwater flow beneath Site SS004 appears to be east. At Site SS003, two wells MW-02 and MW-03 are located hydraulically downgradient of the remediated area. At Site SS003, one well MW-02 is located hydraulically downgradient of the remediated area.

4. Comment: If a sufficient volume of groundwater was not observed in a direct-push borehole, the borehole was reportedly "backfilled to grade with bentonite." The specific type of bentonite used to backfill the borehole should be described. The Well Registration Record provided in Appendix A indicates that both "bentonite slurry" and "bentonite powder" were used to backfill the test holes; however, the number of gallons of water per bag of bentonite was "N/A." Please explain.

   Response: According to the MDNR Well Construction Rules, 10 CSR 23-4.080(2), "All temporary wells per monitoring site may be reported on one (1) registration report form if they are all plugged the same way..." Since the abandonment of all direct-push borings (classified as temporary wells per these rules) were included on this one form, the total amount of bentonite was provided, not the amounts used for each of the 15 boreholes. Versar verified with the MDNR Wellhead Protection Section on November 6, 1996, that this form was completed properly.

Specific Comments:

5. Comment: Page 4, Section 1.2, Paragraph 1: According to the text, Sites SS003, SS004, SS006, and SS009 are located in Cass County, Missouri. A comparison of Figures 1-1 and 1-2 indicates that, while Site SS003 is located in Cass County, Sites SS004, SS006, and SS009 are located in Jackson County.

   Response: The text has been changed to reflect this error.

6. Comment: Page 5, Section 1.3.1, Paragraph 1: Three sediment samples and one surface water sample were collected from a drainage ditch along the western edge of Site SS003. It is unclear whether this drainage ditch receives runoff from the former source area at Site SS003. According to the Belton 7.5-minute quadrangle, as well as topographic contours presented on the map of Figure 1-3, topography in the area of Site SS003 slopes to the east or southeast. In addition, the presumed hydraulic downgradient direction is to the south or southeast (see Page 24, Section 4.1, Monitoring Well Installation, Paragraph 1).

   Response: Depending on the level of precipitation, runoff could enter this ditch. Additional information can be found in the referenced report (O'Brien and Gere, 1991).

7. Comment: Page 7, Section 1.3.2, Paragraph 1: Surface water runoff in this area would reportedly flow into a grassy drainage ditch along the western part of the site. However, according to the Belton 7.5-minute quadrangle, the topography in the area of Site SS004 slopes to the east or southeast. In addition, according to Figure 1-4 (Page 9), the estimated direction of groundwater flow is to the east in the vicinity of the site. A detailed topographic map should be included and an explanation of the relationship between surface water runoff and estimated groundwater flow directions should be provided.

   Response: The information presented was reported in the IRP Phase II Stage 2 Investigation (Ecology and Environment, 1988). Based on a review of topographic

maps of the installation, this area is flat, with little change in elevation (i.e., no contours available within the immediate vicinity of the site), therefore, no detailed topographic map is available. In addition, verifying detailed surface topography was not within the scope of this groundwater assessment. In following the overall elevation data, flow should follow the "estimated direction of groundwater flow" shown in Figure 1-4, however two buildings are directly in this path. Buildings are generally constructed so that surface runoff is directed away from the building, not into the buildings. Therefore, the premise presented in the IRP Investigation may be true.

Based on groundwater contour maps prepared for Sites SS003 and SS004, groundwater flow beneath Site SS003 appears to be southeast and groundwater flow beneath Site SS004 appears to be east. Generally, groundwater flow beneath both of these Sites appears to be towards Scope Creek located to the southeast. Based on depth to bedrock beneath Site SS004, shallow groundwater also appears to be influenced by bedrock topography (bedrock is encountered at greater depths in an easterly direction).

8. Comment: Page 11, Paragraphs 3 and 4: Fifteen borings were drilled at Site SS009 in 1994. According to the text, TPH was detected in only one of these borings, at a concentration below the MDNR soil cleanup guideline for TPH-impacted soil. However, a small area of contaminated soil was also reportedly encountered near the site of the former excavation. It is unclear whether these contaminated areas have since been excavated.

   Response: The soil below the MDNR soil cleanup guideline was not excavated.

9. Comment: Page 13, Section 2.2, Paragraph 2: According to this paragraph, Scope Creek is an intermittent stream. However, according to other Richards-Gebaur reports, Scope Creek is largely intermittent in its headwaters, but becomes perennial in the northeast part of the facility, where it joins the Little Blue River.

   Response: According to the Final Environmental Impact Statement (1994), "Scope Creek is an intermittent stream that contains water much of the time." Therefore, the text appears correct.

10. Comment: Page 13, Section 2.2, Paragraph 2: The text states that surface water supplies are limited in the Saline Province. Please define and describe the "Saline Province."

    Response: The reference to the Saline Province has been removed.

11. Comment: Page 14, Paragraph 2: According to the text, the Lane Formation is a medium gray to bluish-gray shale that is commonly silty in the upper part. It should be noted that "Several feet of massive to cross-bedded sandstone is present near the top of the Lane in exposures on the Richards-Gebaur U.S. Air Force Base...lenses of conglomerate consisting of locally derived particles of limestone, shale, chert, and carbonized wood are interbedded with the cross-bedded sandstone." (Gentile, Richard

J., Geology of the Belton Quadrangle, Missouri Department of Natural Resources - Division of Geology and Land Survey Report of Investigation, Number 69, p. 23).

Response: Versar will incorporate this information if this reference is provided.

12. Comment: Page 14, Section 2.4, Paragraph 1: A 1976 USGS publication reportedly indicates that OL-Q is located within the Osage Salt Plains groundwater area on the Central Nonglaciated Plains groundwater region. This publication should be listed as a reference in Section 6.0 (Pages 41 to 42).

Response: The reference to USGS (1976) was a secondary reference and could not be obtained. Many other reports related to investigations at OL-Q make the same statement, therefore, this reference will be changed to the BCP (USAF, 1994).

13. Comment: Page 16, Figure 3-1: This map should contain a north arrow.

Response: A north arrow has been added to the map.

14. Comment: Page 19, Figure 3-4: Two of the direct-push borings depicted on this map are labeled as "HP07," while none of the borings are labeled as "HP08."

Response: This error has been corrected.

15. Comment: Page 21, Paragraph 1: Soil cuttings obtained through air rotary drilling were screened for VOCs using a PID. Reliability of such screening is questionable, due to the potential for volatilization of VOCs during air rotary drilling.

Response: Versar agrees with this comment, however, due to the nature of this type of drilling, this was one of several "screening tools" used. Since soil characterization for contamination was not part of this study, the use of a PID was solely to aide in characterization of the material encountered.

16. Comment: Page 22, Paragraph 1: Due to extremely low recharge rates, a sufficient volume of groundwater was not received for *in situ* measurements at the end of purge for several of the wells. It is unclear whether *ex-situ* measurements were taken.

Response: Ex-situ (laboratory analysis) measurements were taken.

17. Comment: Page 25, Paragraph 2: Based on Versar's observations, the shallow groundwater encountered appears to be "perched" above the bedrock (in the unconsolidated sediments and weathered bedrock). However, according to the boring log and well construction diagram provided in Appendix A, SS003-MW-02 is screened entirely within the bedrock, but contains approximately two feet of water. This indicates a water-producing zone within the bedrock at MW-02.

Response: Well SS004-MW-02 is screened from a depth of 10 to 15 feet below existing grade, straddling weathered (shale and claystone) and competent (limestone) bedrock. Based on field observations, the weathered shale/claystone was not

considered to be true competent bedrock (soft to the touch), which would allow groundwater to easily pass through this material. The groundwater present in this well is believed to be the result of fractures in the competent (limestone) bedrock or water entering the interval of screen through the weathered shale and claystone.

18. Comment: Page 26, Table 4-1: Information regarding direct-push borehole SS009-HP-05 has been omitted from this table.

Response: The information for borehole SS009-HP-05 has been added to the table.

19. Comment: Page 28, Groundwater Sampling Results: VOCs were detected at low concentrations in the samples collected from well SS004-MW-01, which was presumed to be a hydraulically upgradient well. This may indicate that the estimated groundwater flow direction is incorrect. Additional hydrogeologic investigation should be conducted.

Response: While well SS004-MW-01 was originally planned to be upgradient, the well was installed within a portion of the remediated area (heavy equipment precluded installing the well several feet further to the north). Based on groundwater contours of the site, this well is located at the high point and wells 03 and 04 are downgradient.

20. Comment: Page 31, Site Geology and Hydrogeology, Paragraph 2: Based on Versar's observations, the shallow groundwater encountered appears to be "perched" above the bedrock (in the unconsolidated sediments and weathered bedrock). However, according to the boring log and well construction diagram provided in Appendix A, SS006-MW-01 is screened entirely within the bedrock, but contains approximately seven feet of water. This indicates a water-producing zone within the bedrock at MW-01.

Response: Versar agrees with this comment and the referenced text is incorrect. This description will be revised to correctly present the findings, based on this well log. Well SS006-MW-01 is screened from a depth of 5.7 to 15.7 feet below existing grade, straddling weathered (shale and claystone) and competent (limestone) bedrock. The competent bedrock units are relatively thin (less than 2 feet) in thickness and are situated between the weathered shale and claystone units. The weathered units are believed to be the source of groundwater present in this well.

21. Comment: Page 34, Paragraph 2: According to the text, temporary well SS009-PZ-02 was located on the *northwestern* side of the previously excavated areas. However, according to Figure 3-4 (Page 19), this temporary well was located *southeast* of the excavated area.

Response: Versar agrees with this comment and the location will be corrected in the text.

22. Comment: Page 34, Paragraph 2: According to the text, temporary well SS009-PZ-03 was completed to bedrock (13 feet beg). However, according to information presented in Table 4-1 (Page 26), the depth to bedrock at PZ-03 was 14 feet.

Response: The depth to bedrock at PZ-03 is 14 feet, not 13 feet as referenced in the text. This will be corrected.

23. Comment: Page 34, Paragraph 2: Because temporary well SS009-PZ-03 did not contain a sufficient volume of water, well SS004-MW-01 was "used as the upgradient well" for Site SS009. Because the groundwater flow direction was not determined at Site SS009, the wells should not be referred to as either "upgradient" or "downgradient."

Response: Based on groundwater contour maps prepared for Sites SS004, which is located approximately 175 feet southwest of Site SS009, groundwater flow beneath Site SS009 is most likely to the east or southeast (towards Scope Creek). Therefore well SS004-MW-01 can suffice as the upgradient well.

24. Comment: Page 35, Paragraph 2: The concentrations of arsenic, chromium, lead, and barium detected in groundwater at Site SS009 are described as "relatively low." It should be noted that MCLs were exceeded for each of these analytes.

Response: Versar agrees with this comment. While these metals are naturally occurring components of the surficial soils, they are not low levels and are above MCLs.

25. Comment: Page 39, Section 5.2: Groundwater flow directions have not been determined. It is, therefore, not known whether the existing wells are upgradient or downgradient of the site. These data gaps are unacceptable. Groundwater flow directions must be determined in order to ascertain whether the groundwater has been impacted by soil contamination at the various sites.

Response: See Responses to Comment 1, 3, and 7.

26. Comment: Page 39, Section 5.2: The statement is made that, although groundwater flow directions are unknown, since borings were completed "around the perimeter of most of the sites," and evidence of contamination was either not observed or contaminants were only detected at "relatively low concentrations" (i.e., based on field screening of the soil samples and groundwater sampling results), the actual determination of groundwater flow direction does not impact the overall conclusions of this study. It should be noted that field screening consisted only of screening soil cuttings for VOCs using a PID. Contaminants of concern include compounds other than VOCs. In addition, the use of air during drilling could volatilize VOCs, so that they may not be detected, regardless of whether or not they were initially present. Furthermore, although boreholes may have been completed around the perimeter of the sites, in most cases, groundwater monitoring wells were not. Finally, Missouri Department of Natural Resources disagrees with the claim that "the actual determination of groundwater flow direction does not impact the overall conclusions of this study." If the groundwater flow direction is unknown, analytical results from the existing wells are insufficient for confirmation of the presence or absence of groundwater contamination at the site. It is necessary to determine the groundwater flow direction to ensure that groundwater was sampled at the proper locations.

Response: See Responses to Comment 1, 3, 7 and 15.

27. Comment: Page 39, Section 5.3, Bullet 2: Versar recommends no additional environmental activities be performed at Sites SS003, SS004, and SS006 and that case closure be granted for each of those sites, based partially on the idea that the target compounds were either not detected or detected at "relatively low concentrations" in the groundwater samples. It is necessary to first determine whether the groundwater samples collected were hydrologically downgradient of the site. It should also be noted that some of the contaminants were detected above their respective MCLs.

Response: Based on groundwater contour maps prepared for Sites SS003 and SS004, groundwater flow beneath Site SS003 appears to be southeast and groundwater flow beneath Site SS004 appears to be east. In both cases, the flow is towards Scope Creek. At Site SS003, two wells MW-02 and MW-03 are located hydraulically downgradient of the remediated area. At Site SS003, one well MW-02 is located hydraulically downgradient of the remediated area. Concentrations of contaminants detected in these wells were low (below MCLs). Based on these concentrations in the downgradient wells, Versar recommends that these two sites be closed.

Recommendations:

28. Comment: The text refers to this investigation as a "preliminary groundwater assessment" (Page 23, Section 3.6, Paragraphs 1 and 4). Results of this "preliminary assessment" indicate that the hydrogeology of the area is somewhat complex and may consist of multiple zones of perched water. In order to further define the hydrogeology at Sites SS003, SS004, SS006, and SS009, additional investigation is necessary. Because direct-push technology and air rotary drilling are not ideal techniques for the investigation of potential perched zones, which may be difficult to recognize during drilling operations, Missouri Department of Natural Resources recommends that additional boreholes be advanced using a hollow stem auger (HSA) and that a split spoon sampler be used to continuously sample the soils. Use of this method should improve the ability to detect horizons suitable for monitoring.

Response: Versar disagrees with this comment. Based on most of the information obtained during the course of this study, and additional information reviewed from EPA (Groundwater Evaluation Study, Jacobs Engineering,1995), source of groundwater appears to be just above any competent bedrock layer, in most cases. The use of a HSA would not allow entry into bedrock and, therefore, wells installed with this method could not straddle the location of the groundwater.

29. Comment: In the event that a persistent water-bearing unit can be identified through the use of an HSA, then groundwater flow direction should be determined, and downgradient groundwater samples collected and analyzed.

Response: See Response to Comment 28.

Please note that there were no formal comments received from MDNR regarding the report for OWS704; however, the several comments were transmitted verbally have been incorporated into that report. In addition, all relevant comments that were addressed above have also been incorporated into the OWS704 report.

Comments received from AFCEE/ERS (Booz Allen) were incorporated into the text of both reports, however, because of time constraints, a formal response to comments could not be prepared.